FILE HISTORY

US 5,414,761

PATENT:	5,414,761
INVENTORS:	Darbee, Paul V.
TITLE:	Remote control system
APPLICATION NO:	US1993134086A
FILED:	08 OCT 1993
ISSUED:	09 MAY 1995
COMPILED:	04 FEB 2014

ISSUE CLASSIFICATION	Class	Subclass
	379	102

[redacted]

5414761

5414761

UTILITY SERIAL NUMBER	PATENT DATE	PATENT NUMBER
08/134086	MAY 09 1995	

SERIAL NUMBER	FILING DATE	CLASS	SUBCLASS	GROUP ART UNIT	EXAMINER
08/134,086	10/08/93 RULE 60	~~340~~ 379	102	~~2617~~ 2608	W. CHAN

APPLICANTS

PAUL V. DARBEE, SANTA ANA, CA.

30X

CONTINUING DATA********

VERIFIED Yes WFC

THIS APPLN IS A CON OF 08/046,105 04/08/93 PAT 5,255,313
WHICH IS A CON OF 07/587,326 09/24/90 PAT 5,228,077
WHICH IS A CIP OF 07/127,999 12/02/87 PAT 4,959,810
WHICH IS A CIP OF 07/109,336 10/14/87 ABN

FOREIGN/PCT APPLICATIONS********

VERIFIED

None WFC

NOTE - DISCLAIMER
The term of this patent subsequent to 07/13/10 has been disclaimed

FOREIGN FILING LICENSE GRANTED 02/10/94 ***** SMALL ENTITY *****

Foreign priority claimed / 35 USC 119 conditions met / Verified and Acknowledged	AS FILED	STATE OR COUNTRY	SHEETS DRWGS.	TOTAL CLAIMS	INDEP. CLAIMS	FILING FEE RECEIVED	ATTORNEY'S DOCKET NO.
☐ yes ☑ no / ☐ yes ☑ no / WFC Examiner's initials		CA	18	7	1	$494.00	93173

ADDRESS

THOMAS R. VIGIL
VIGIL & HANRATH
836 S. NORTHWEST HIGHWAY
BARRINGTON, IL 60010

TITLE

~~UNIVERSAL~~ REMOTE CONTROL SYSTEM ~~WITH DATA COUPLING~~

#15

U.S. DEPT. of COMM.-Pat. & TM Office-PTO-436L (rev. 10-78)

PARTS OF APPLICATION FILED SEPARATELY

Rugenia Lo 12-16-94
Applications Examiner

NOTICE OF ALLOWANCE MAILED

12/13/94

Assistant Examiner

WING F. CHAN
PRIMARY EXAMINER
GROUP 2600

Primary Examiner

CLAIMS ALLOWED

Total Claims	Print Claim
19	1

DRAWING

Sheets Drwg.	Figs. Drwg.	Print Fig.
18	40	23

ISSUE BATCH NUMBER H05

PREPARED FOR ISSUE

ISSUE FEE

Amount Due	Date Paid
$605.00	12-22-94

FORM PTO-1267 (Rev. 11-92) U.S. Department of Commerce Patent and Trademark Office

DISCLAIMER LABEL

Application No.
08/134,086

A terminal disclaimer has been entered and recorded under 35 U.S.C. 253 in this file.

DO NOT DESTROY

ARNING: The information disclosed herein may be restricted. Unauthorized disclosure may be prohibited by the United States Code Title 35, Sections 122, 181 and 368. Possession outside the U.S. Patent & Trademark Office is restricted to authorized employees and contractors only.

rm PTO-436A
ev. 8/92)

5,414,761

REMOTE CONTROL SYSTEM

Transaction History

Date	Transaction Description
11/3/1993	Notice Mailed--Application Incomplete--Filing Date Assigned
2/7/1994	Application Is Now Complete
2/22/1994	Application Captured on Microfilm
4/18/1994	Preliminary Amendment
5/2/1994	Case Docketed to Examiner in GAU
5/9/1994	Information Disclosure Statement (IDS) Filed
5/9/1994	Information Disclosure Statement (IDS) Filed
6/6/1994	Case Docketed to Examiner in GAU
6/20/1994	Non-Final Rejection
6/27/1994	Mail Non-Final Rejection
9/1/1994	Information Disclosure Statement (IDS) Filed
9/1/1994	Information Disclosure Statement (IDS) Filed
9/19/1994	Response after Non-Final Action
9/23/1994	Information Disclosure Statement (IDS) Filed
9/23/1994	Information Disclosure Statement (IDS) Filed
10/19/1994	Date Forwarded to Examiner
12/1/1994	Terminal Disclaimer Approved in TC
12/13/1994	Mail Notice of Allowance
12/13/1994	Notice of Allowance Data Verification Completed
12/13/1994	Mail Examiner's Amendment
12/13/1994	Examiner's Amendment Communication
12/22/1994	Issue Fee Payment Verified
4/4/1995	Issue Notification Mailed
5/9/1995	Recordation of Patent Grant Mailed
7/24/1995	Request to Make of Record Noted Concerns in Granted Patent

08/184036

[redacted]

APPROVED FOR LICENSE ☐

INITIALS OCT 2 9347

CONTENTS

		Date Entered or Counted	Date Received or Mailed
	1. Application ____ papers.		
No Paper	2. ~~Certificate Decl~~		10/09/93
	3. Ltr re fee & oath		11/3/93
	4. Sue Change		11/16/93
	5. Ltr Incomplete		12/30/93
	6. Ltr re Drftsmn		Oct. 8 1993
	7. Pre Amdt A w/Prior Art		Oct. 8, 1993
	8. Form Ltr w/attch.		Nov. 29 1993
	9. Forwarding w/attch.		Dec. 3 1993
	10. Form Ltr w/attch.		Dec. 13 1993
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6/3/94	12. Form Ltr w/attch.		May 9 1994
6-20	13. Rej 3 month(s)		cd 7-27-94 MK
	14. Prior Art		9/19/94
10-19-94	15. Amdt C		9/19/94
	16. Terminal Disclaimer		9/19/94
	17. ~~Prior Art w/Refers~~		9-23-94
12-8=	18. Notice of Allow.		12/13/94 MK
	19. PTO Grant MAY 09 1995		
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SEARCHED

Class	Sub.	Date	Exmr.
379	102	6/17/94	WFC
	104		
	105		
	443		
	444		
	93		
	97-99		
348	734		
	478		
updated search		12/2/94	WFC

SEARCH NOTES

	Date	Exmr.

INTERFERENCE SEARCHED

Class	Sub.	Date	Exmr.
same as above		12/2/94	WFC

STAFF AREA

★ U.S. GOVERNMENT PRINTING OFFICE: 1992-327-409

PATENT NUMBER

APPLICATION SERIAL NUMBER
08/134,086

APPLICANT'S NAME (PLEASE PRINT)
P. V. Darbee

IF REISSUE, ORIGINAL PATENT NUMBER

INTERNATIONAL CLASSIFICATION 6

H	04	M		11/00	
H	04	N		5/44	
				/	
				/	

ORIGINAL CLASSIFICATION

CLASS	SUBCLASS
379	102

CROSS REFERENCE(S)

CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)			
348	734			

GROUP ART UNIT: 2608

ASSISTANT EXAMINER (PLEASE STAMP OR PRINT FULL NAME)

PRIMARY EXAMINER (PLEASE STAMP OR PRINT FULL NAME)
WING F. CHAN

PTO 270
(REV. 5-91)

ISSUE CLASSIFICATION SLIP

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

Claim Final	Claim Original	Date							
	1	6/17/94	12/5/94						
2	2	✓	=						
3	3		=						
4	4		=						
5	5		=						
6	6		=						
7	7		=						
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11	11		=						
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17	17		=						
18	18		=						
19	19		=						
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SYMBOLS

✓	Rejected
=	Allowed
-	(Through numberal) Canceled
+	Restricted
N	Non-elected
I	Interference
A	Appeal
O	Objected

Claim Final	Claim Original	Date							
	51								
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US005414761A

United States Patent [19]

Darbee

[11] Patent Number: 5,414,761

[45] Date of Patent: * May 9, 1995

[54] **REMOTE CONTROL SYSTEM**

[75] Inventor: **Paul V. Darbee**, Santa Ana, Calif.

[73] Assignee: **Universal Electronics Inc.**, Twinsburg, Ohio

[*] Notice: The portion of the term of this patent subsequent to Jul. 13, 2010 has been disclaimed.

[21] Appl. No.: **134,086**

[22] Filed: **Oct. 8, 1993**

Related U.S. Application Data

[63] Continuation of Ser. No. 46,105, Apr. 8, 1993, Pat. No. 5,255,313, which is a continuation of Ser. No. 587,326, Sep. 24, 1990, Pat. No. 5,228,077, which is a continuation-in-part of Ser. No. 127,999, Dec. 2, 1987, Pat. No. 4,959,810, which is a continuation-in-part of Ser. No. 109,336, Oct. 14, 1987, abandoned.

[51] **Int. Cl.**[6] **H04M 11/00; H04N 5/44**

[52] **U.S. Cl.** **379/102**; 348/734

[58] **Field of Search** 379/102, 104, 105, 443, 379/444, 93, 97–99; 348/734, 478

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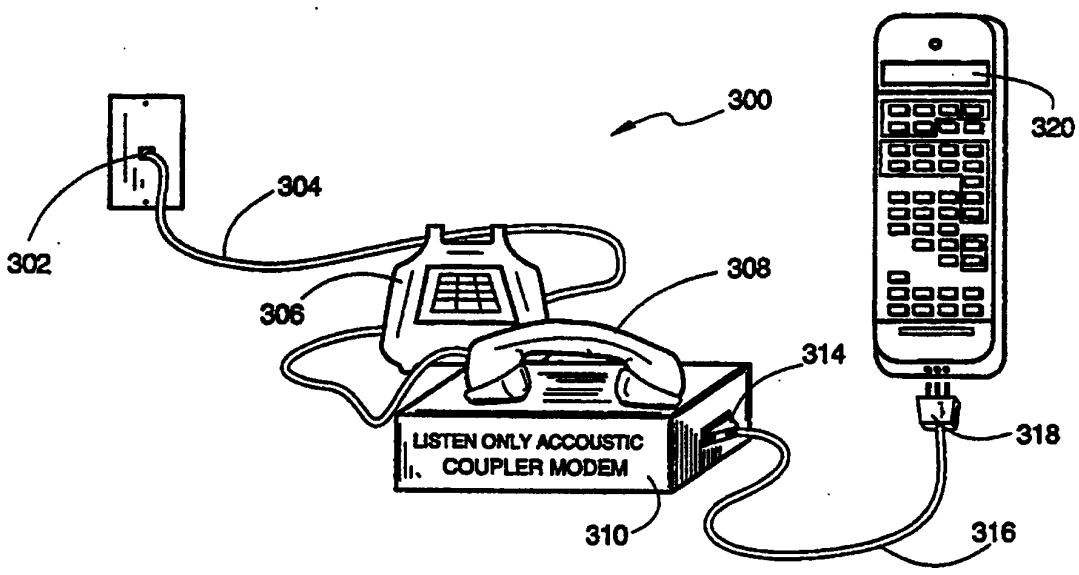
(List continued on next page.)

Primary Examiner—Wing F. Chan
Attorney, Agent, or Firm—Thomas R. Vigil

[57] **ABSTRACT**

The remote control system includes a remote control and a computer having a memory and at least one of instruction codes or code data for creating appropriate IR lamp driver instructions for causing an infrared signal generator to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, stored in the memory of the computer. The remote control comprises: input circuitry including a set of keys or pushbuttons for inputting commands into the remote control, infrared signal output circuitry including IR lamp driver circuitry for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to the input circuitry and to the signal output circuitry, a memory coupled to the CPU, and data coupling circuitry and structure for periodically coupling the computer to the remote control for inputting from the computer memory at least one of instruction codes or appropriate IR lamp driver instructions for causing the infrared signal output circuitry to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled into the memory of the remote control to enable the remote control to control various devices to be controlled upon the inputting of commands to the keys of the input circuitry.

19 Claims, 18 Drawing Sheets



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2229023	9/1990	United Kingdom .
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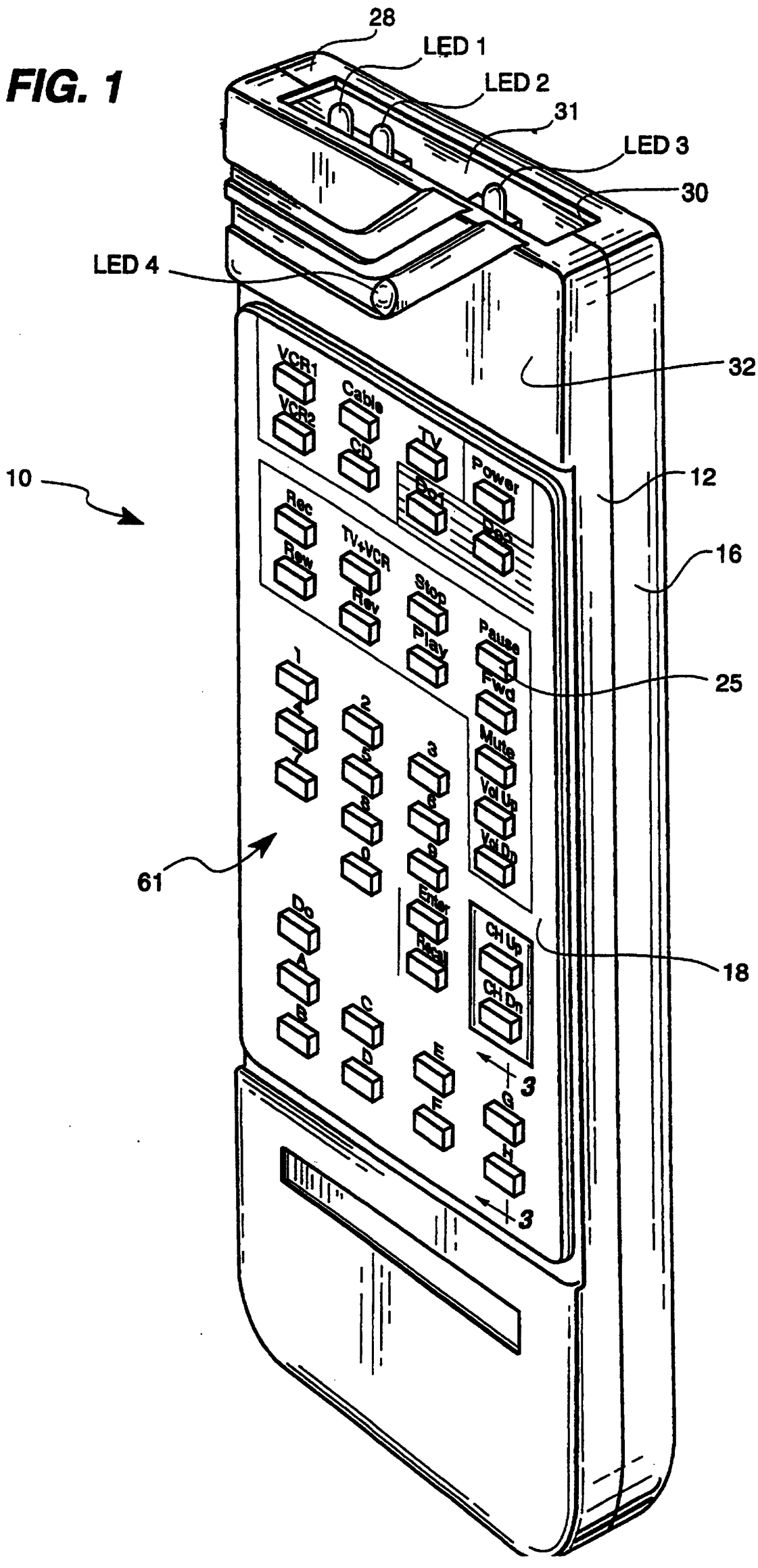
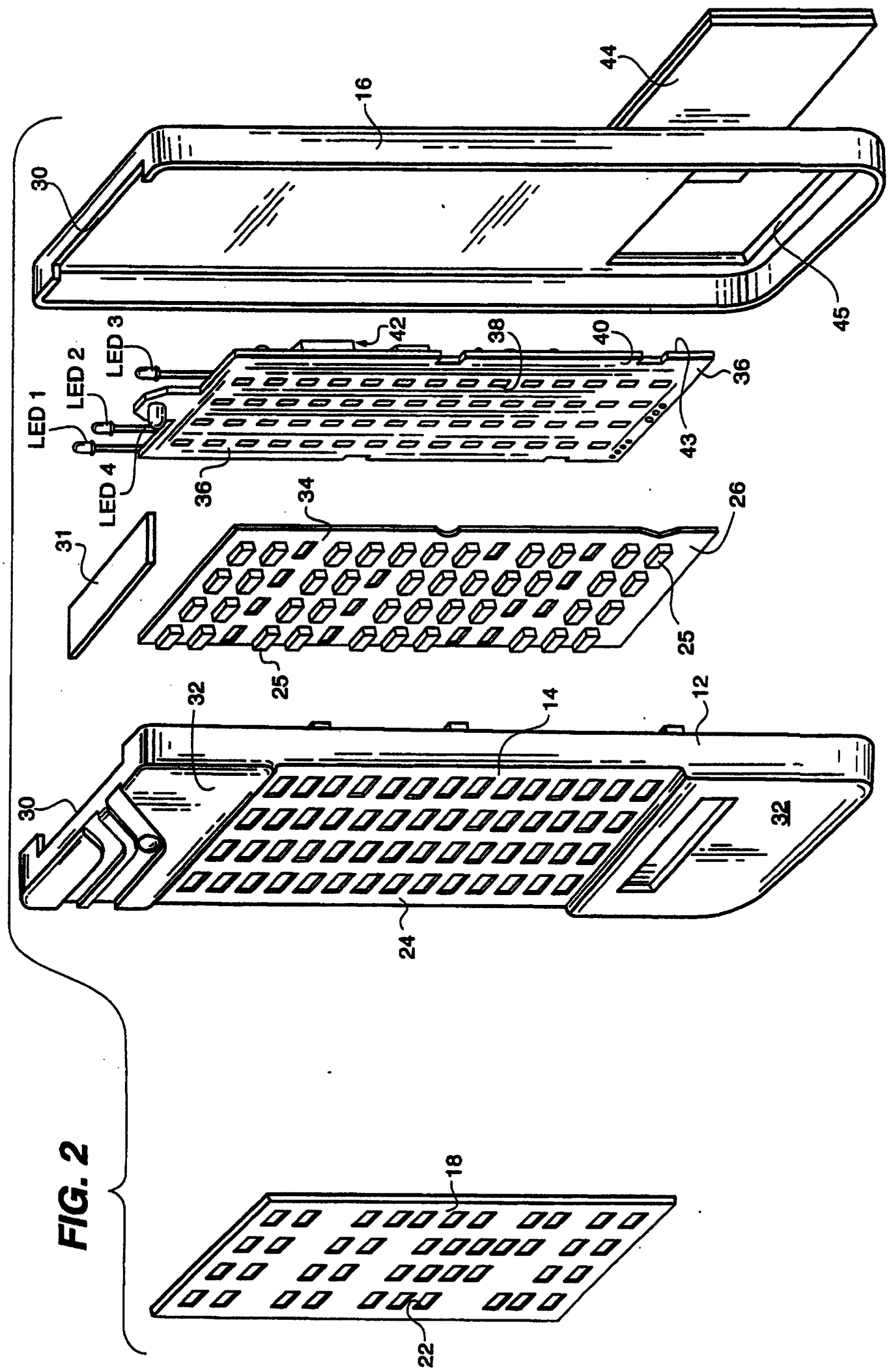
IEEE Transactions on Consumer Electronics, vol. CE-31, No. 1, Feb. 1985, pp. 59-69, J. Platte et al., "A new intelligent remote control for consumer electronic devices".

IEEE Spectrum, Mar. 1983, pp. 48-53, I. Dorros, "Telephone nets go digital".

FIG. 1




44
16
30
45
LED 3
LED 2
LED 1
LED 4
42
38
40
36
43
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34
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31
25
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18
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FIG. 2

FIG. 3

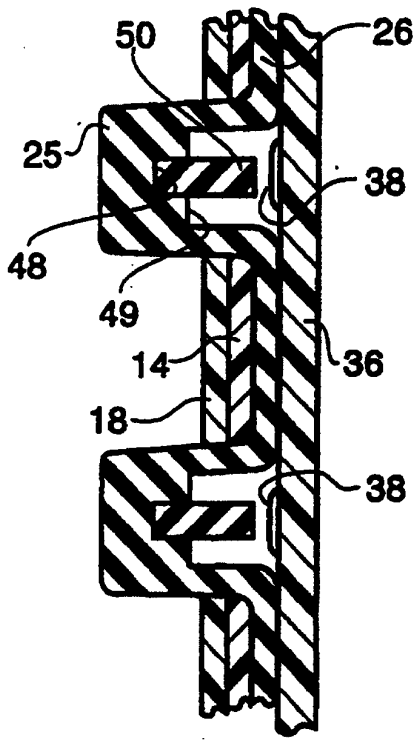


FIG. 4

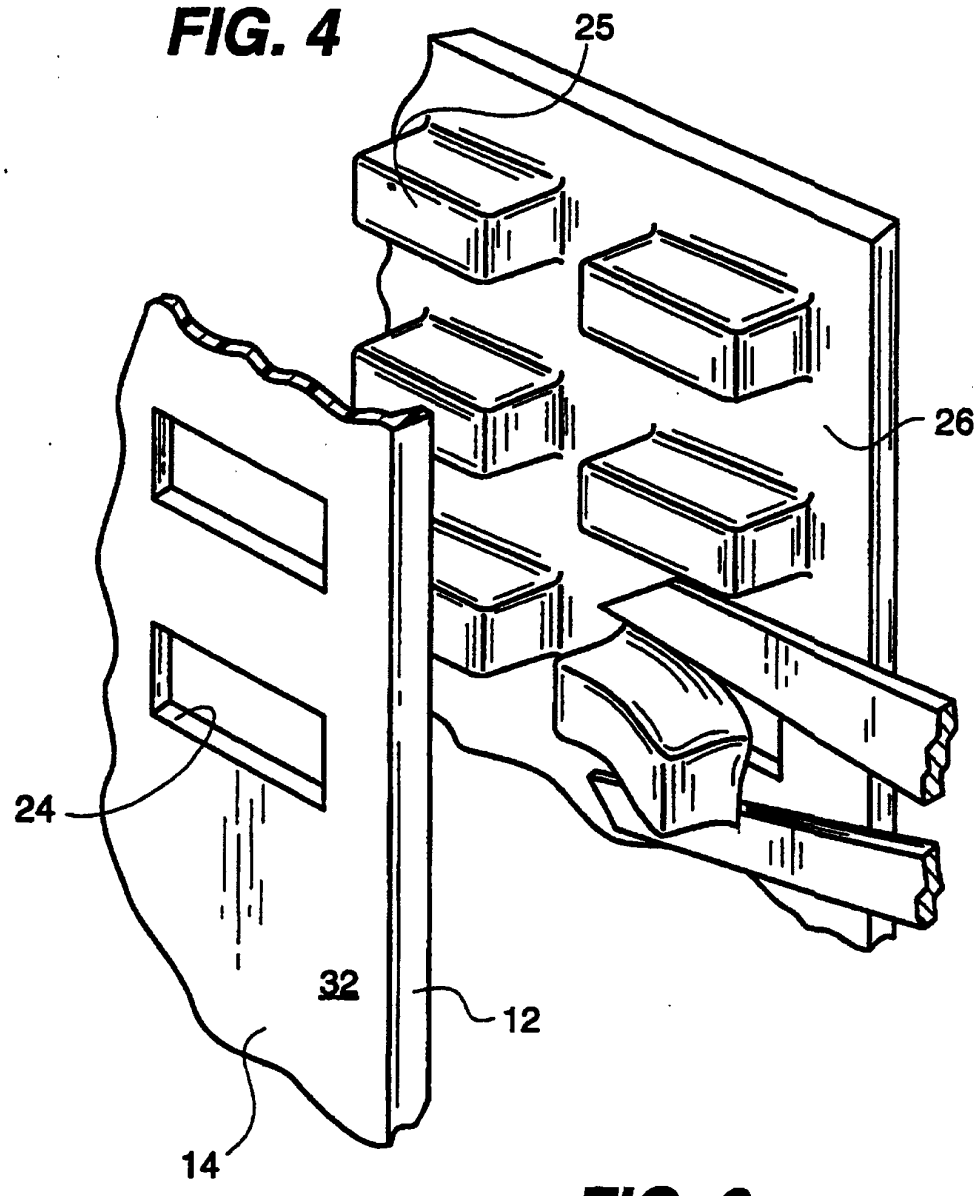


FIG. 5

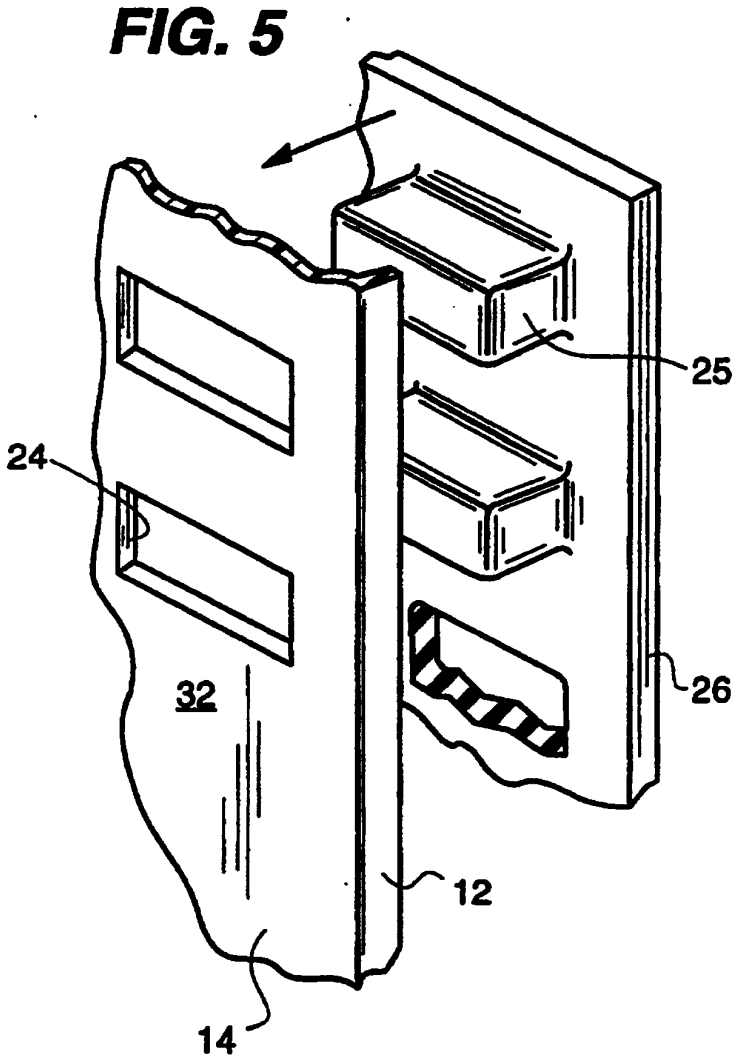


FIG. 6

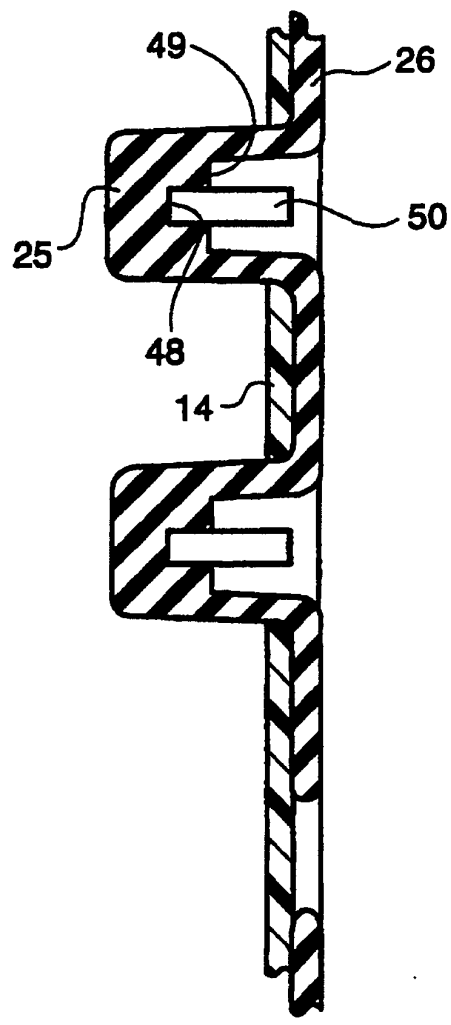


FIG. 7

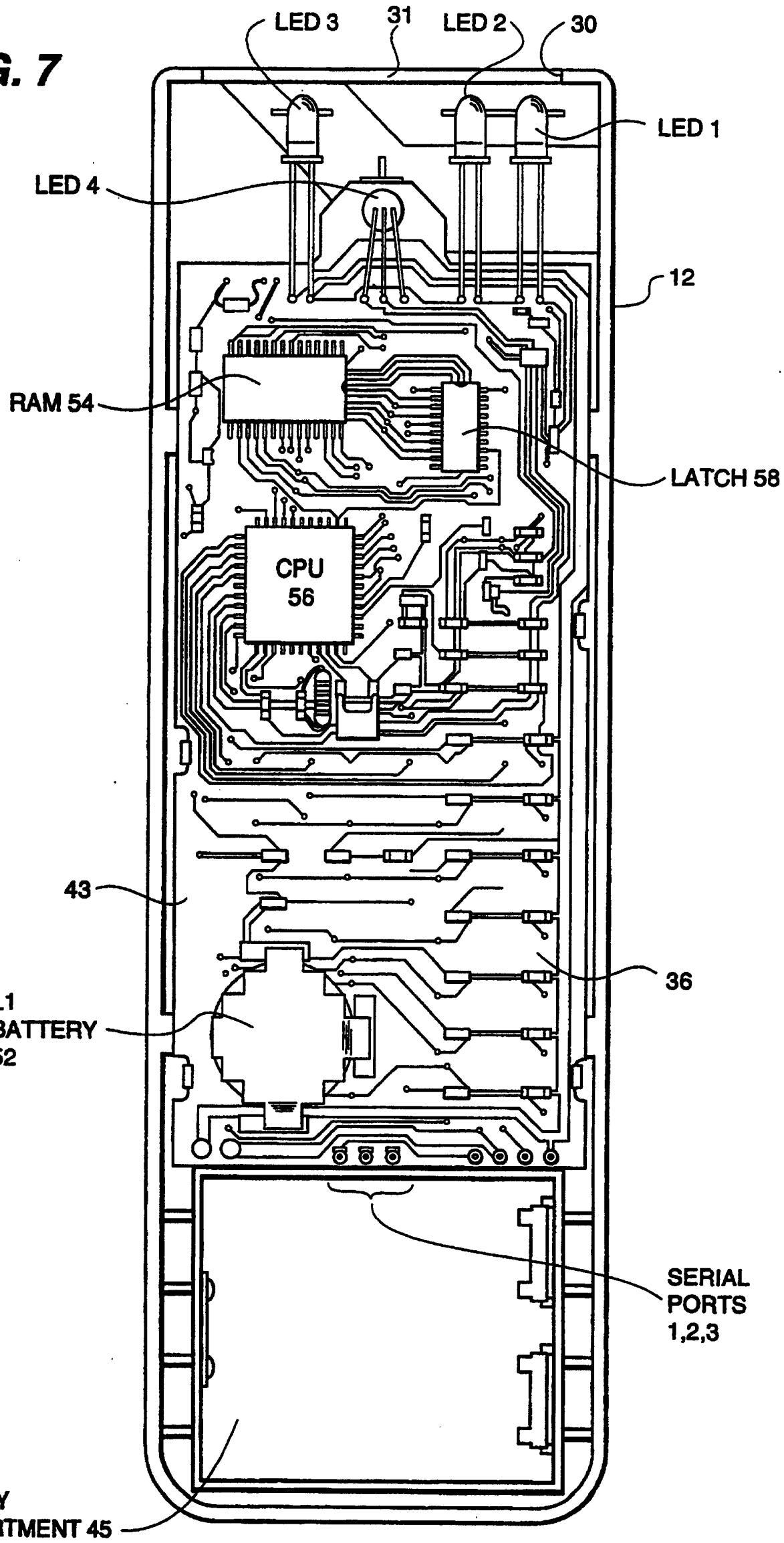

LED 3
31
LED 2
30
LED 1
LED 4
12
RAM 54
LATCH 58
CPU
56
43
36
L1
BATTERY
52
SERIAL
PORTS
1,2,3
BATTERY
COMPARTMENT 45

FIG. 8

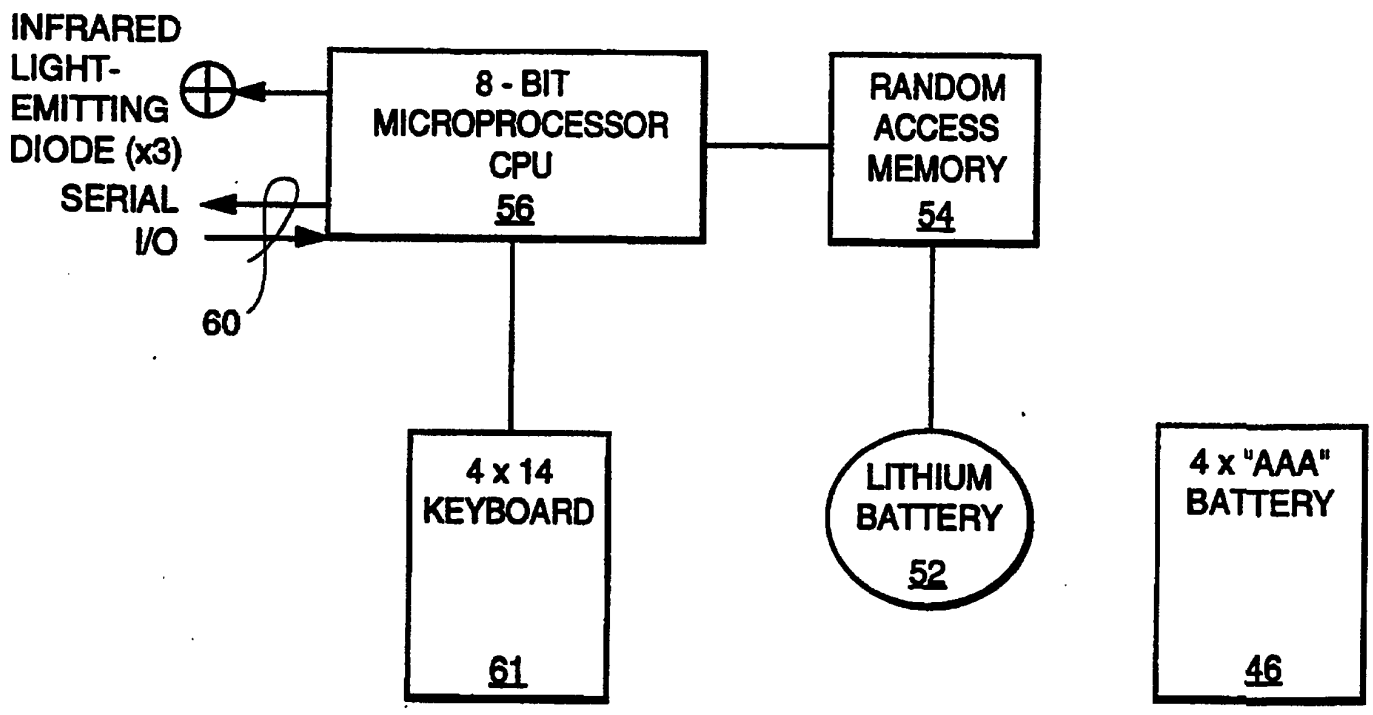
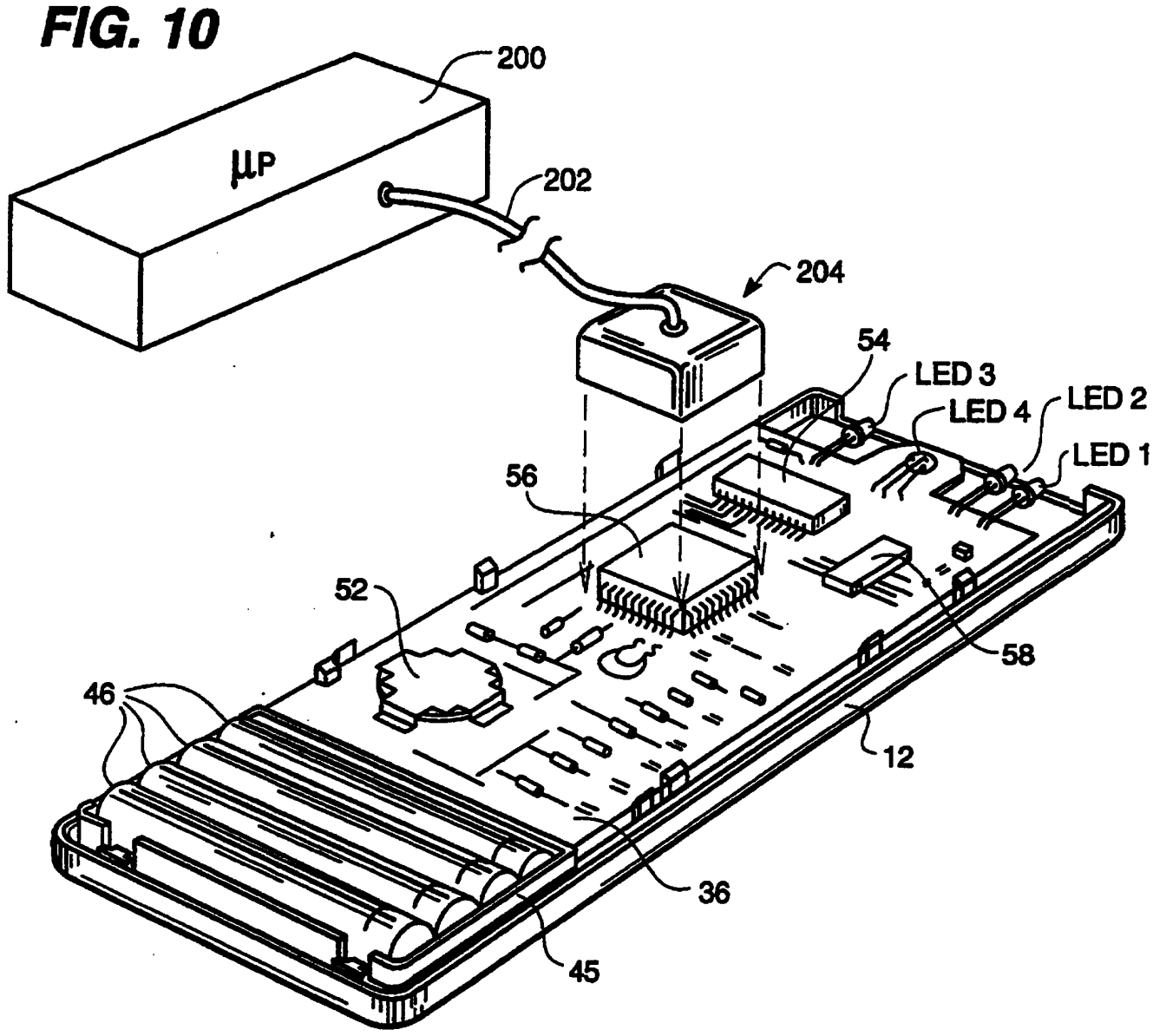

INFRARED LIGHT-EMITTING DIODE (x3)
SERIAL I/O
60
8 - BIT MICROPROCESSOR CPU 56
RANDOM ACCESS MEMORY 54
4 x 14 KEYBOARD 61
LITHIUM BATTERY 52
4 x "AAA" BATTERY 46

FIG. 10


200
µP
202
204
54
LED 3
LED 4
LED 2
LED 1
56
52
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12
36
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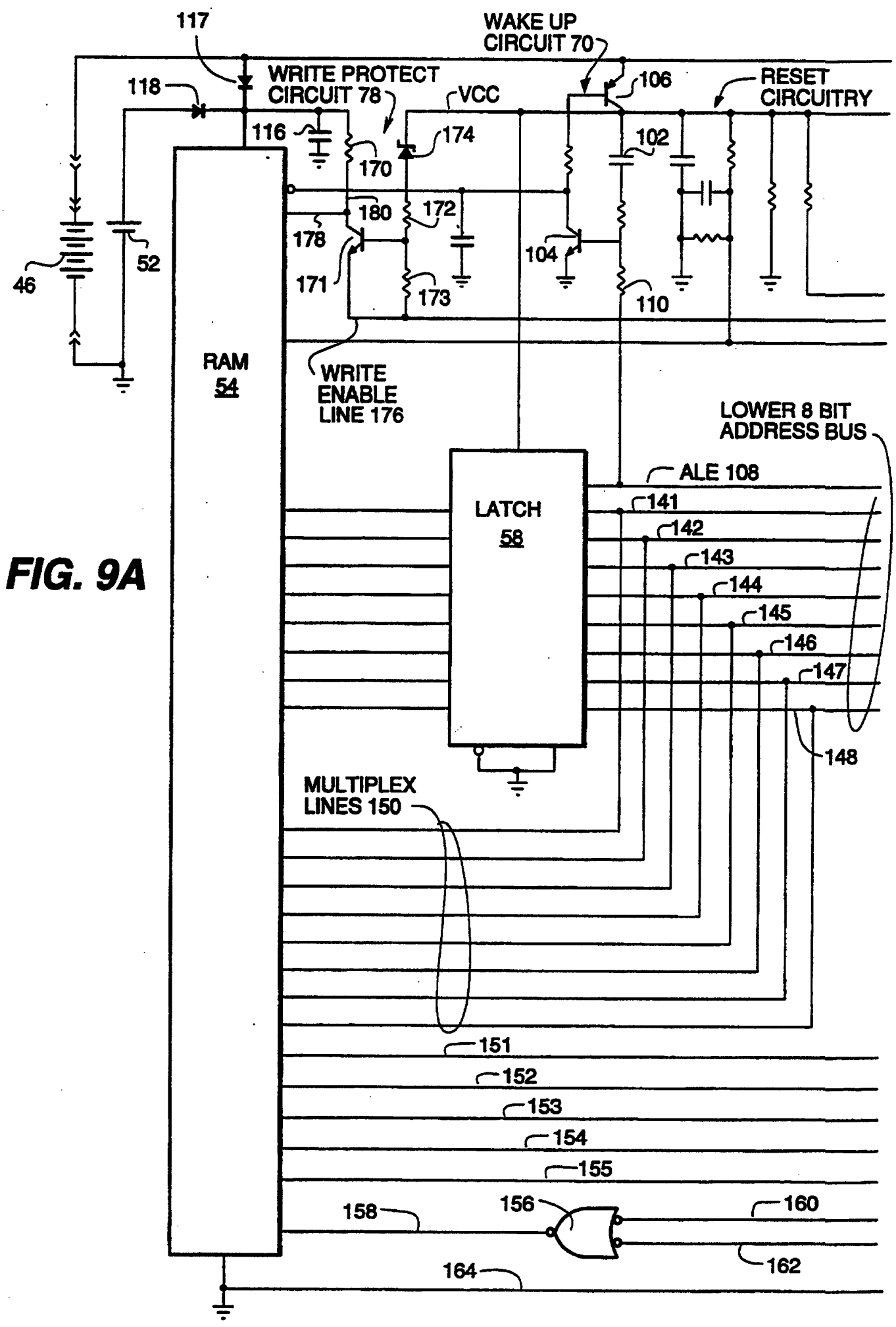
117
WAKE UP
CIRCUIT 70
118
WRITE PROTECT
CIRCUIT 78
VCC
106
RESET
CIRCUITRY
116
174
102
170
180
172
178
104
46
52
171
173
110
RAM
54
WRITE
ENABLE
LINE 176
LOWER 8 BIT
ADDRESS BUS
ALE 108
LATCH
58
141
142
143
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145
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147
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MULTIPLEX
LINES 150
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FIG. 9A

FIG. 9B

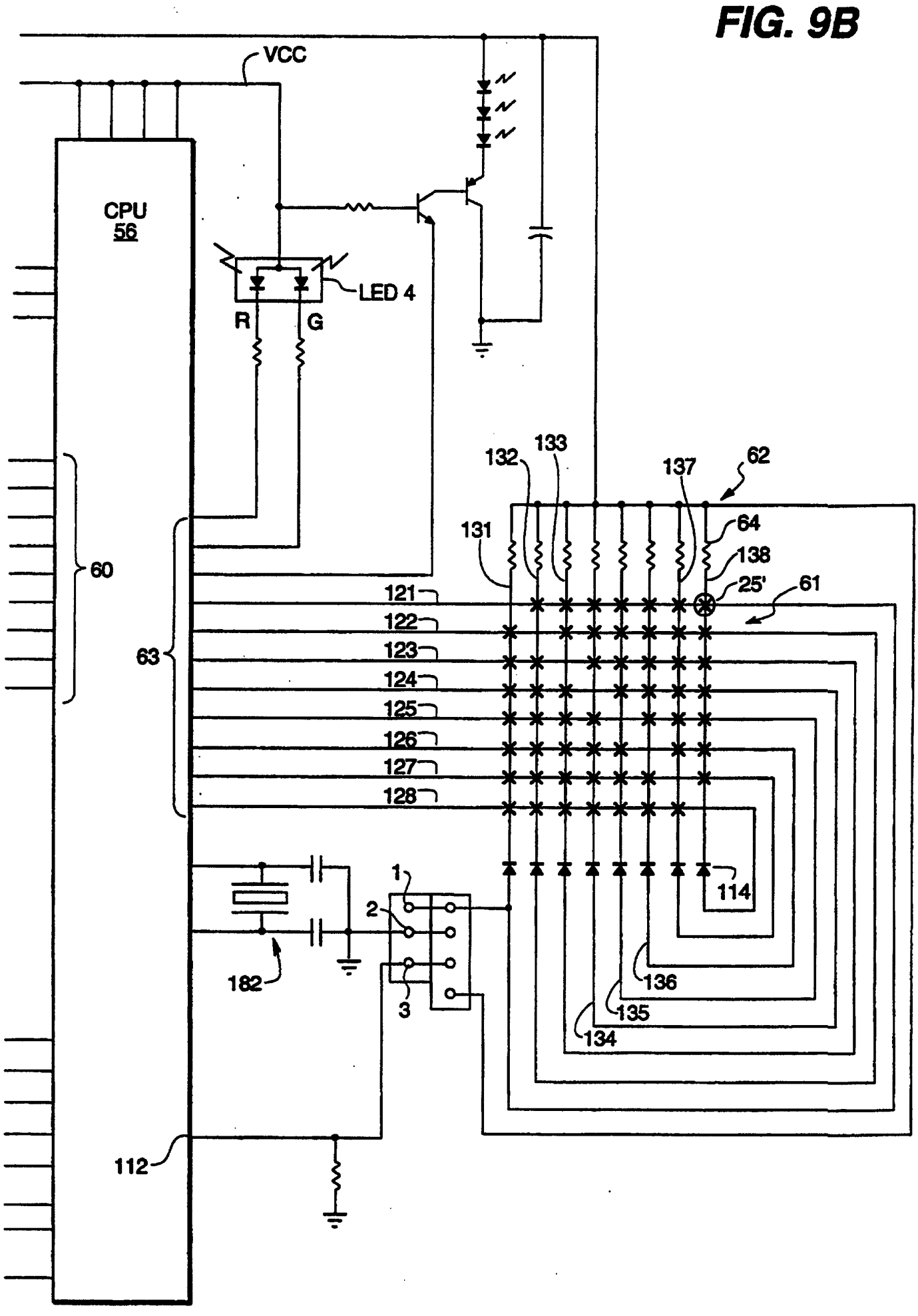


FIG. 11

MODULATION SCHEMES

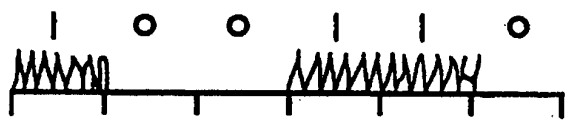
FIG. 11a  FIXED BIT TIME, FULL WIDTH BURST

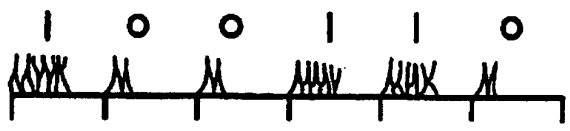
FIG. 11b  FIXED BIT TIME, BURST WIDTH MODULATED

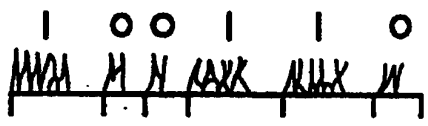
FIG. 11c  FIXED OFF TIME, BURST WIDTH MODULATED

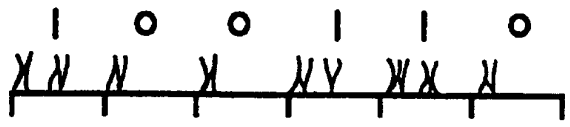
FIG. 11d  FIXED BIT TIME, SINGLE / DOUBLE BURST

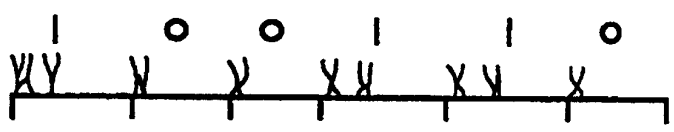
FIG. 11e  FIXED OFF TIME, SINGLE / DOUBLE BURST

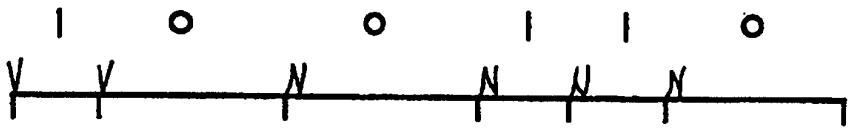
FIG. 11f  FIXED BURST TIME, OFF TIME MODULATED

FIG. 11g  RANDOM

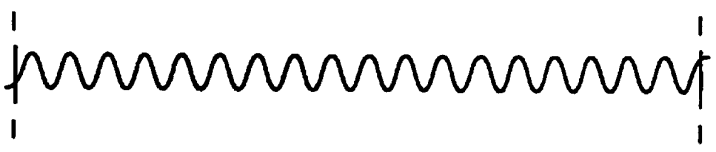
FIG. 11h  ONE FREQUENCY FOR EACH KEY

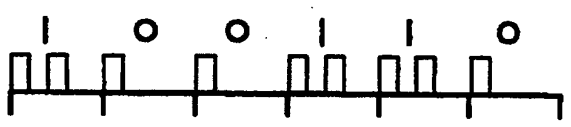
FIG. 11i  SINGLE / DOUBLE PULSE, FIXED BIT TIME

FIG. 12A

CAPTURING IR CODE

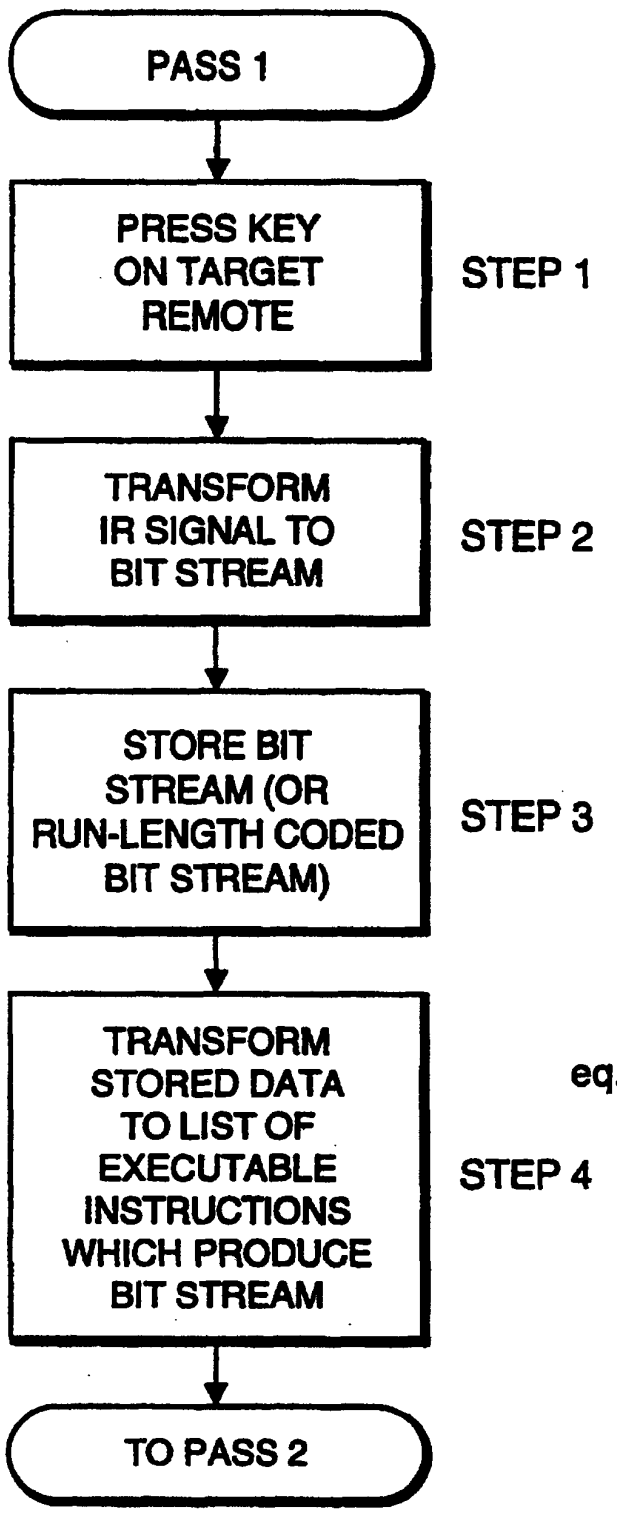


FIG. 12B

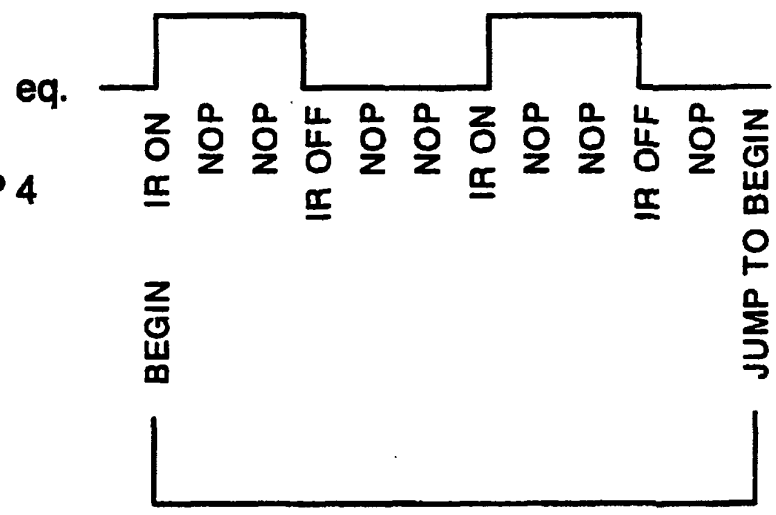


FIG. 13A

CAPTURING IR CODE

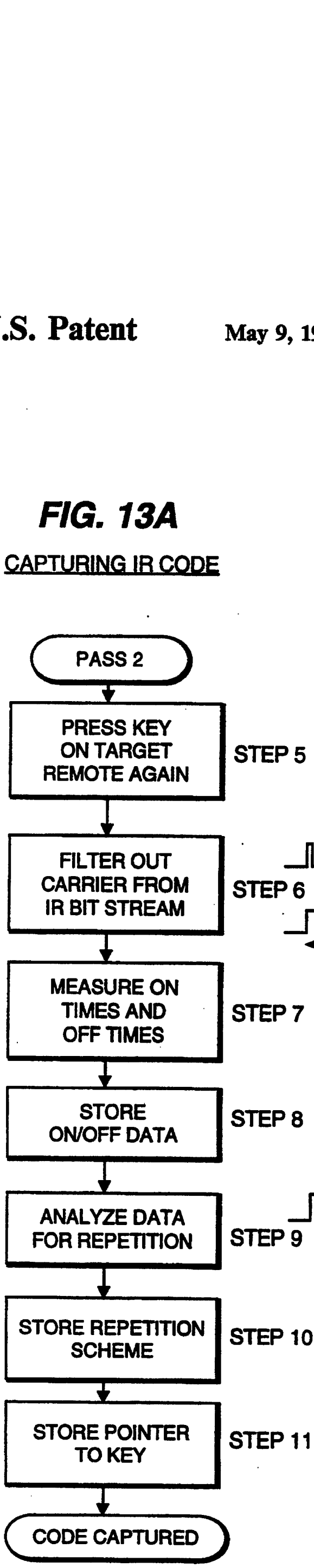


FIG. 13B

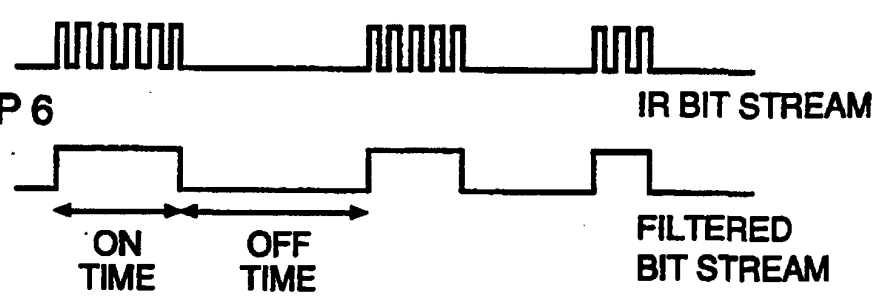


FIG. 13C

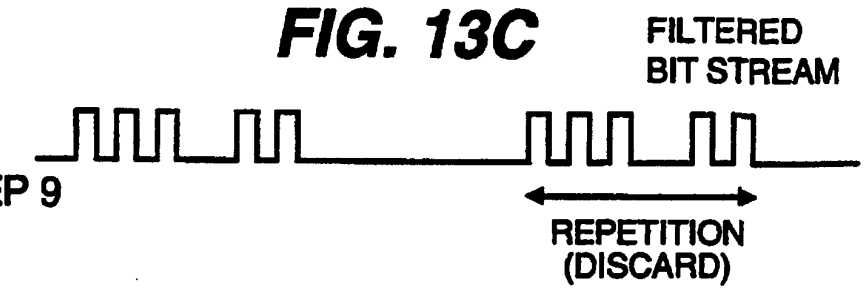


FIG. 14

GENERATING IR CODE

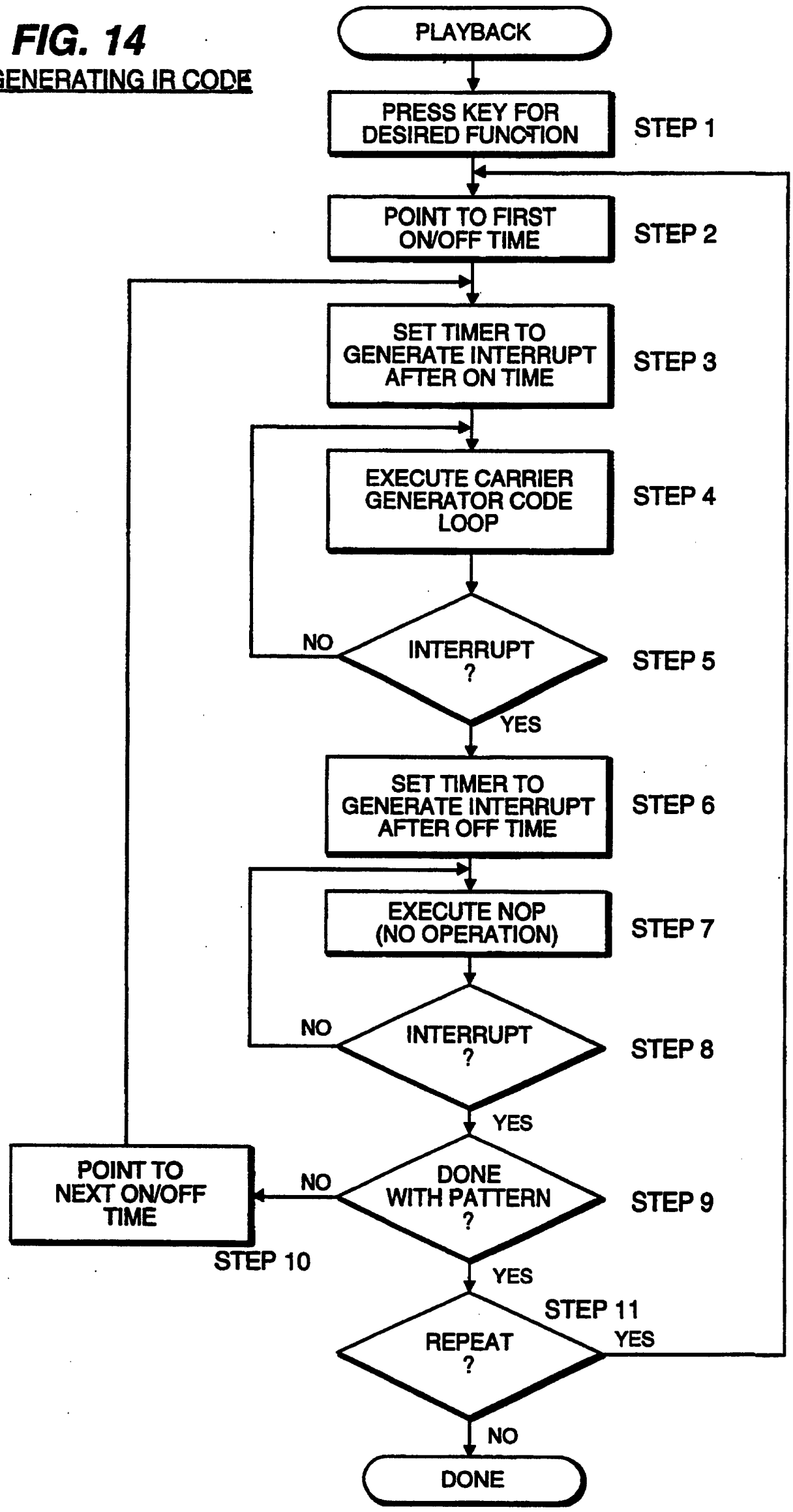
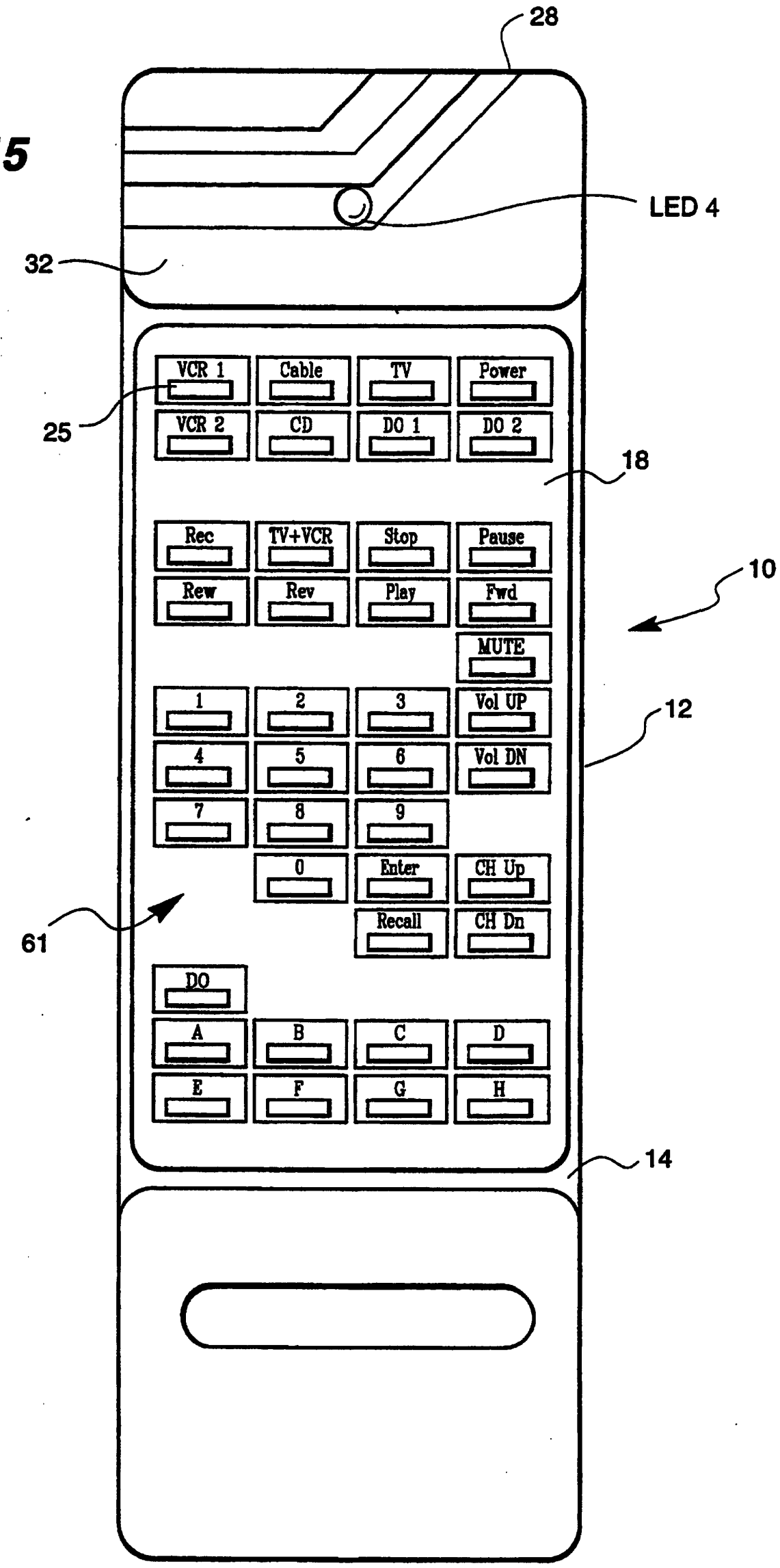


FIG. 15



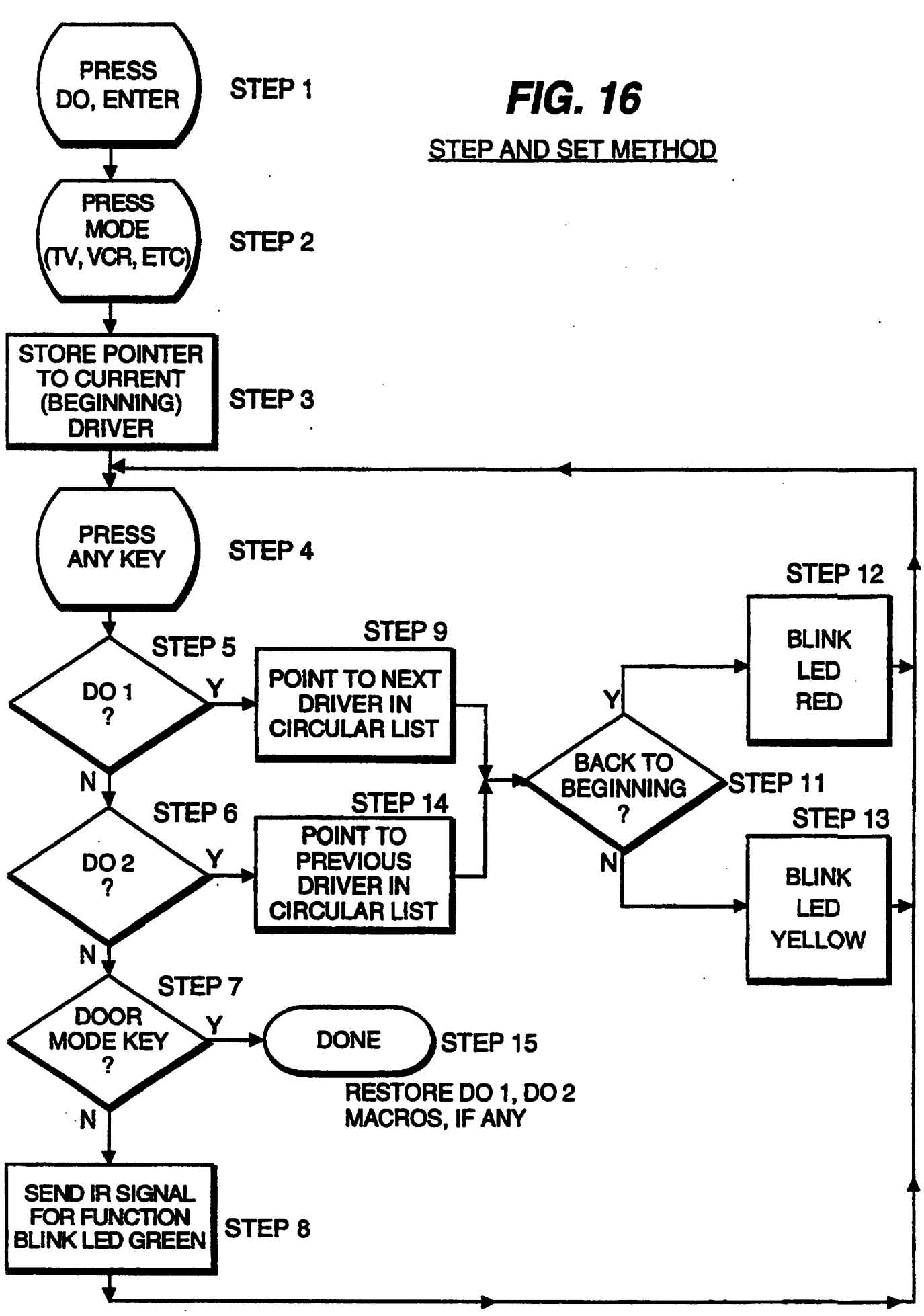


FIG. 16

STEP AND SET METHOD

FIG. 17

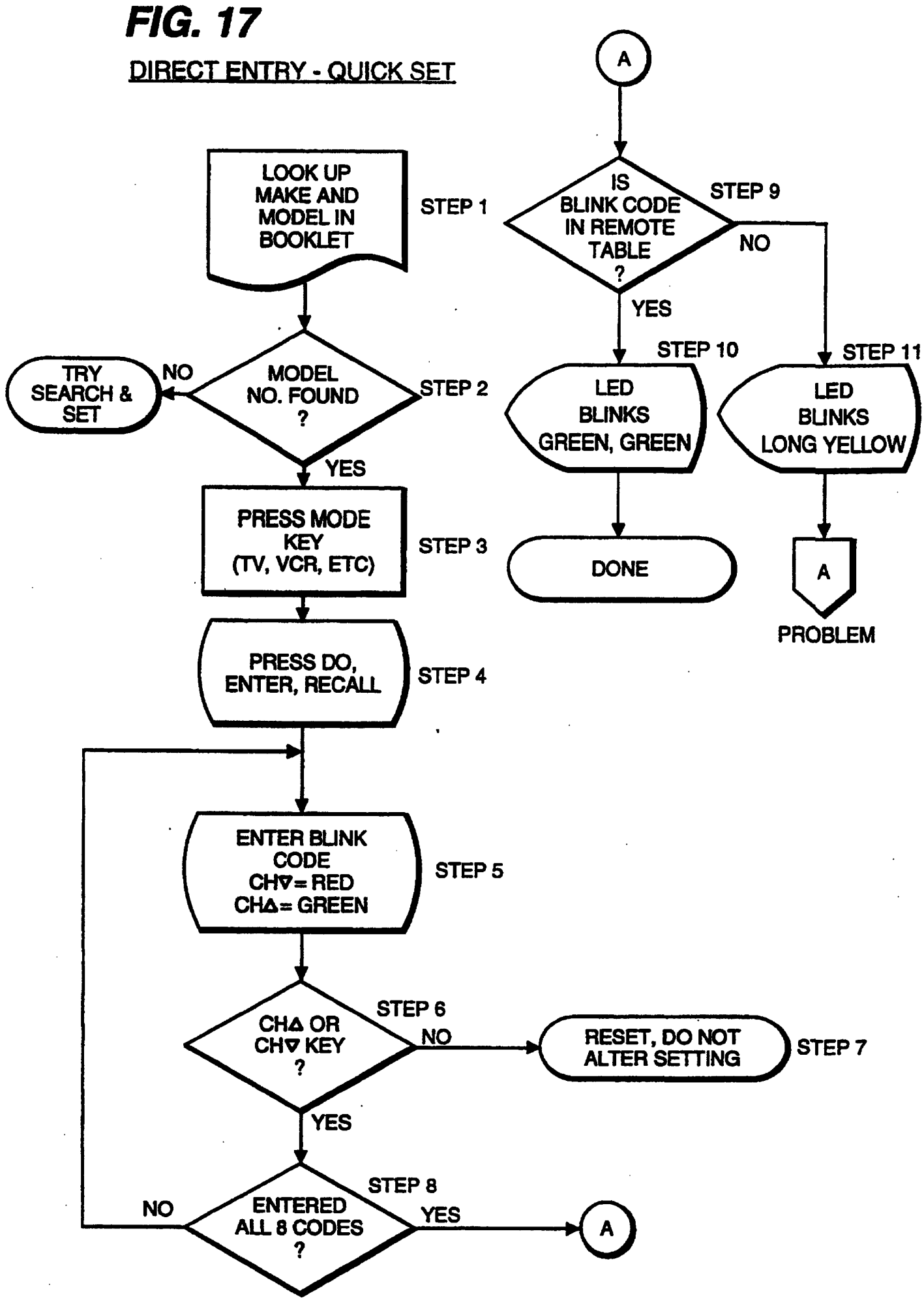
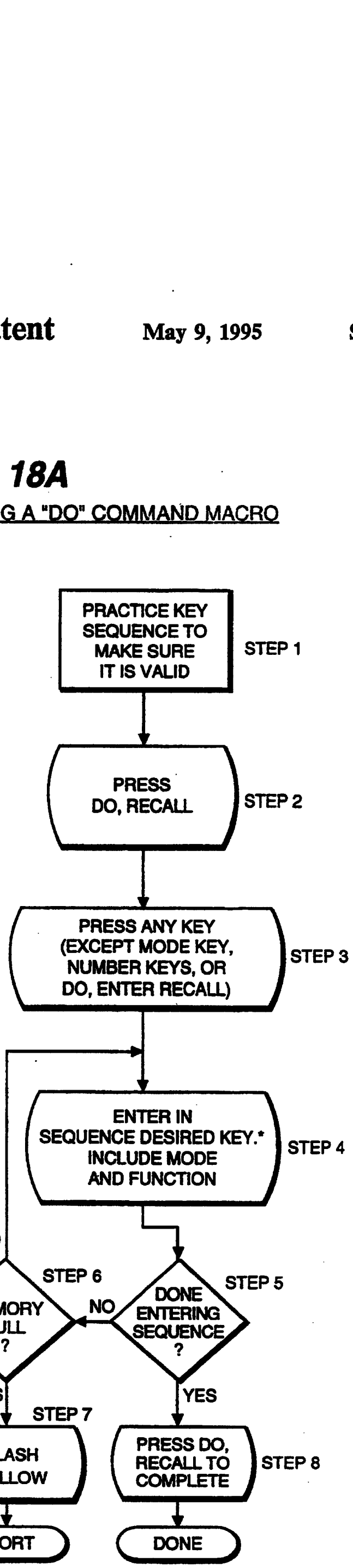


FIG. 18A

SETTING A "DO" COMMAND MACRO



* eg. TV, POWER, VCR 1, POWER, PLAY, TV, 3, ENTER

FIG. 18B

EXECUTING A MACRO "DO" COMMAND

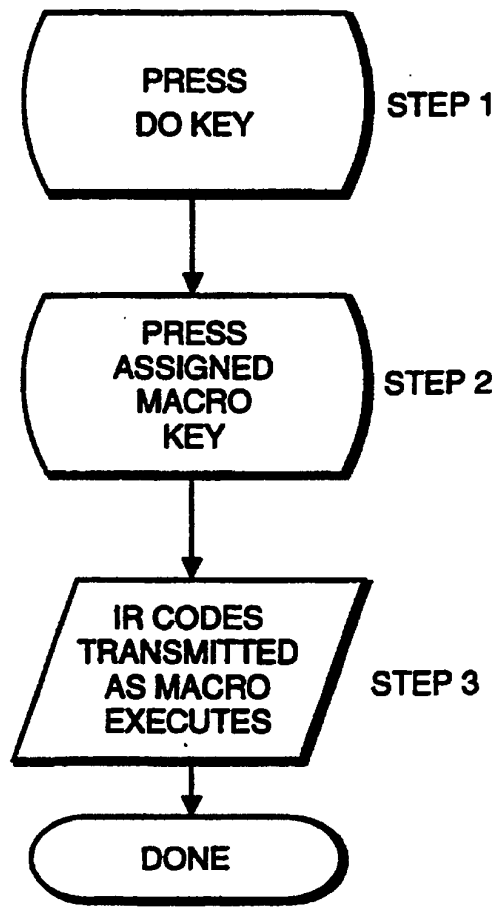


FIG. 19A

TO IDENTIFY WHAT DEVICE REMOTE IS SET FOR - BLINK CODE

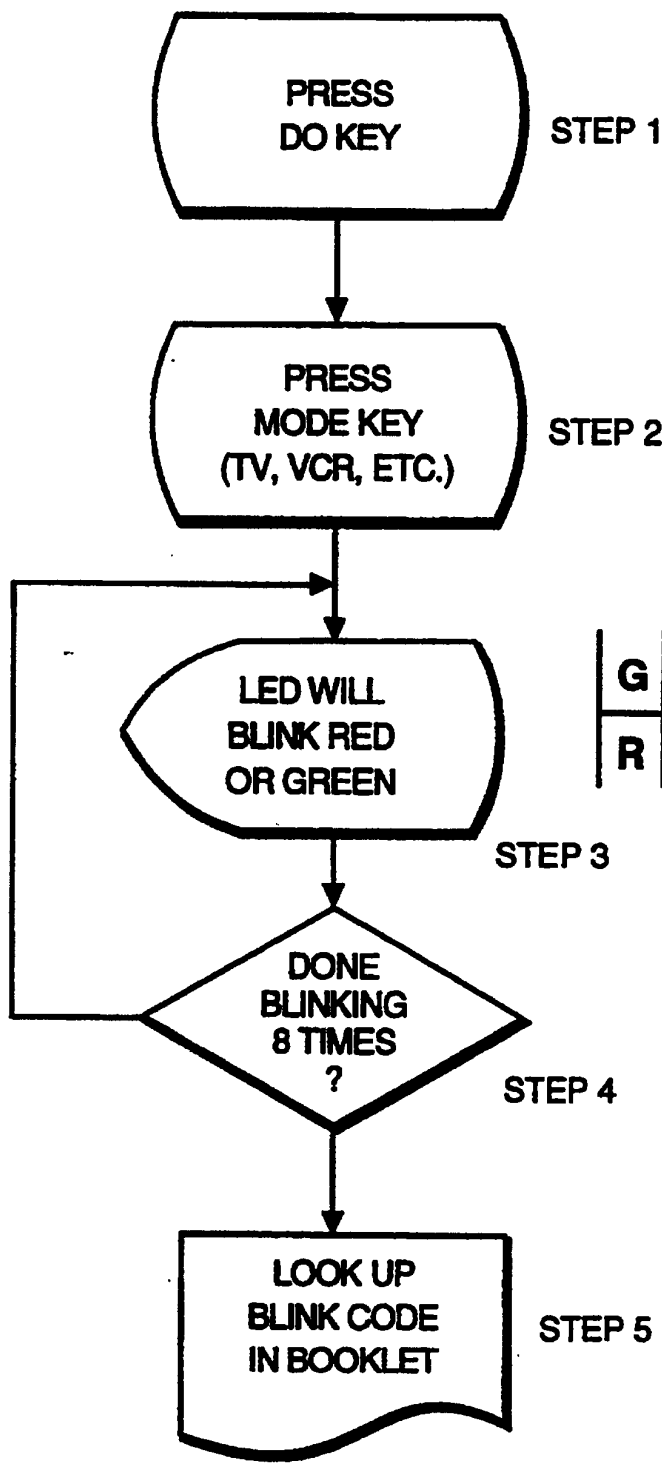


FIG. 19B

G	G	G	G	G	G	G	G
R	R	R	R	R	R	R	R

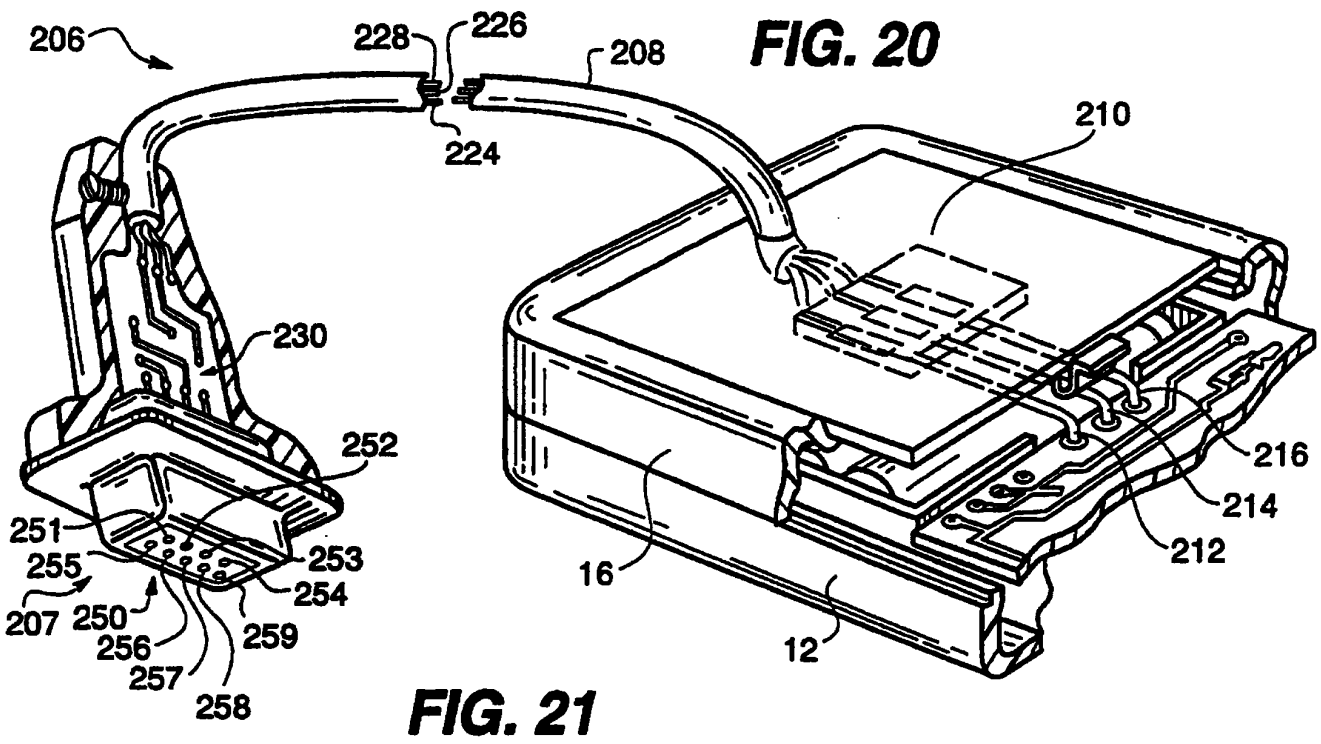


FIG. 20

FIG. 21

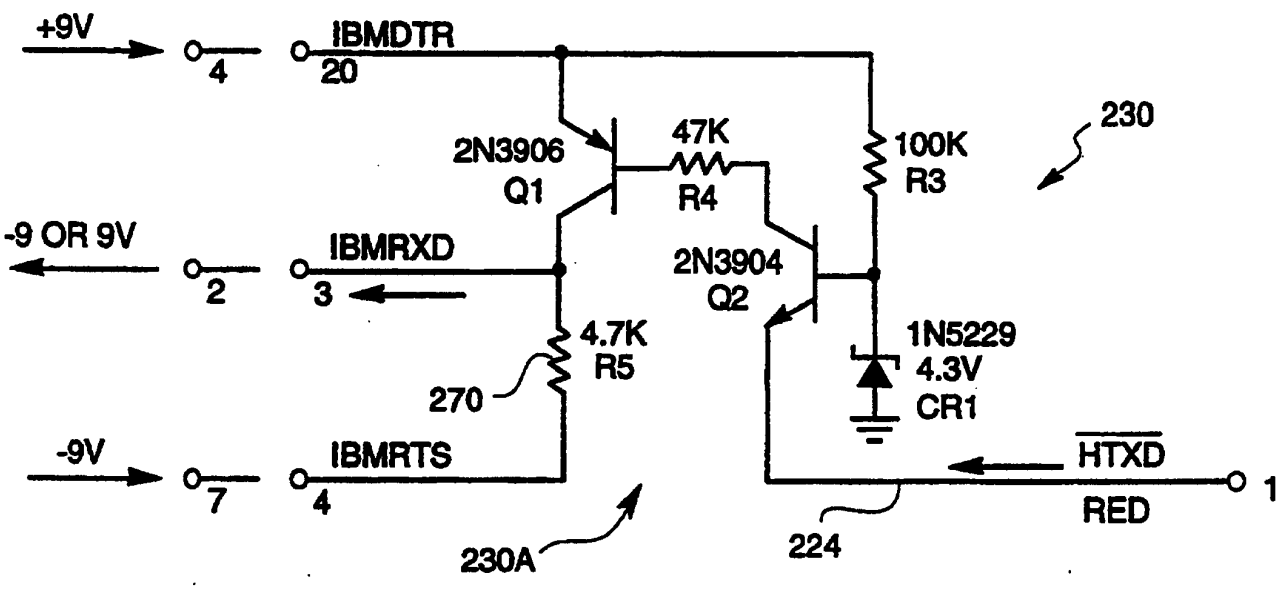


FIG. 22

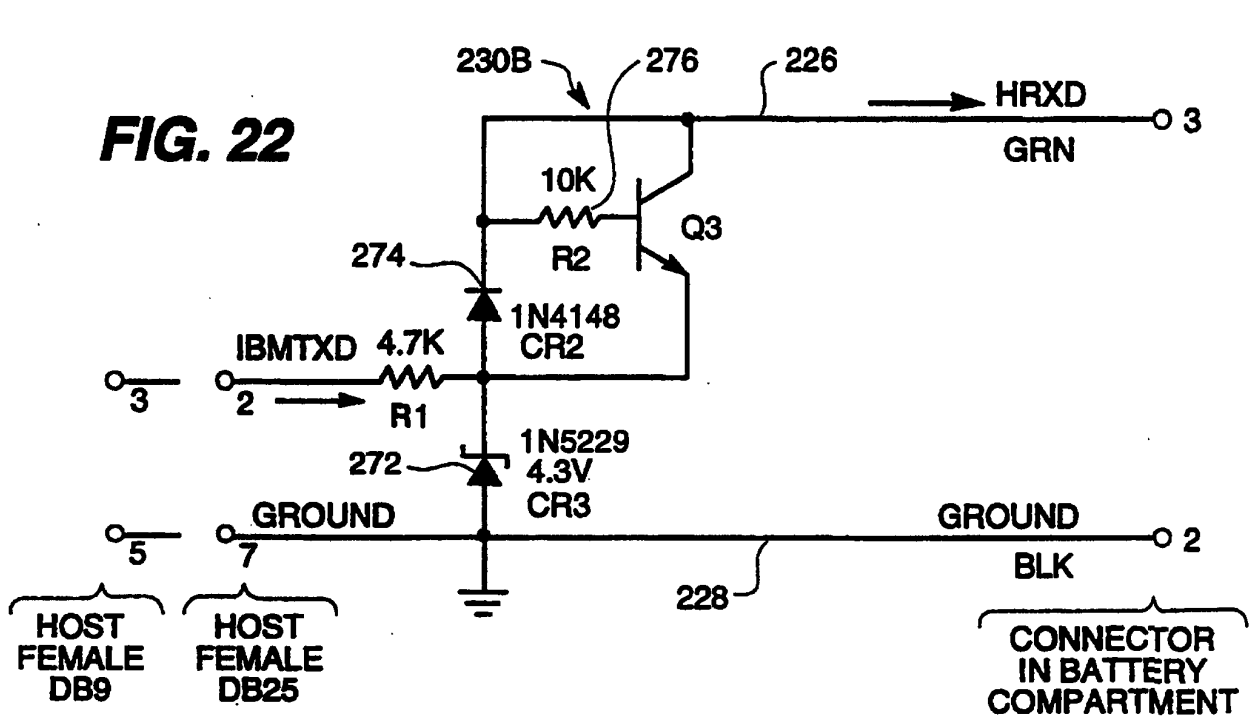


FIG. 23

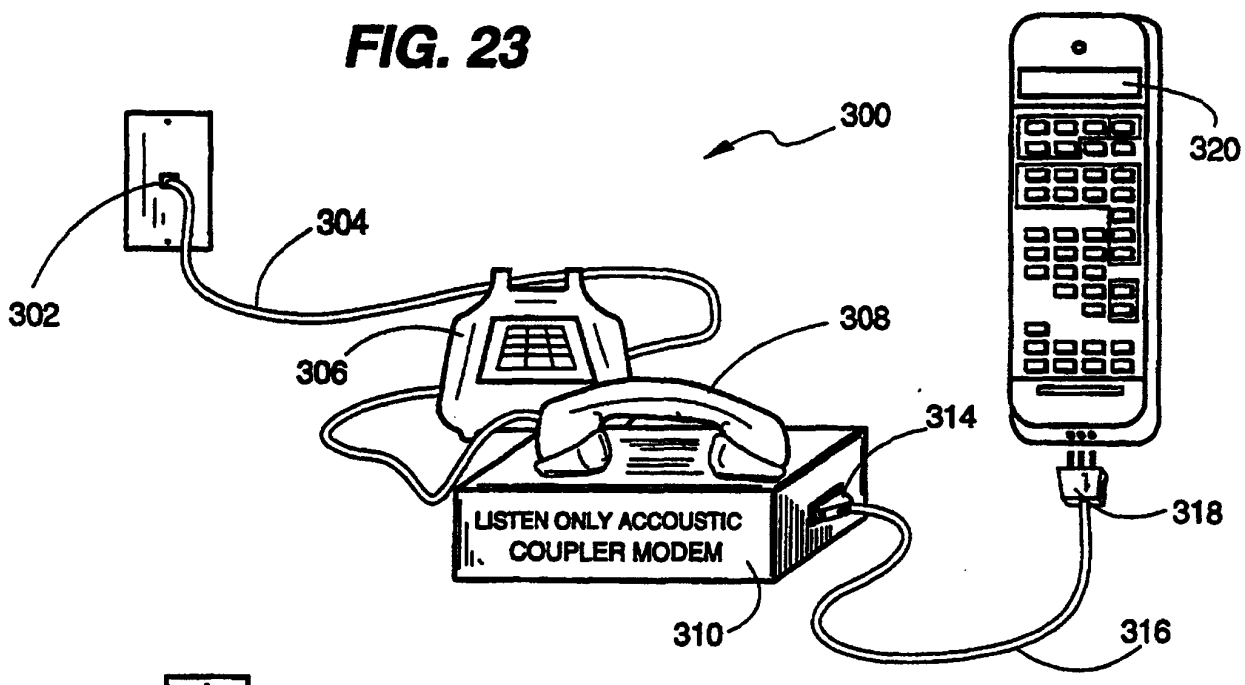


FIG. 24

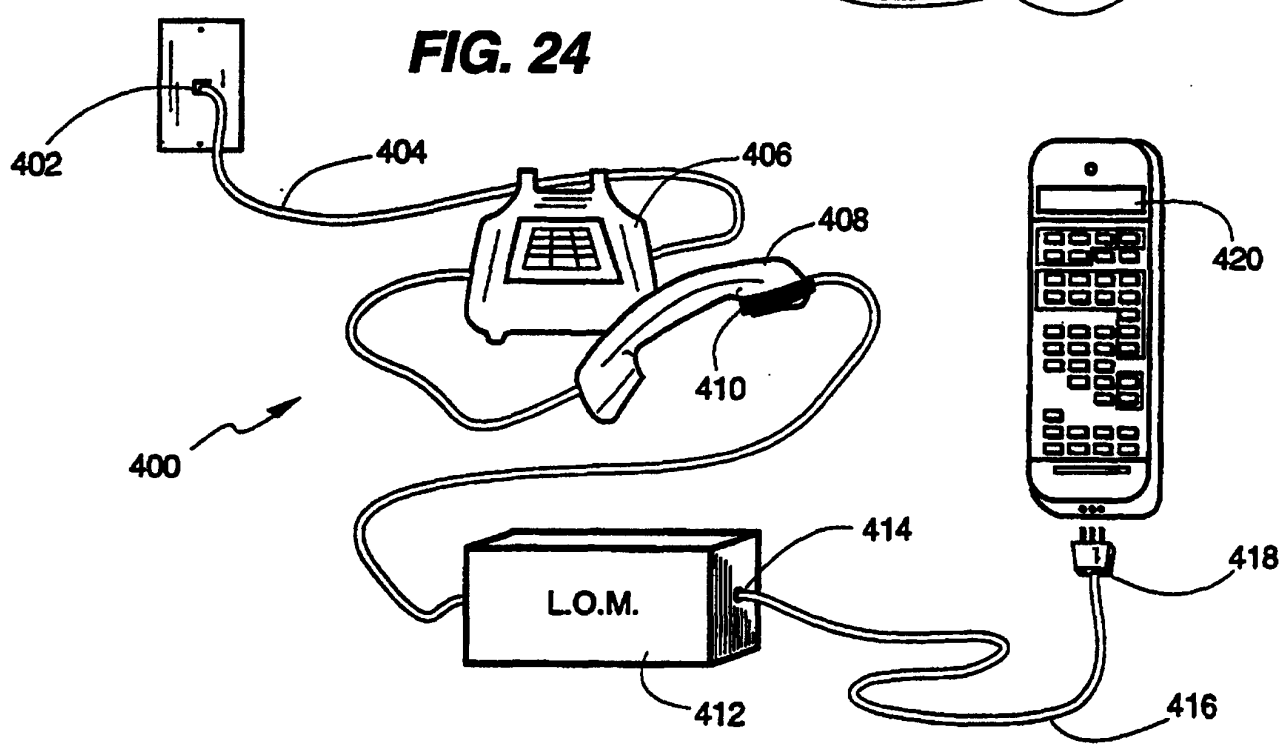


FIG. 25

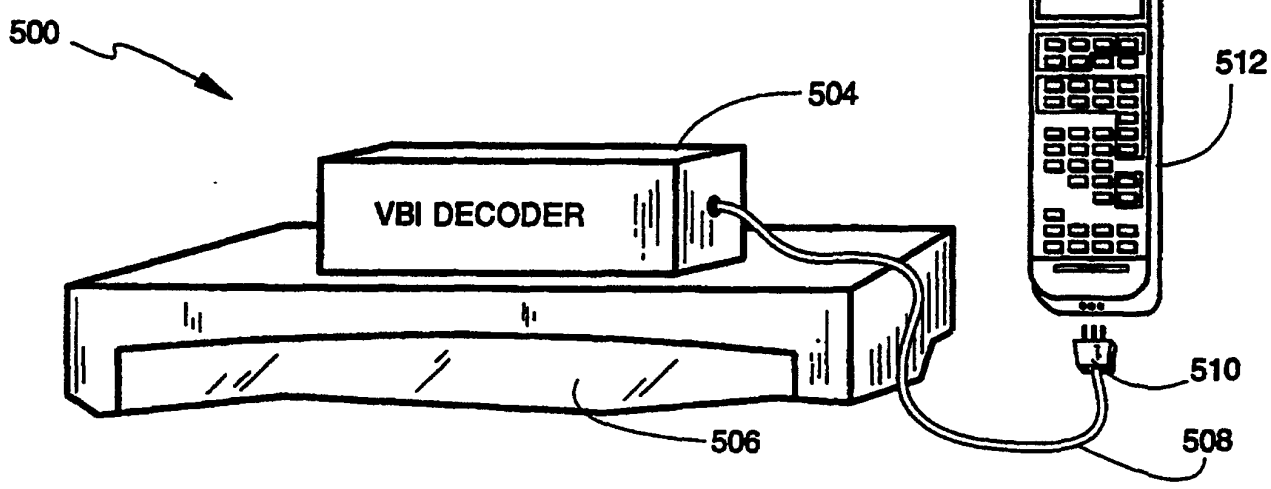
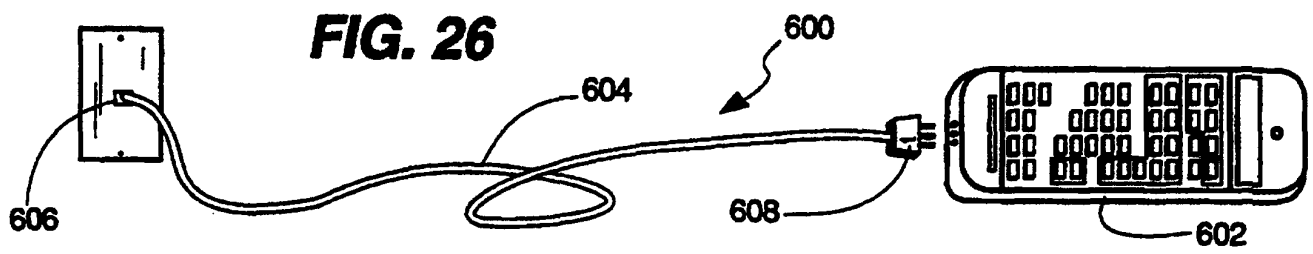


FIG. 26



REMOTE CONTROL SYSTEM

This application is a Continuation application of U.S. application Ser. No. 08/046,105, filed Apr. 8, 1993, now U.S. Pat. No. 5,255,313, which is a Continuation Application of U.S. application Ser. No. 07/587,326, filed Sep. 24, 1990, now U.S. Pat. No. 5,228,077, which is a Continuation-In-Part Application of application Ser. No. 07/127,999, filed Dec. 2, 1987, now U.S. Pat. No. 4,959,810, which is a Continuation-In-Part of application Ser. No. 07/109,336, filed Oct. 14, 1987, now abandoned.

FIELD OF THE INVENTION

The present invention relates to a universal remote control system including a remote control of the type which is hand held and which can be coupled via coded infrared signals with a remote control receiver built into a television or other remotely controlled electrical apparatus to turn on the apparatus, such as the television, at a distance, to adjust the volume, tone and brightness, to change channels, and to turn the television off and a data transmission system for inputting data to the remote control.

2. Description of the Related Art Including Information Disclosed under 37 CFR Sections 1.97–1.99

Heretofore it has been proposed to provide a reconfigurable remote control device and programmable functions for such a remote control device which will enable one to learn, store and retransmit infrared codes that are emitted from the controller for a remotely controlled apparatus, such as a television.

For example, in the Welles II U.S. Pat. No. 4,623,887 and the Ehlers U.S. Pat. No. 4,626,848, there is disclosed a reconfigurable remote control device which has the ability to learn, store and repeat remote control codes from any other infrared transmitter. Such a reconfigurable, remote control transmitter device includes an infrared receiver, a microprocessor, a non-volatile random access memory, a scratch pad random access memory, and an infrared transmitter.

According to the teachings of the Ehlers patent, the infrared signals received by the remote control device are in bursts of pulses and the device counts the number of pulses in each burst as well as the time duration of each pause in a transmission between bursts.

The Evans et al. U.S. Pat. No. 4,825,200 which issued on Apr. 25, 1989 on application Ser. No. 66,833, filed on Jun. 25, 1987, teaches a reconfigurable remote control transmitter that includes a learn mode and a run mode and is similar to the remote control system disclosed in the Ehlers patent.

Evans et al. does not teach or suggest the provision in a universal remote control of data coupling means including terminal means (such as serial ports) coupled to a CPU for enabling code data to be supplied from outside the remote control through the terminal means and CPU to a memory of the remote control.

The Imoto U.S. Pat. No. 4,771,283 teaches a system for the collecting of operating codes from various remote control transmitters by inputting the code data therefrom via infrared code signals to an infrared receiving diode at an input of the system, deciphering those code signals, storing them in a RAM and then upon operation of keys, supplying outputs via one of several cables extending from outputs of the system to devices to be controlled.

Imoto does not teach means for outputting infrared code signals nor does Imoto teach in a remote control, terminal means coupled to a CPU for supplying code data from outside the remote control through the terminal means and the CPU to a memory of the remote control.

SUMMARY OF THE INVENTION

According to the present invention there is provided a remote control system with data coupling including: a remote control, a computer having a memory, at least one of instruction codes or code data for creating appropriate infrared (IR) lamp driver instructions for causing an infrared signal generator to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, stored in the memory of the computer, the remote control comprising input circuitry including a set of keys or pushbuttons for inputting commands into the remote control, infrared signal output circuitry including IR lamp driver circuitry for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to the input circuitry and to the signal output circuitry, a memory coupled to the CPU, and data coupling circuitry and structure for periodically coupling the computer to the remote control for receiving from the computer memory and inputting into the memory of the remote control at least one of (a) the instruction codes or (b) the code data for creating appropriate IR lamp driver instructions, the code date causing the infrared signal output circuitry to emit infrared signals which will cause specific functions to occur in a specific controlled device when the input circuitry are operated, and the code data operating a variety of devices to be controlled and enabling the remote control to control various devices to be controlled upon the inputting of commands to the keys of the input circuitry.

Further according to the invention there is provided a remote control system with data coupling including: a remote control, a computer having a memory, at least one of instruction codes or code data for creating appropriate infrared (IR) lamp driver instructions for causing an infrared signal generator to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, stored in the memory of the computer, a remote control comprising input circuitry including a set of keys or pushbuttons for inputting commands into the remote control, infrared signal output circuitry including IR lamp driver circuitry for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to the input circuitry and to the signal output circuitry, a memory coupled to the CPU, and data coupling circuitry and structure for periodically coupling the computer to the remote control for receiving from the computer memory and inputting into the memory of the remote control at least one of (a) the instruction codes or (b) code data for creating appropriate IR lamp driver instructions for causing the infrared signal output circuitry to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled into the memory of the remote control to enable the remote control to control various devices to be controlled upon the inputting of commands to the keys of the input circuitry and a data transmission system including the data coupling

circuitry and structure for coupling the remote control to the computer, directly, through decoding circuitry and a television set which receives a television signal containing at least one off the instruction codes or the code data.

Still further according to the present invention there is provided a remote control system with data coupling including a remote control comprising input circuitry including a set of keys or pushbuttons for inputting commands into the remote control, infrared signal output circuitry including IR lamp driver circuitry for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to the input circuitry and to the signal output circuitry, a memory coupled to the CPU and data coupling circuitry and structure including terminal structure comprising a receiving port coupled to the CPU for enabling at least one of (a) instruction codes or (b) the code data for creating appropriate IR lamp driver instructions for causing the infrared signal output circuitry to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, to be supplied from outside the remote control through the receiving port of the terminal structure directly to the CPU for direct entry to the memory to enable the remote control to control various devices to be controlled upon the inputting of commands to the keys of the input circuitry and a data transmission system including coupling circuitry for coupling the terminal structure to a computer, directly, through a telephone line, through a modem and a telephone line, or through decoding circuitry and a television set which receives a television signal containing at least one of the instruction codes or the code data.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front perspective view of the universal remote control device constructed according to the teachings of the present invention.

FIG. 2 is an exploded perspective view of the control device show n in FIG. 1.

FIG. 3 is an enlarged fragmentary sectional view through two of the push buttons of the control device shown in FIGS. 1 and 2.

FIG. 4 is a fragmentary corner view of a push button containing panel and a base panel.

FIG. 5 is a fragmentary corner view similar to FIG. 4 as the panels are brought together and shows one of the push buttons cut away from the push button containing panel.

FIG. 6 is a fragmentary sectional view of the assembly 15 formed by bringing the push button containing panel into engagement with the base panel.

FIG. 7 is a plan view of the circuit board assembly mounted inside the control device viewing the control device from the back side thereof with a back cover panel removed.

FIG. 8 is a block diagram of the operating circuitry in the control device.

FIGS. 9A & 9B are a detailed schematic circuit diagram of the operating circuitry shown in FIG. 8.

FIG. 10 is a perspective view showing the connection of a programming connector over the central processing unit of the operating circuitry in the control device, the programming connector being connected to a microprocessor, being operable to disable the central processing unit, and being used to program the random access memory (RAM) of the operating ciruitry.

FIGS. 11*a* to 11*i* are graphical representations of several modulation schemes which are used in infrared remote control transmitters.

FIG. 12A is a flow chart of a first part of a method for capturing an IR code and FIG. 12B is a graph of the envelope of the code.

FIG. 13A is a flow chart of a second part of a method for capturing an IR code; FIG. 13B is a waveform of the IR bit stream and filtered bit stream; and FIG. 13C is a graph of the waveform of a filtered repetition of a filtered bit stream.

FIG. 14 is a flow chart of the method used for generating an infrared code.

FIG. 15 is a front plan view of the control device shown in FIG. 1 and shows the various pushbuttons of the device.

FIG. 16 is a flow chart of the search and set procedure followed in using the control device of the present invention.

FIG. 17 is a flow chart of a direct-entry/quick-set procedure followed in using the remote control device.

FIG. 18A is a flow chart of the procedure followed in setting a "DO" command and FIG. 18B is a flow chart of the method for executing a "DO" command.

FIG. 19A is a flow chart of the method used to identify what type of unit the remote control device is set for and FIG. 19B is a table of the identifying blink code.

FIG. 20 is a fragmentary perspective view with portions broken away of a connector with conversion circuitry therein and a special battery case cover for the control device by which new data can be inputed into the RAM of the operating circuitry of the control device.

FIG. 21 is a schematic circuit diagram of part of the conversion circuitry in the connector shown in FIG. 20.

FIG. 22 is a schematic circuit diagram of another part of the conversion circuitry in the connector shown in FIG. 20.

FIG. 23 is a schematic block diagram of the data transmission system of the universal remote control system of the present invention and shows the manner in which data is input via a telephone line to the remote control.

FIG. 24 is a block schematic diagram of a modified data transmission system similar to the data transmission system shown in FIG. 23 for inputting data via a telephone line to the remote control using a pickup coil.

FIG. 25 is a block schematic diagram of another embodiment of a data transmission system which utilizes the vertical blanking interval on a raster across a television screen for transmitting data to the remote control and shows a vertical blanking interval decoder and a cable with a three-pin jack pluggable into the remote control for transmitting data to the remote control.

FIG. 26 is a block schematic diagram of a direct connection from a digital telephone line to the remote control having a direct access arrangement therein for inputting data to the remote control.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 1 in greater detail, there is illustrated therein a universal remote control device 10 constructed according to the teachings of the present invention.

As shown, the device 10 includes a housing 11 including an upper housing member 12 having a base panel 14,

and a lower housing member **16**. An overlay face panel **18** is positioned over the base panel **14**.

The two panels **14** and **18** have openings **22** and **24** (FIG. **2**) therethrough for receiving elastomeric pushbuttons **25**, all of which extend from and are fixed to or integral with an elastomeric body panel **26** as shown in FIG. **2**.

The pushbuttons **25** are arranged in rows and columns and are identified as follows on the overlay face panel **18**:

VCR 1	Cable	TV	Power
VCR 2	CD	DO 1	DO 2
Rec	TV . VCR	Stop	Pause
Rew	Reverse	Play	Fast Fwd
			Mute
1	2	3	Vol Up
4	5	6	Vol Dn
7	8	9	
	0	Enter	CH Up
		Recall	CH Dn
DO			
A	C	E	G
B	D	F	H

This arrangement is shown in FIG. **15** and the manner in which these pushbuttons **25** are utilized in operating the control device **10** will be described in greater detail in connection with the description of FIGS. **15–19B**.

At a top or forward end **28** of the device **10**, there is provided an opening **30** for three light emitting diodes, LED **1**, LED **2** and LED **3**. The opening **30** is covered by an infrared-transport lens **31**. Also, provided on a top surface **32** of the upper housing member **12** of the control device **10** is a light emitting diode, LED **4**, by which information, in the form of red and green blink codes, is communicated to the user of the device **10**.

FIG. **2** is an exploded view of the components of the device **10**. As shown, the device **10** includes the overlay face panel **18** with pushbutton-receiving, generally rectangular openings **22**, the upper housing member **12** with base panel **14** having a plurality of generally rectangular, pushbutton receiving openings **24**, the elastomeric body panel **26** having pushbuttons **25** extending from an upper surface **34** thereof, a printed circuit board **36** having conductive switches **38** on an upper surface **40** thereof and operating circuitry **42** (FIG. **7**) mounted on the underside **43** thereof, the lower housing member **16**, a cover **44** for a battery compartment **45** (FIG. **7**) for receiving batteries **46** (FIG.**10**) for the circuitry **42** of the control device **10**, and the infrared-transport lens **31**.

It will be noted that the base panel **14** of the upper housing member **12** has pushbutton openings **24** completely across each one of fourteen (14) rows across and four (4) columns down. However, not all of these openings or holes **24** have pushbuttons **25** extending therethrough, as noted by the lesser number of pushbutton-receiving openings **22**, in the overlay face panel **18**. Likewise, the body panel **26** initially has pushbuttons **25** arranged completely across tile upper surface **34** in fourteen (14) rows across and fourteen (14) columns down.

The printed circuit board **36** has conductive switches **38** aligned with each one of the pushbuttons **25** so that more switches **38** are provided than may be necessary for this particular control device **10**.

The availability of additional pushbutton openings **24** in the base panel **14** will enable the control device **10** to be modified as necessary by the addition of further pushbuttons **25** to perform numerous other functions as called for.

This mechanical construction of the upper and lower housing members **12** and **16** and the panels **14** and **18** and circuit board **36** enable the control device **10** to be modified to include additional circuits in the operating circuitry **42** and pushbutton switches **25** for performing additional functions, if desired. In this respect, overlay face panel **18** is easily replaceable to modify the device **10** to include more or less pushbuttons **25** and associated switches **38**.

The simplicity of the construction of the pushbuttons **25**, the base panel **14** and the overlay panel **18** is shown in FIGS. **3–6**. As shown in FIG. **3**, the body panel **26** has a plurality of raised pushbuttons **25** formed thereon. Each raised rectangular button **25** has a recessed area or hollow **48** on the underside **49** of each button **25** in which is mounted a conductive plunger or puck **50** adapted to engage one of the conductive switches **38** on the circuit board **36**. With the pushbuttons **25** and the panel **26** being formed from a sheet of elastomeric material it is an easy matter to remove the buttons **25** that are not necessary with a scissors or other cutting element, as shown in FIG. **4**.

Then, the pushbutton body panel **26** is moved into engagement with the base panel **14**, as shown in FIG. **5**, to form the assembly shown in FIG. **6**.

After the pushbutton body panel **26** and the base panel portion **14** have been assembled as shown in FIG. **6**, the overlay face panel **18** is mounted on top of the base panel **14** and the circuit board **36** is mounted within the housing member **12**.

Referring now to FIG. **7**, there is illustrated therein the operating circuitry **42** of the control device **10** which includes batteries **46** (FIG. **10**) mounted in the compartment **45** for providing power for the circuitry **42** and a lithium battery **52**, which backs up a static RAM **54**. A central processing unit (CPU) **56**, is coupled through a latch **58** to the RAM **54**. Three LEDs, LED **1**, LED **2**, and LED **3** are coupled to the circuitry **42** for communication with the apparatus to be controlled. All elements of the circuitry **42** are mounted on the circuit board **36** mounted in the upper housing member **12**. A further LED, LED **4** is coupled to CPU **56** for communication with the user of the device **10** as will be described in greater detail below.

A block schematic circuit diagram of the operating circuitry **42** is shown in FIG. **8** and includes CPU **56**, the infrared light emitting diodes, LED **1**, LED **2**, and LED **3** coupled to the CPU **56**, serial input/output ports **60** of CPU **56**, the RAM **54** coupled to CPU **56** and backed up by lithium battery **52** and a 4×14 keyboard **61** coupled to CPU **56**. The four AAA batteries **46** are also shown.

FIGS. **9A** and **9B** are a detailed schematic circuit diagram of the operating circuitry **42**. The operating circuit **42** includes the central processing unit **56**, the latch **58**, the random access memory **54** and LED **1**, LED **2**, LED **3** and LED **4**.

The operating circuitry also includes several subcircuits. One of those subcircuits **62** (FIG. **9B**) includes the keyboard **61** having pushbuttons **25**, each of which is connected to a port **63** of the CPU **56** shown in FIG. **9B** and can be referred to as the keyboard circuit **62**. The X's in FIG. **9B** indicate the pushbuttons **25** and when one of those pushbuttons X is pressed, current flows through a resistor in a column line, e.g., when button **25'**

is pressed current flows through resistor **64** in column line **138** going to the button or key **25'**. That raises the voltage on a supply line VCC to the CPU **56** of the microprocessor.

Accordingly, whenever a button **25** is pressed, it will increase the voltage on line VCC which initiates a switching process in a wake up circuit **70** for "waking up" or energizing the CPU **56** in the manner described below.

In addition to the keyboard circuit **62** and the wakeup circuit **70**, the subcircuits include a reset circuit **74**, and a write protect circuit **78**.

When the voltage on line VCC goes up, a signal is passed through capacitor **102**, to the base of a transistor **104** in the wake up circuit **70**. This turns on the transistor **104** which in turn turns on transistor **106** This turning on of the transistors **104** and **106** will bring voltage on line VCC to the full DC voltage of about 5½ volts. When the voltage on line VCC reaches 5½ volts, the CPU **56** begins to operate.

When operating, the CPU **56** establishes a signal on line ALE **108** which is passed through a resistor **110** and filtered by capacitor **102**. Once the ALE signal is established, it causes a voltage to be generated at the base of transistor **104**, maintaining transistor **104** turned on, which in turn maintains transistor **106** turned on, thus enabling the CPU **56** to continue to run. The CPU **56** can turn itself off by executing a HALT instruction which causes the ALE signal to cease, thus turning off transistors **104** and **106** and removing power via line VCC to the CPU **56**.

It is to be noted that the wake up circuit **70** can be activated by depression of a key or button **25** or by an input signal at serial port **3**. coupled to an input port **112** of the CPU **56**.

The circuit elements described above form the wakeup circuit **70** for activating the operating circuitry **42** of the device **10**. This circuit uses substrate static-protection diodes **114** in a CMOS chip coupled to the keyboard **61**. With this arrangement, source current is supplied to transmitter **104** via line VCC when a key or pushbutton **25** is depressed.

The RAM **54** is connected to the lithium battery **52** and, when the device **10** is not being used, draws about 20 nanoamps from the battery **52**, which gives the device **10** a shelf life between 5 and 10 years. A backup capacitor **116** is coupled to the RAM **54** and has (at 20 nanoamps) a discharge time of about 10 minutes, providing ample time to change (if necessary) the battery **52** without losing the instructions and data stored in the RAM **54**. Capacitor **116** is kept charged by battery **46** through diode **117** when the device **10** is operating and, at other times, by battery **52** through diode **118**.

After the CPU **56** has been powered up, or awakened, the CPU **56** makes a scan of row lines **121–128** to the keyboard **61** by sequentially forcing each line **121–128** low and then polling the other lines to find out which button **25**, such as button **25'**, has been pressed. As a result of pushbutton **25'** being pressed, a low impressed upon row line **121** will cause a low on column line **128** and that will result in the row line **128** being low.

The CPU **56** first sets row line **121** low and then begins scanning, starting with the row line **122**, for another row line having a low voltage thereon and by finding the row line with the low voltage, in the above example, row line **128**, the CPU **56** knows that button **25'** at the intersection of row line **128** and column line **138** has been depressed.

If the CPU **56** had not found a low on another row line, such as row line **128**, after having set line row **121** low, line **121** is returned to its previous value and row line **122** is then set low, and the scan continued until a low row line is found to identify which button **25** has been depressed.

When the CPU **56** determines which pushbutton **25** has been depressed the CPU **56** will then know what function is to be carried out.

It is to be noted that the keyboard circuit **62** is uniquely designed to include only eight (8) row lines **121–128** and eight (8) column lines **131–138** each having a resistor **64** and a current directing diode **114** therein and each being arranged across the row lines **131–138** so that **56** switch positions are provided with only eight (8) lines.

All memory cycles exercised must involve the latch **58** because the CPU **56** has its data bus multiplexed with the lower 8 bits of the address bus on lines **141–148**.

Coming out of the CPU **56** to the latch **58**, is a group of nine (9) lines **108** and **141–148**. One of the lines, line **108**, carries the ALE signal. The eight (8) lines **141–148** between the latch **58** and the CPU **56** are the multiplexed data and address bus lines. These lines comprise the lower 8 bits of the address bus. A group of multiplex lines are identified with reference numeral **150**. Five more lines **151–155** comprise the upper five bits of the address bus, making a total of 13 bits of address.

An inverting OR gate **156** having an output line **158** and two input lines **160** and **162** together with ground line **164** are coupled between the CPU **56** and the RAM **54**. The line **158** defines an output enable for the RAM **54**.

Accordingly, when the CPU **56** wants to do a read, it actuates either of the two input lines **160** or **162** going into the OR gate **156**. Line **160** is a PSEN line for telling the RAM **54** that it is to be enabled to receive data and line **162** is a Read Output line to tell the RAM **54** that the CPU is going to read the information stored in the RAM **54**. With OR gate **156** the two lines and functions are combined on one line **158**. In other words, the CPU **56** tells the RAM **54**, through the OR gate **156**, that it wants to read information stored in the RAM **54**.

The circuitry **42** also includes the write protect circuit **78** which has the double duty of being a low battery indicating circuit. The circuit **78** includes a resistor **170**, a transistor **171**, two resistors **172**, **173** and a Zener diode **174** connected as shown.

A write enable line **176** is connected between the transistor **171** and the CPU **56**.

When the CPU **56** desires to write information into the RAM **54**, it places the address on the address bus lines **141–148** and **151–155**, strokes the lower 8 bits of the address bus on lines **141–148** into the latch **58** using ALE line **108**, places the information on the data bus lines **141–148**, and then brings the write enable line **176** low.

When the write enable line **176** goes low, unless the transistor **171** is turned on by virtue of the battery voltage being more than 4.3 volts, a line **178** going into the RAM **54** at the collector **180** of the transistor **171** (which is the "write enable" for the RAM **54**), is prevented from going low, maintaining the RAM "Write Protected". This condition also is created when the battery **48** is low. The "write enable" line **176** also functions as a low battery detector because, during execution of the program, a check is made to see whether writing to the RAM **54** is enabled. If it is not, this shows

that the batteries are weak and a signal is sent to the user by flashing the red LED, of LED 4, 5 times.

Note that LED 4 includes a red LED and a green LED incorporated into one package so that when both LEDs are turned on, a yellow light is emitted, making LED 4 a tricolor LED. Such tricolor LED 4 enables the device 10 easily to communicate to the user by way of the color, number and sequence of light blinks.

A clock circuit 182 including a crystal resonator is coupled to the CPU 56.

Three serial ports 1–3 are coupled to the CPU 56 and include port 1 which is a transmitting port, port 2 which is ground and port 3 which is a receiving port. Serial port 1 is connected to row line 121 so that data can be serially transmitted in the form of highs and lows by CPU 56 from the RAM 54 over row line 121 to serial port 1. Incoming data is received serially from data supply means, such as from the memory of a personal computer at serial port 3 and conveyed to input port 112, when it is desired to update the code data and/or instructions in the RAM 54.

The three infrared-emitting LEDs, LED 1, LED 2, and LED 3 are connected in the circuitry 42 as shown.

The reset circuit 74 includes two resistors and a capacitor connected as shown and coupled between line VCC and a reset line 184.

As will be described in greater detail in connection with the description of FIGS. 11–14, the manufacturer of the device 10, using known methods or the method described herein with reference to FIGS. 12A–13C, will decipher the infrared codes for operating various pieces of equipment, such as a TV, a VCR, a CD, a Cable Converter or other equipment which is controlled by a remote infrared transmitting device.

After the infrared code is deciphered, the code data therefor and instructions for generating such code (see the flow chart in FIG. 14) are stored in a programming computer 200 (FIG. 10) and the device 10 is programmed as explained below.

It is to be noted that the circuitry 42 has no ROM and all instruction codes and code data are loaded directly into the RAM 54. This allows for infinite upgradability in the field via the serial ports 1, 2, 3.

FIG. 10 is a perspective view of a programming computer 200 coupled by a cable 202 to a special connector 204 which is adapted to be received over the CPU 56 in the operating circuitry 42 for disabling the CPU 56 and for enabling the RAM 54 to be programmed by the programming computer 200. Essentially this is done by tri-stating the CPU 56 and placing the RAM 54 into the address space of the computer 200 which writes initial instruction code including code for the serial port driver, and subsequently serially, other instruction code and code data into the RAM 54. For this purpose the programming computer 200 has instruction codes such as serial port driver instructions and data relative to the infrared codes for operating a multiple number of electronic apparatus, such as televisions, VCR's, etc stored therein. Signals from the programming computer 200, via the connector 204 cause the inputs and outputs 60 of the CPU to be disabled so that instruction codes and data can be input into the RAM 54 quickly and efficiently from the programming computer after the operating circuitry 42 is mounted in the control device 10.

Later, after the device 10 has been in use for some time and the RAM 54 needs to be updated with instruction codes and data relative to new equipment on the market, the control device 10 can be simply and easily updated at a service outlet having an ordinary personal computer (having instruction codes and code data stored in a memory of the computer) with a serial port using a novel nine pin to three pin, 9 volt to 5 volt, signal coupling and converting assembly 206 (FIG. 20). The updating can be done by adding to the data in RAM 54 or by rewriting (writing over) the data in RAM 54. The assembly 206 is described in greater detail hereinafter in connection with the description of FIGS. 20–22.

The infrared codes to be learned include a wide range of different codes for operating different electrical apparatus manufactured by the same or different manufacturers. In FIG. 11, which is identical to FIG. 1 in U.S. Pat. No. 4,623,887, there are illustrated several modulation schemes for infrared codes. FIGS. 11*a*–11*g* illustrate different types of gated carrier frequencies. Typical carrier frequencies for infrared remote transmitters are 20 Khz to 45 Khz, with the majority being at 38 Khz and 40 Khz. The gating schemes illustrated include both fixed and variable bit periods, non-return to zero (NRZ), variable burst widths, single/double burst modulation schemes, and a final catch-all category called random because there is no readily distinguishable pattern of ones and zeros.

In addition to these schemes, there is also a transmitter which puts out a different continuous frequency (CW) for each key as represented in FIG. 11*h*.

Finally, several new types of transmitters do not use a carrier frequency at all but instead send a stream of pulses where the data is encoded in the spaces between the infrared pulses as shown in FIG. 11*i*.

Data modulation schemes for most transmitters have a higher level of data organization which may be called a keyboard encoding scheme which causes different data to be sent depending upon the transmitter and the key pressed. This will be described in greater detail hereinafter in connection with FIGS. 15–19.

The code data for the infrared codes may be obtained from vendor information sheets and specifications, can be determined using the methods disclosed in U.S. Pat. Nos. 4,623,887 and 4,626,848, or by the method disclosed herein.

In the method for learning or acquiring code data for infrared codes disclosed herein, no counting of pulses is carried out. Instead the method involves the following steps:

(a) receiving a transmission of a train of pulses from a remote control transmitter;
(b) recording the point-in-time of an edge of each pulse in a train of the pulses;
(c) transforming the recorded point-in-time data into a list of instructions for generating a replica of the train of pulses;
(d) timing the duration of a train of the pulses;
(e) timing the period between trains of pulses;
(f) associating a function 7 key of the universal remote control device 10 with the time duration of the train of pulses and the list of instructions for generating a replica of the train of pulses;
(g) determining whether or not repetitions of the transmission of train of pulses is present;
(h) ignoring repetitions of the train of pulses;
(i) noting that repetitions are present; and
(j) storing for use in a universal remote control device, the information acquired in steps (c), (d), (e), (f) and (i).

Typically, each pulse has a fixed duty cycle and in carrying out the above described method it can be assumed that each pulse has a fixed duty cycle.

The manual and computer steps followed in practicing this method are set forth in FIGS. 12A and 13A.

FIG. 12A is a flow chart of the first part of this method for capturing an IR code and FIG. 12B is a graph of a pulse train comprising a portion of the code.

There is shown in FIG. 12B, adjacent the transforming step in FIG. 12A, a graph of the waveform of the captured, and later recreated, infrared codes, showing when the infrared signal is on and when it is off. When the CPU 56 executes the instructions set forth below the waveform in FIG. 12B, infrared-emitting LEDs, LED 1, LED 2, and LED 3 are turned on when the instruction IR-ON is executed and turned off when the instruction IR-OFF is executed. No operation is performed when the instruction NOP is called for. In this way the infrared codes are transformed into a bit stream of 0's and 1's.

FIG. 13A is a flow chart of a second part of the method for capturing an IR code.

FIG. 13B shows the IR infrared bitstream and an envelope of the filtered bitstream.

FIG. 13C shows the filtered waveform that is analyzed for repetition. The repetition scheme and a pointer to indicate, upon regeneration of the infrared code, which key will generate that code are stored in a memory for later inputting into the RAM 54.

FIG. 14 is a flow chart of a sequence of eleven (11) steps that a user initiates to generate a specific IR code for performing a specific function, namely, for generating a captured IR code stored in the remote control device 10. The code data is stored in the RAM 54 of the remote control device 10 and the sequence of steps the circuitry 42 goes through to take the code data in the RAM 54 and generate the infrared code therefrom is set forth in this Figure.

FIG. 15 is a plan view of the keyboard 61 and shows the different keys or pushbuttons 25 of the control device 10 extending through the base panel 14 of upper housing member 12 and the face panel 18 where the label or identification for each pushbutton or key 25 is shown. The light emitting diode, LED 4, is also indicated.

FIG. 16 is a flowchart of the steps initiated by a user of the device 10 in a step and set procedure for searching for code data in the device 10 for the infrared code needed to operate the user's specific apparatus and to set the device 10 for that code data.

FIG. 17 is a flow chart of the steps initiated by a user in carrying out a direct-entry/quick-set procedure for matching the user's equipment or apparatus to the device 10.

The steps of this procedure include:

STEP 1. Look up make and model number of the controlled apparatus in a table provided to the user in an instruction booklet.

STEP 2. Model number is found and matched with a series of 8 "R"s and "G"s.

STEP 3. Here the operator presses the desired mode button or key.

STEP 4. Press DO, Enter, Recall. This tells the device 10 to do a Quick-Match.

STEP 5. Next enter the sequence of eight, red and green blinks found in TABLE I (set forth below) provided in the instruction booklet. This is done by pressing Channel Down for "R" and Channel Up for "G".

STEP 6. Here a determination is made if a key other than Channel Up or Channel Down. was pressed.

STEP 7. The device 10 tricolor LED 4 will flash red or green depending on what button is pushed.

STEP 8. When all eight codes are entered, the program goes on to STEP 9.

STEP 9. Here a check is made to see if the blink code is in the table in the RAM 54 of the remote control device 10.

STEP 10. If the device 10 has successfully Quick-Matched to the controlled apparatus, the LED 4 will flash green twice.

STEP 11. If it did not match, it will flash yellow indicating that codes for that controlled apparatus are not loaded into the RAM 54.

TABLE 1

Blink Code	A	B	C	D	E	F	G	H
	DEVICE BLINK CODES AND SPECIAL FEATURE BUTTONS TELEVISION SETS							
RRRR RRRR	Display 25 = Col Up	MTS 26 = Col Dn	Pict + 27 = Brt Up	Pict – 28 = Brt Dn	Sleep 29 = Hue Up	TV/Video 30 = Hue Dn	Ant 31 = Mtx	Tone 32 = Reset
RRRG RRRG	Screen Dn	Sp Phne/ Pmt Ctl	AutoOn/ Data Ent	AutoOff/ Data Cir	Ant	Stereo		
RRRG RGRG	Add	clear						
RRRG GRRR	A Ch	Hi Fi						
RRRG GRGR	Ant/Aux	Time/Ch	Program	TV/VCR				
RRRG GGGR	Ant/Aux	Time/Ch						
RRRG GGGG	Pwr On	Pwr Off	Display	Ant				
GRRG RRRG	Aux	Last Ch	Timer					
GRRG RRGG	Fine Up 25 = Stereo	Fine Dn 26 = TimeFa	L Ctl 27 = Timer	R Ctl 28 = TimeS1	OBC 29 = TV/AV	Func	Review	BiLing
GRRG RGRR	Fine Up 25 = Stereo	Fine Dn 26 = TimeFa	L Ctl 27 = Timer	R Ctl 28 = TimeS1	OBC 29 = TV/AV	Func	Review	BiLing
GRRG RGGR	Tint R 24 = SAP 32 = Ext 1	Tint L 25 = Reset 33 = Ext 2	Color R 26 = Q/V 34 = Ant	Color L 27 = EXP	Contr R 28 = Disp	Contr L 29 = Mono	Timer 30 = Lock	Stereo 31 = TV
GRRG GRRG	TV/Video	Time						
GRRG GRGR	TV/Video 25 = Timer	Wide 26 = 100	Lvl UP 27 = BiLing	Lvl Dn	Memory	Func	MTC	Stereo
GRRG GRGG	10	11	12	13				
GRRG GGRR	RF12 26 = 100 34 = Pict	Ch Rtn 27 = Audio 35 = Reset	Str SAP 28 = CCC1	Mono 29 = CCC2	Timer 30 = CCC3	T Set 31 = CCC4	TV/CATV 32 = ContDn	TV/Vid 33 = ContUp
GRGG RRRR	Sleep	Review						

TABLE 1-continued

Blink Code	A	B	C	D	E	F	G	H
GRGG RRRG	K	L						
GRGG RRGR	SAP	Sleep	TV/Video					
GRGG RRGG	Program	Q Rev	SAP	Sleep	TV/Video	Add	Delete	
GRGG RGRG	Sleep	St/SAP	TV/Video					
GRGG RGGR	11	12	13	14	15	16		
GRGG RGGG	K	L						
GRGG GRRR	K	L						
			VIDEO CASSETTE RECORDERS					
RRRR RARR	Nse Cncl							
RRGR RRRG	Ant							
RRGR RRGR	Ant							
RRGR RRGG	Frm Adv	Slow	Slow Up	Slow Dn	Srch Fwd	Srch Rev		
RRGR RGRR	A	B	C	D	E	F	Slow	
RRGR GGGR	Slow							
RRGR RGGR	Slow +	Slow −	Eject	CM Skip	Program	Input	Mode	AM/PM
	28 = Shift	29 = Reset	30 = Mem/PS	31 = SR				
RRGR RGGG	Forward	FlshBack	Ant	Vol +	Vol −	Reverse	Sp Phne	PC
RRGR GRRR	Ant/Aux							
RRGR GRRG	11	12	13	14	15	16		
RRGR GRGR	Frm Adv	Memory	Reset	Chg Time				
RRGR GGRR	Pwr On	Pwr Off						
RRGR GGGG	Slow	Slow Up	Slow Dn	Set Up	Set Dn	Timer	Clear	Display
	29 = Frame	30 = Memory	31 = Prog	32 = Qtr	33 = QtrStr	34 = Quick	35 = Remain	36 = Rst
	37 = Clock	38 = APS	39 = 100					
GGRG RRRR	K	L						
GGRG RRRG	CFM	Slow						
GGRG RRGR	Slow	OSP	Shift L	Shift R	Slow Dn	Slow Up	St +	St −
	28 = Timer							
GGRG RRGG	11	12	13	14	15	16	Slow	
GGRG RGRR	Slow Dn	Slow Up	Slow					
			CABLE CONVERTERS					
RRRR RRGR	A/B	Add	Delete	Set	Lock	Last Ch		
RRRR RRGG	A	B	Event(*)	#	Arrow Up	Arrow Dn	Ap	Delete
	25 = F	26 = K	27 = Learn	28 = PGM	29 = TCP	30 = Enter		
RRRR RGRR	Skew L	Skew R	Audio	SAT	Ant East	Ant West		
RRRR RGRG	Plus	Minus	Dot	Box	Str	Clear	Time	Auth
	22 = C/R	23 = #						
RRRR RGGR	Prog	Auth						
RRRR RGGG	Auth							
RRRR GRRR	Auth	Prog						
RRRR GRRG	Plus	Minus	Rcp	*	M1	M2	M3	M4
RRRR GRGR	A − B	Dot 1	Dot 2	*	Am	Dm	F	
RRRR GRGG	Arrow Up	Arrow Dn						
			COMPACT DISK PLAYERS					
RRRR RRRR	CD Fwd	CD BckUp						
GRRG GRGG	Fwd Indx	Rev Indx	Repeat	Memory				

*For numbered functions, press "DO" then the two-digit number.

FIG. 18A is a flow chart of the steps for setting a "DO" command macro, for achieving a function that normally requires the actuation of several buttons, by programming one particular button to perform the functions required of the several buttons to achieve a specific function.

FIG. 18B is a flowchart of the simple two pushbutton steps required for executing the "DO" macro command created in FIG. 18A.

FIG. 19A sets forth the steps initiated by a user to determine the various blink codes which identify what equipment or apparatus the remote control device 10 is set for.

FIG. 19B illustrates a sample blinking grid of eight red and green blinks which will be presented to the user. Once a particular pattern of eight red or green blinks has taken place, the user of the device 10 will look up the blink pattern or code in TABLE I included in a user handbook. This table shows the user which pushbuttons 25 labelled A–H are associated with additional functions stored which may be stored in the RAM 54. Additional functions beyond the eight supported by pushbuttons AH are performed by pushing "DO", and then the two-digit sequence shown in TABLE I.

The instructions for using the control device 10 which are supplied to a purchaser thereof in an instruction booklet are set forth below.

Matching the Device to Your Equipment

The device 10 can control most remote controlled TV's, VCR's, cable converters, and CD players, but it needs the user's input to match it to your particular equipment. The easiest way to do this is to STEP-and-SET your device 10. You will only need to do this once for each different type of device you have.

1. To STEP-and-SET your device 10, first press DO, Enter.
2. Press one of the following equipment selection buttons to tell the device 10 what kind of equipment to match.

VCR1	Cable	TV
VCR2	CD	

3. Aim the device 10 at the equipment and try various function buttons to see if the equipment responds

correctly. Make sure you are reasonably close to the equipment and that nothing is blocking the path. The light (LED 4) at the top of the device 10 will shine green whenever it is sending an infrared code, or it will not light at all if it does not send a code for a particular button.

4. If your equipment did not respond correctly or did not respond at all, press DO1 to change the device 10 so that it will send the next set of infrared codes in its library, or press DO2 to change it so it will send the previous set of codes.
5. When you use DO1 or DO2 to step the device 10 setting forward or back, its light will blink yellow each time you step it. The settings step around in a circle. Whenever you get back to the setting where you started the device 10 light will blink red to notify you.
6. Use DO1 and DO2 to step through the sets of codes and keep trying out functions until your equipment responds correctly. The device 10 will then be set to send the proper infrared codes for operating your particular equipment.
7. When you are satisfied that the device 10 is properly matched, press DO, or any of the equipment selection buttons to restore the DO1 and DO2 buttons to their normal functions.
8. If your equipment is responding to your device 10 but some buttons are causing the wrong thing to happen, keep going. Some equipment responds to the infrared codes of other brands of equipment.
9. If you try out all of the codes in the device 10 library and your equipment still does not respond, it is probably because the code data for generating the infrared codes for operating your equipment is not in the library of your control device 10.

The Keyboard 61

Take a look at the keyboard. There are four groups of buttons:

1. Equipment Selection Buttons tell the device 10 which equipment is to be controlled:

VCR1	Cable	TV
VCR2	CD	

2. Basic Function Buttons are used to control your TV, VCR, CABLE and CD. They work in much the same way as in older remotes which typically have the following buttons.

			Power
Rec.	TV.VCR	Stop	Pause
Rewind	Reverse	Play	Fast Fwd
			Mute
1	2	3	Vol.Up
4	5	6	Vol.Dn
7	8	9	
		0	EnterChan.Up
		Recall	Chan.Dn

3. Extended Function Buttons perform any special unctions your equipment may have, such as color control, picture control, tint control, etc. These buttons are identified with the following alphabet letters.

A	C	E	G

-continued

B	D	F	H

4. DO Buttons are used to perform very powerful DO Commands which are explained below.

Special Features

Besides the basic functions such as channel up/down and volume up/down that most TV remote controls have, there could be special features as well, for example:

Color up/down.
Picture up/down.
Tint up/down.
Sleep.

Your VCR's remote control can also have special features such as:

Frame advance
Channel up/down

Your cable converter remote control can also have additional features such as:

Channel recall
Delete

Your CD player remote control can have special features such as:

Repeat
Track programming

Once you have matched the device 10 to your TV, VCR, Cable Converter and CD player, all functions that were controlled by your old remote control devices can now be controlled by the device 10. You may even notice some extra features that weren't controlled by your old remote.

Since the device 10 can control such a wide range of equipment, there is not enough room on it for buttons for every possible feature of every remote control. Instead, there are eight extended function buttons at the bottom labelled A through H. To find out what these eight buttons control for your particular TV, VCR, cable converter and CD player:

1. Get your pen and paper ready.
2. Press DO and then the button (TV VCR1 VCR2 Cable CD) of the device you want to know the special features of.
3. The device 10 will blink "red" or "green" 8 times. Every time it blinks "red" write down an "R". Every time it blinks "green" write down a "G". When you're finished writing it should look something like this:

R R R G R R R G

This is the "Blink Code" for your device. If you miss it the first time around, just press DO and the device button a second time.

4. Look at TABLE I and find the sequence of "R"s and "G"s that matches the one you wrote down.
5. Read the special features chart next to your Blink Code sequence which tells you what functions the A through H buttons control for your particular device.

For example, the feature chart of your TV might read:

A: Color Up
B: Color Down
C: Picture Up
D: Picture Down

6. To turn the color up in this example, you would press TV (of course if the device **10** is already set to control your TV, you do not have to press TV again but it doesn't hurt if you do so), then A.
7. To turn the color back down, you would just press B.
8. Write down what special functions are controlled by the A through H buttons on the handy stick-on labels enclosed with the control device **10**.
9. After writing down the special functions on the labels, stick them on to the back of the control device **10** for quick and easy reference.

If The Controlled Equipment Has More Than 8 Extended Functions

Usually, the eight A through H buttons are enough for most controlled equipment. If they're not, don't worry. If your controlled equipment has more than eight special features these too are controlled by the device **10**.

Beyond the A through H function buttons, any additional functions are performed by pressing DO then two of the 0-9 number buttons. For example, your TV's feature chart may show additional functions like these:

25: SAP	26: Reset	27: Q/V
28: Display	29: Mono	30: Stereo

If you did have these features and wanted to use them, you would press DO and then the two-digit number for that feature. For example, you might:

Press DO, 3.0. This would turn your TV's stereo broadcast feature on.

If you use a feature like this frequently you may want to assign it to a DO command, our next topic of discussion.

Setting DO Commands

DO Commands give you the power to perform a multitude of different functions with the push of just one or two buttons. DO Commands let you assign any of the following buttons to tell the device **10** to automatically perform a series of keystrokes you use often:

		DO1	DO2
Rec	TV.VCR	Stop	Pause
Rewind	Reverse	Play	Fast Fwd.
			Mute
			Vol. Up
			Vol. Dn
		Enter	Chan. Up
			Chan. Dn
A	C	E	G
B	D	F	H

To tell the device **10** to do what you want, you must teach it. As an example, you can teach the device **10** to turn your whole system on and set the TV to channel **4** by doing the following:

1. Press DO, Recall. This tells the device **10** that you want to teach it something to do.
2. Next, you must assign a button **25** you will use to DO whatever you teach it. You can use any of the device **10**'s buttons **25** set forth above. For example, let's use DO1 at the top of the keyboard: Press DO1.
3. Now, you must tell the device **10** what button sequence you would press to turn your whole system on and set the TV to channel **4**.
4. Press TV Power. This tells the device **10** to turn your TV on.
5. Press 4, Enter (pressing Enter may not be required for your TV). This tells the device **10** to set your TV to channel 4.
6. Press VCR. Power. This tells the device **10** to turn your VCR on.
7. Press Cable, Power. This tells the device **10** to turn your cable converter on.

Now you have pressed all the buttons you want the device **10** to learn for this example.

8. Press DO, Recall. This tells the device **10** that you are finished teaching it and to remember what you have taught it.

Now the device **10** knows how to turn your TV, VCR, and cable converter on and set the TV to channel 4, just by pressing one button.

9. Aim the device **10** at your equipment and press DO1. Make sure you keep the device **10** pointed at your equipment while the light is flashing.

Now that you know how DO Commands work, you can teach the device **10** to "DO" practically any sequence of keystrokes. Just remember to keep the following in mind:

To perform a DO Command, press DO then the button you assigned to remember the DO Command. However, if you assigned the DO1 or DO2 buttons to remember a DO Command, you do not have to press DO first, just press DO1 or DO2.

If the device **10** light (LED4) starts blinking green, yellow, red while you are trying to teach it, it is telling you that RAM **54** is full. The DO command you are teaching is automatically erased. You can teach the device **10** a shorter DO command, or erase some other DO command you have already taught the device **10** to obtain more memory space.

After the DO Command is finished, the last apparatus **10** selected within the DO Command will be the apparatus the device **10** will work with next.

Erasing a DO command

If you just want to change a DO Command, you do not have to erase it first—just set up the new DO Command in its place. However, to get rid of a DO Command without replacing it with a new one:

1. Press DO Recall.
2. Press the button you have assigned to the DO command that you want to erase. For example, to erase the DO command you taught the device **10** in the above example:

Press DO1.

3. Press DO, Recall again. The old DO Command is now erased.

QUICK-MATCHING To Your Equipment

There is a quicker way to match your equipment to the device **10** by Quick-Matching. Quick-Matching is a way to set the device **10** directly to match any controlled equipment in its library. Follow the steps below to do a Quick-Match:

1. Match the device **10** to your equipment using STEP-and-SET.
2. Press DO. then the desired device button (TV, VCR1, VCR2 or Cable. The device **10** light will blink red or green eight times.
3. Write down the sequence of red and green blinks. This is the "Blink Code" for the particular device.
4. Press DO Enter Recall. This tells the device **10** to do a Quick-Match.

5. Enter the correct sequence by pressing Ch Dn for "R" and Ch Up for "G". The device **10** light (LED **4**) will flash "red" or "green" depending on what button you push. The Ch Dn and Ch Up buttons **25** are labelled with the correct color for each.
6. When the device **10** has successfully Quick-Matched your equipment it will automatically flash green twice. If it did not match, it will flash yellow. If it fails to Quick-Match, it is probably because the requisite code data is not stored in the library in your device **10**.

QUICK-MATCHING Between Controlled Equipment

One of the great benefits of Quick-Matching is that you can switch the device **10** functions between the remote controlled TVs, VCRs and cable converters you may own. This is done by using "Quick-Match" within a "DO command".

Let's suppose you have two TVs in your house and only one device **10**. Here's how to switch between them:

1. Press DO Recall. the button you want to use to switch to your other TV set.

For example, press DO2. This tells the device **10** that you want to teach it a DO Command.

2. Press DO Enter Recall. This tells the device **10** that you want to do a Quick-Match.
3. Enter the R and G blink sequence of the second TV you want to control by pressing Ch Dn for "R" and Ch Up for "G".
4. Press DO. Recall. This tells the device **10** that you are finished teaching it a "DO command".

Now, to set the device **10** to control your second TV, press DO2. This tells the device **10** that you will be controlling your second TV.

To go back to controlling your first TV, simply teach device **10** another "DO command". Just repeat the steps above, except use a different button and the correct R and G sequence for your first TV.

The device **10** can easily be taught to control a whole houseful of infrared remote controlled equipment—just teach the device **10** a DO Command to QUICK-MATCH each additional piece of equipment.

In FIG. **20** is shown a unique signal coupling and converting assembly **206** which includes a connector assembly **207**, a cable **208** and a special cover plate **210** for the battery compartment **45**. The cover plate **210** has on the underside thereof three pins **212, 214** and **216** which are positioned to connect with the three serial ports **1, 2** and **3**. The pins **212, 214** and **216** mounted to the cover plate **210** are connected by three wire conductors **224, 226** and **228** in cable **208** to connector assembly **207** which has conversion circuitry **230** therein. The connector assembly **207** has a nine pin array **250** of sockets **251–259** for receiving nine pins and the conversion circuitry **230** which enables one to use some of the nine sockets **250** of the connector assembly **207** for communication with the three pins **212, 214, 216** that are connected to the serial ports **1, 2** and **3** as shown in FIGS. **21** and **22**.

FIGS. **21** and **22** are a schematic diagram of the conversion circuitry **230**.

In FIG. **21** is shown circuit portion **230A**. In this circuit portion, plus nine volts goes into pin **4** of connector DB-9 or pin **20** of connector DB-25 and minus 9 volts goes into pin **7** of DB-9 or pin **4** of connector DB-25, which are connected to the circuit portion **230A** of the conversion circuitry **230**. This provides a constant source of positive and negative voltage and is used as the power supply for the circuit. Note that two different types of personal computer host female connectors can be used, namely, female connector DB-9 or female connector DB-25 in the connector assembly **207**.

Serial information is transmitted by the hand held control device **10** via line HTXD at serial port **1** and is level translated by the operating circuitry **42** from a range of from plus 5 volts to zero volts to a range of from minus 9 volts to plus 9 volts.

In this respect, when 0 volts is present at serial port **1**, transistors **Q1** and **Q2** are turned on such that +9 volts is supplied from pin **4** of connector DB-9 or pin **20** of connector DB25 through transistor **Q1** to pin **2** of connector DB-9 or pin **3** of connector DB-25.

Then, when +5 volts is present at serial port **1**, the emitter-base of transistor **Q2** is reverse biased, turning off transistor **Q2** which turns off transistor **Q1**. As a result, the 9 volts at pin **7** of connector DB-9 or pin **4** of connector DB-25 is supplied through resistor **270** to pin **2** of connector DB-9 or pin **3** of connector DB-25.

The circuit portion **230B** is shown in FIG. **22** and performs a receiving function for the control device **10**. When pin **3** of connector DB-9 or pin **2** of connector DB-25 is at −9 volts, its normal resting state, then HTXD at serial port **3** is at 0 volts. When pin **3** of connector DB-9 or pin **2** of connector DB-25 goes to +9 volts, HTXD at serial port **3** goes to plus 5 volts. Pin **5** of connector DB-9 or pin **7** of connector DB-25 is directly connected to serial port **2** and always stays at ground.

In transmitting data to the control device **10**, the programming computer supplies +9 v or −9 v to pin **3** of connector DB-9 or pin **2** of connector DB-25. When +9 v is present on IBMTXD, 4.3 volts established by Zener diode **272** is passed through diode **274** to serial port **3**.

When −9 v is present on IBMTXD, the Zener diode **272** clamps to −0.6 volts resulting in conduction through transistor **Q3** pulling serial port **3** to 0 volts.

The diode **274**, the transistor **Q3** and a resistor **276** connected as shown are provided to allow pressing a key **25** on keyboard **26** to "wake up" CPU **56** (actuate the wake up circuit **70**) even though circuit portion **230B** is connected to the control device **10**.

An important feature of the universal remote control system of the present invention is the inclusion therein of a data transmission system which enables all types of data and particularly code data relating to codes for generating infrared signals for operating various control devices to be input into the memory, such as the RAM, of the universal remote control. With this capability, the user of the universal remote control can quickly and simply input data into the universal remote control, whether it had code operating data therein or not, to control a variety of controllable devices.

It is even possible that data can be input into the universal remote control which will enable the remote control to become a video game or perform any number of functions in addition to controlling controllable devices such a VCR or television set.

The data transmission systems are illustrated in FIGS. **23–26** and will now be described below with reference to those FIG.'s.

Referring now to FIG. **23** in greater detail, there is shown a data transmission system **300** which includes a conventional telephone jack **302**, such as an **RJ11** jack, which is connected to a telephone line and which has a cable **304** extending therefrom to a telephone **306**. A

handset 308 of the telephone is then adapted to be attached to a listen-only acoustic coupler modem 310 which will pick up and convert acoustic telephone signals to digital signals for transmission to a universal remote control 312. In other words, once the user has accessed a code number such as a 900 number, has pressed a sequence of keys on the telephone and receives a signal over the telephone 306 that the telephone 306 is ready to communicate code data to him, he then places the handset 308 on the modem 310.

Then an RS232 connector 314 is connected to the modem 310 and a cable 316 extends therefrom to a three-prong jack 318 which is adapted to mate with and connect to three serial ports, which, in the universal remote 312, are located on the bottom edge of the remote control 312. It will also be noted that the remote control 312 has a visual display 320 which can be a liquid crystal display or other type of visual display whereby information regarding the data being input can be communicated to the user.

FIG. 24 illustrates a modified data transmission system 400 which includes a telephone jack 402 which is typically an RJ11 jack that connects to a telephone line and which has a cable 404 leading to a telephone 406. A handset 408 of the telephone 406 has a pick-up coil 410 connected thereto. The pick-up coil 410 then extends to a listen-only modem 412 which is connected by an RS232 serial port 414 to a cable 416 leading to a three-prong jack 418 that is connected to the bottom of a universal remote control 420 in the same manner as in FIG. 23.

In FIG. 25 there is illustrated still another data transmission system 500. In this system, a television 502 has a vertical blanking interval decoder 504 connected thereto whereby data that is stored on the vertical blanking interval as a raster scan is made across the television screen 506 of the television 502 is picked up by the decoder 507 and decoded. Then, this data is supplied via a cable 508 and a three-prong jack 510 and the serial ports in a universal remote control 512 to the memory of the remote control 512. With this data transmission system 500, data is obtained directly from the television set for inputting data into the memory of the universal remote control 512.

In FIG. 26 is illustrated a simplified data transmission system 600 which is based upon the use of a digital data telephone line or integrated services digital network (ISDN) whereby data can be input directly over the telephone line to the universal remote control 602.

In the data transmission system 600, the universal remote control 602 has a modem (not shown) therein which includes a direct access arrangement to enable communication via a cable 604 connected to a telephone jack 606 and to a three-prong jack 608 directly with a source of data that can be a large mainframe computer that is connected to the ISDN for transmitting data to the universal remote control 602.

From the foregoing description, it will be apparent that the universal remote control 10, the signal coupling and converting assembly 206, and the data transmission system 300, 400, 500 or 600 of the present invention have a number of advantages, some of which have been described above and others of which are inherent in the invention disclosed herein. For example:

1) With no ROM in the circuitry 42, the instruction codes and code data in the RAM 54 can be upgraded at any time via the serial ports 1, 2 and 3.
2) By loading the instruction codes and initial code directly into the RAM 54 by tri-stating the CPU 56, the circuitry 42 is enabled to function without a ROM.
3) The serial ports 1, 2 and 3 together with the signal coupling and converting assembly 206 and the data transmitting system 300, 400, 500 or 600 enable data to be input into the circuitry 42 from a telephone line or a television set, an RS232 interface device and a three pin jack to the serial ports 1, 2 and 3.
4) The visible LED 4 providing red/green/yellow/-off blink code provides a means for communicating to the user where the device 10 has "landed" after searching for codes to control a specific apparatus. The user can then look up in the instruction booklet what extended functions are available via the letter keys A–H or number keys, plus the DO key for that particular apparatus or equipment.
5) The write-protect circuit 78 prevents corruption of the operating program or data in the RAM 54 during transient states when the microprocessor is being turned on or turned off.
6) The multiplexing of the address and data lines between the RAM 54 and the CPU 56 enables scrambling of the instruction codes and the code data so that the memory image in the RAM 54 is encrypted.
7) The construction of the keyboard 61 enables one to have 56 keys which can be decoded using only 8 bidirectional input (and output) ports 63.
8) The keyboard 61 including the keyboard circuitry 62 plus the wakeup circuit 70 provides a system whereby pressing any key turns on power to the CPU 56.
9) The provision of three infrared LEDs 1, 2 and 3 with no current-limiting resistors enables the device 10 to use maximum energy to create the infrared control pulses with a minimum amount of energy wasted.
10) The DO keys together with the numeral and letter keys allow a number of DO functions to be performed with the device 10 by a user.
11) Any combination of products can be controlled with the universal remote control device 10.
12) The step-and-set method for locating the code data for generating the infrared code necessary to operate the user's equipment or for the user to learn that such code data is not present in the library in the RAM 54.

I claim:

1. A remote control system with data coupling including: a remote control comprising input means including a set of keys or pushbuttons for inputting commands into the remote control, infrared signal output means including IR lamp driver means for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to the input means and to the signal output means, memory means coupled to the CPU and data coupling means including receiving means coupled to the CPU for enabling at least one of (a) instruction codes or (b) code data for creating appropriate IR lamp driver instructions for causing the infrared signal output means to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, to be supplied from outside the remote control through the receiving means directly to the CPU for direct entry to the memory to enable the remote

control to control various devices to be controlled upon the inputting of commands to the keys of the input means and a data transmission system including coupling means for coupling the receiving means to a computer, directly, through a telephone line, through a modem and a telephone line, or through decoding means and a television set which receives a television signal containing at least one of the instruction codes or the code data.

2. The universal remote control system of claim 1 wherein said data-transmission system includes a serial port connector for connecting to said remote control, a cable connected to said serial port connector and means for coupling said connector to a telephone line or to a television set.

3. The universal remote control system of claim 2 wherein said coupling means include a vertical blanking interval decoder, defining a decoding means, connected to a television set.

4. The universal remote control system of claim 2 wherein said remote control includes a direct access arrangement and said coupling means includes a telephone jack connected to the other end of said cable for ISDN data line transmission.

5. The universal remote control system of claim 2 wherein said data transmission system includes an RS232 serial port connector, a modem to which the RS232 serial port connector is connected to, and telephone line coupling means for coupling said modem to a telephone line.

6. The universal remote control system of claim 5 wherein said modem is a listen only modem.

7. The universal remote control system of claim 5 wherein said telephone line coupling means includes pick-up coil that couples to a handset of a telephone and is coupled by a line to said modem.

8. The universal remote control system of claim 5 wherein said modem is all acoustic coupler modem which is adapted to receive therein a handset of a telephone and acoustically pick up the sound transmission from the handset.

9. The universal remote control system of claim 1 wherein said coupling means includes a cable, first connector means at one end of said cable for connection to said receiving means, and interface connector means at the other end of said cable for connecting to a computer, directly, through a telephone line, through a modem and a telephone line, or through decoding means, a television set, and a television signal which is picked up by the television set and which has data from a computer.

10. The universal remote control system of claim 1 wherein said memory means include a non-volatile, read-write memory.

11. The universal remote control system of claim 1 wherein said universal remote control further includes a visual display coupled to the CPU whereby various data including information about the data being input into said memory means can be displayed on said visual display to a user.

12. The universal remote control system of claim 1 wherein said receiving means include terminal means comprising three serial ports coupled to said CPU, one port being coupled to the ground for the CPU, one port, forming a receiving port, being coupled to an input of said CPU and one port, forming a sending port, being coupled to an output of said CPU.

13. A method for communicating at least one of (a) instruction codes or (b) function code data for operating a controlled consumer electronic device, such as a television set, with the remote control, from a computer, through a modem system comprising a modem or a pickup coil associated with a remote control, to a memory of the remote control, said method comprising the steps of:

providing function code data for creating appropriate infrared (IR) lamp driver instructions for causing an infrared signal generator to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, in a digital format of data bytes each comprising a predetermined number of bits for transmission over a telephone line;

providing instruction codes for transmission over a telephone line;

transmitting the information of the at least one of the instruction codes or the function code data over a telephone line;

picking up with the modem or pick up coil the information being transmitted;

retrieving from the information transmitted at least one of the instruction codes or the function code data; and,

storing the at least one of the instruction codes or the function code data in digital format in the memory of the remote control.

14. A remote control system with data coupling including: a remote control, a computer having a memory, at least one of instruction codes or code data for creating appropriate infrared (IR) lamp driver instructions for causing an infrared signal generator to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, stored in said memory of said computer, said remote control comprising input means including a set of keys or pushbuttons for inputting commands into said remote control, infrared signal output means including IR lamp driver means for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to said input means and to said signal output means, memory means coupled to said CPU, and data coupling means for periodically coupling said computer to said remote control for receiving from said computer memory and inputting into said memory means of said remote control at least one of (a) said instruction codes or (b) said code data for creating appropriate IR lamp driver instructions, said code data causing said infrared signal output means to emit infrared signals which will cause specific functions to occur in a specific controlled device when said input means are operated, and said code data operating a variety of devices to be controlled and enabling said remote control to control various devices to be controlled upon the inputting of commands to said keys of said input means.

15. A remote control system with data coupling including: a remote control, a computer having a memory, at least one of instruction codes or code data for creating appropriate infrared (IR) lamp driver instructions for causing an infrared signal generator to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, stored in said memory of said computer, said remote control comprising input means including a set of keys or pushbuttons for

inputting commands into said remote control, infrared signal output means including IR lamp driver means for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to said input means and to said signal output means, memory means coupled to said CPU, and data coupling means for periodically coupling said computer to said remote control for receiving from said computer memory and inputting into said memory means of said remote control at least one of (a) said instruction codes or (b) said code data for creating appropriate IR lamp driver instructions for causing said infrared signal output means to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled into said memory means of said remote control to enable said remote control to control various devices to be controlled upon said inputting of commands to said keys of said input means and a data transmission system including said data coupling means for coupling said remote control to said computer, directly, through a telephone line, through a modem and a telephone line, or through decoding means and a television set which receives a television signal containing at least one of said instruction codes or said code data.

16. A remote control system with data coupling including: a remote control, a computer having a memory, instruction codes stored in said memory of said computer, said remote control comprising input means including a set of keys or pushbuttons for inputting commands into said remote control, infrared signal output means including IR lamp driver means for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to said input means and to said signal output means, memory means coupled to said CPU for storing instruction codes and code data for creating appropriate IR lamp driver instructions, said code data causing said infrared signal output means to emit infrared signals which will cause specific functions to occur in a specific controlled device when said input means are operated, and said code data operating a variety of devices to be controlled and enabling said remote control to control various devices to be controlled upon the inputting of commands to said keys of said input means, and data coupling means for periodically coupling said computer to said remote control for receiving from said computer memory and inputting into said memory means of said remote control said instruction codes.

17. A remote control system with data coupling including: a remote control, a computer having a memory, instruction codes stored in said memory of said computer, said remote control comprising input means including a set of keys or pushbuttons for inputting commands into said remote control, infrared signal output means including IR lamp driver means for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to said input means and to said signal output means, memory means coupled to said CPU for storing instruction codes and code data for creating appropriate IR lamp driver instructions, said code data causing said infrared signal output means to emit infrared signals which will cause specific functions to occur in a specific controlled device when said input means are operated, and said code data operating a variety of devices to be controlled and enabling said remote control to control various devices to be controlled upon the inputting of commands to said keys of said input means, and data coupling means for periodically coupling said computer to said remote control for receiving from said computer memory and inputting into said memory means of said remote control said instruction codes, and a data transmission system including said data coupling means for coupling said remote control to said computer, directly, through a telephone line, through a modem and a telephone line, or through decoding means and a television set which receives a television signal containing at least one of said instruction codes or said code data.

18. A remote control system with data coupling including: a remote control, a computer having a memory, at least one of instruction codes or code data for creating appropriate infrared (IR) lamp driver instructions for causing an infrared signal generator to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, stored in said memory of said computer, said remote control comprising input means including a set of keys or pushbuttons for inputting commands into said remote control, infrared signal output means including IR lamp driver means for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to said input means and to said signal output means, memory means coupled to said CPU, and data coupling means including a modem associated with said remote control for periodically coupling said computer to said remote control through a telephone line for receiving from said computer memory and inputting into said memory means of said remote control at least one of (a) said instruction codes or (b) said code data for creating appropriate IR lamp driver instructions, said code data causing said infrared signal output means to emit infrared signals which will cause specific functions to occur in a specific controlled device when said input means are operated, and said code data operating a variety of devices to be controlled and enabling said remote control to control various devices to be controlled upon the inputting of commands to said keys of said input means.

19. A remote control system with data coupling including: a remote control, a computer having a memory, at least one of instruction codes or code data for creating appropriate infrared (IR) lamp driver instructions for causing an infrared signal generator to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, stored in said memory of said computer, said remote control comprising input means including a set of keys or pushbuttons for inputting commands into said remote control, infrared signal output means including IR lamp driver means for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to said input means and to said signal output means, memory means coupled to said CPU, and data coupling means including a pick up coil associated with said remote control and being positionable adjacent a telephone handset for periodically coupling said computer to said remote control through the telephone handset and a telephone line for receiving from said computer memory and inputting into said memory means of said remote control at least one of (a) said instruction codes or (b) said code data for creating appropriate IR lamp driver instructions, said code data causing said infrared signal output means to emit infrared signals which will cause specific functions to occur in a specific controlled device when said input means are operated, and said code data operating a variety of devices to be controlled and enabling said remote control to control various devices to be controlled upon the inputting of commands to said keys of said input means.

* * * * *

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PATENT APPLICATION SERIAL NO. _____

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VERIFIED	THIS APPLN IS A CON OF	08/046,105	04/08/93	PAT	5,255,313
	WHICH IS A CON OF	07/587,326	09/24/90	PAT	5,228,077
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TITLE

UNIVERSAL REMOTE CONTROL SYSTEM

This is to certify that annexed hereto is a true copy from the records of the United States Patent and Trademark Office of the application which is identified above.

By authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS

Date Certifying Officer

Application for United States Letters Patent

of the UNITED STATES OF AMERICA by

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Being a citizen of -

the UNITED STATES OF AMERICA

For:

UNIVERSAL REMOTE CONTROL SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

SUB
CI

This application is a Continuation Application of U.S. Application Serial No. 08/046,105 filed April 8, 1993, which is a Continuation Application of U.S. Application Serial No. 07/587,326 filed September 24, 1990, now U.S. Patent No. 5,228,077, which is a Continuation-In-Part Application of Application Serial No. 07/127,999, Now U.S. Patent No. 4,959,810, which is a Continuation-In-Part of Application Serial No. 07/109,336, now abandoned.

S.N. 08/134086

ABSTRACT OF THE DISCLOSURE

The universal remote control system include a universal remote control comprising imput means for inputting commands, infrared signal output means for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to the input means and to the signal output means, a single, non-volatile, read-write memory coupled to the CPU and data coupling means including terminal means coupled to the CPU for enabling code data for a variety of devices to be controlled to be supplied from outside the remote control through the terminal means and the CPU to the memory to set up the remote control for controlling the devices to be controlled and a data transmission sustem for coupling a telephone line or a television set to the terminal means of the remote control.

UNIVERSAL REMOTE CONTROL SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a universal remote control system including a remote control of the type which is hand held and which can be coupled via coded infrared signals with a remote control receiver built into a television or other remotely controlled electrical apparatus to turn on the apparatus, such as the television, at a distance, to adjust the volume, tone and brightness, to change channels, and to turn the television off and a data transmission system for inputting data to the remote control.

2. Description of the related art including information disclosed under 37 CFR Sections 1.97-1.99

Heretofore it has been proposed to provide a reconfigurable remote control device and programmable functions for such a remote control device which will enable one to learn, store and retransmit infrared codes that are emitted from the controller for a remotely controlled apparatus, such as a television.

For example, in the Welles II U.S. Patent No. 4,623,887 and the Ehlers U.S. Patent No. 4,626,848, there is disclosed a reconfigurable remote control device which has the ability to learn, store and repeat remote control codes from any other infrared transmitter. Such a reconfigurable remote control transmitter device includes an infrared receiver, a microprocessor, a non-volatile random access memory, a scratch pad random access memory, and an infrared transmitter.

According to the teachings of the Ehlers patent, the infrared signals received by the remote control device are in bursts of pulses and the device counts the number of pulses in each burst as well as the time duration of each pause in a transmission between bursts.

The Evans et al. U.S. Patent No. 4,825,200 which issued on April 25, 1989 on application Serial No. 66,833 filed on June 25, 1987, teaches a reconfigurable remote control transmitter that includes a learn mode and a run mode and is similar to the remote control system disclosed in the Ehlers patent.

Evans et al. does not teach or suggest the provision in a

universal remote control of data coupling means including terminal means (such as serial ports) coupled to a CPU for enabling code data to be supplied from outside the remote control through the terminal means and CPU to a memory of the remote control.

The Imoto U.S. Patent No. 4,771,283 teaches a system for the collecting of operating codes from various remote control transmitters by inputting the code data therefrom via infrared code signals to an infrared receiving diode at an input of the system, deciphering those code signals, storing them in a RAM and then upon operation of keys, supplying outputs via one of several cables extending from outputs of the system to devices to be controlled.

Imoto does not teach means for outputting infrared code signals nor does Imoto teach in a remote control, terminal means coupled to a CPU for supplying code data from outside the remote control through the terminal means and the CPU to a memory of the remote control.

~~SUMMARY OF THE INVENTION~~

According to the invention, there is provided a universal remote control system including a universal remote control comprising input means for inputting commands, infrared signal output means for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to said input means and to said signal output means, a single, non-volatile, read-write memory coupled to said CPU and data coupling means including terminal means coupled to said CPU for enabling code data for a variety of devices to be controlled to be supplied from outside said remote control through said terminal means and said CPU to said memory to set up said remote control for controlling the devices to be controlled and a data transmission system for coupling a telephone line or a ~~television set to said terminal means of said remote control.~~

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front perspective view of the universal remote control device constructed according to the teachings of the present invention.

FIG. 2 is an exploded perspective view of the control device show n in FIG. 1.

FIG. 3 is an enlarged fragmentary sectional view through two of the push buttons of the control device shown in FIGS. 1 and 2.

FIG. 4 is a fragmentary corner view of a push button containing panel and a base panel.

FIG. 5 is a fragmentary corner view similar to FIG. 4 as the panels are brought together and shows one of the push buttons cut away from the push button containing panel.

FIG. 6 is a fragmentary sectional view of the assembly 15 formed by bringing the push button containing panel into engagement with the base panel.

FIG. 7 is a plan view of the circuit board assembly mounted inside the control device viewing the control device from the back side thereof with a back cover panel removed.

FIG. 8 is a block diagram of the operating circuitry in the control device.

FIGS. 9A & 9B are a detailed schematic circuit diagram of the operating circuitry shown in FIG. 8.

FIG. 10 is a perspective view showing the connection of a programming connector over the central processing unit of the operating circuitry in the control device, the programming connector being connected to a microprocessor, being operable to disable the central processing unit, and being used to program the random access memory (RAM) of the operating circuitry.

FIGS. 11a to 11i are graphical representations of several modulation schemes which are used in infrared remote control transmitters.

FIG. 12A is a flow chart of a first part of a method for capturing an IR code and FIG. 12B is a graph of the envelope of the code.

FIG. 13A is a flow chart of a second part of a method for capturing an IR code; FIG. 13B is a waveform of the IR bit stream and filtered bit stream; and FIG. 13C is a graph of the waveform of a filtered repetition of a filtered bit stream.

FIG. 14 is a flow chart of the method used for generating an infrared code.

FIG. 15 is a front plan view of the control device shown in FIG. 1 and shows the various pushbuttons of the device.

FIG. 16 is a flow chart of the search and set procedure followed in using the control device of the present invention.

FIG. 17 is a flow chart of a direct-entry/quick-set procedure followed in using the remote control device.

FIG. 18A is a flow chart of the procedure followed in setting a "DO" command and FIG. 18B is a flow chart of the method for executing a "DO" command.

FIG. 19A is a flow chart of the method used to identify what type of unit the remote control device is set for and FIG. 19B is a table of the identifying blink code.

FIG. 20 is a fragmentary perspective view with portions broken away of a connector with conversion circuitry therein and a special battery case cover for the control device by which new data can be inputed into the RAM of the operating circuitry of the control device.

FIG. 21 is a schematic circuit diagram of part of the conversion circuitry in the connector shown in FIG. 20.

FIG. 22 is a schematic circuit diagram of another part of the conversion circuitry in the connector shown in FIG. 20.

FIG. 23 is a schematic block diagram of the data transmission system of the universal remote control system of the present invention and shows the manner in which data is input via a telephone line to the remote control.

FIG. 24 is a block schematic diagram of a modified data transmission system similar to the data transmission system shown in FIG. 23 for inputting data via a telephone line to the remote control using a pickup coil.

FIG. 25 is a block schematic diagram of another embodiment of a data transmission system which utilizes the vertical blanking interval on a raster across a television screen for transmitting data to the remote control and shows a vertical blanking interval decoder and a cable with a three-pin jack pluggable into the remote control for transmitting data to the remote control.

FIG. 26 is a block schematic diagram of a direct connection from a digital telephone line to the remote control having a direct access arrangement therein for inputting data to the remote control.

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DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 1 in greater detail, there is illustrated therein a universal remote control device 10 constructed according to the teachings of the present invention.

As shown, the device 10 includes a housing 11 including an upper housing member 12 having a base panel 14, and a lower housing member 16. An overlay face panel 18 is positioned over the base panel 14.

The two panels 14 and 18 have openings 22 and 24 (FIG. 2) therethrough for receiving elastomeric pushbuttons 25, all of which extend from and are fixed to or integral with an elastomeric body panel 26 as shown in FIG. 2.

The pushbuttons 25 are arranged in rows and columns and are identified as follows on the overlay face panel 18:

VCR 1	Cable	TV	Power
VCR 2	CD	DO 1	DO 2
Rec	TV . VCR	Stop	Pause
Rew	Reverse	Play	Fast Fwd
			Mute
1	2	3	Vol Up
4	5	6	Vol Dn
7	8	9	
	0	Enter	CH Up
		Recall	CH Dn

DO			
A	C	E	G
B	D	F	H

This arrangement is shown in FIG. 15 and the manner in which these pushbuttons 25 are utilized in operating the control device 10 will be described in greater detail in connection with the description of FIGS. 15-19B.

At a top or forward end 28 of the device 10, there is provided an opening 30 for three light emitting diodes, LED 1, LED 2 and LED 3. The opening 30 is covered by an infrared-transport lens 31. Also, provided on a top surface 32 of the upper housing member 12 of the control device 10 is a light emitting diode, LED 4, by which information, in the form of red and green blink codes, is communicated to the user of the

device 10.

FIG. 2 is an exploded view of the components of the device 10. As shown, the device 10 includes the overlay face panel 18 with pushbutton-receiving, generally rectangular openings 22, the upper housing member 12 with base panel 14 having a plurality of generally rectangular, pushbutton receiving openings 24, the elastomeric body panel 26 having pushbuttons 25 extending from an upper surface 34 thereof, a printed circuit board 36 having conductive switches 38 on an upper surface 40 thereof and operating circuitry 42 (FIG. 7) mounted on the underside 43 thereof, the lower housing member 16, a cover 44 for a battery compartment 45 (FIG. 7) for receiving batteries 46 (FIG.10) for the circuitry 42 of the control device 10, and the infrared-transport lens 31.

It will be noted that the base panel 14 of the upper housing member 12 has pushbutton openings 24 completely across each one of fourteen (14) rows across and four (4) columns down. However, not all of these openings or holes 24 have pushbuttons 25 extending therethrough, as noted by the lesser number of pushbutton-receiving openings 22, in the overlay face panel 18. Likewise, the body panel 26 initially has pushbuttons 25 arranged completely across the upper surface 34 in fourteen (14) rows across and fourteen (14) columns down.

The printed circuit board 36 has conductive switches 38 aligned with each one of the pushbuttons 25 so that more switches 38 are provided than may be necessary for this particular control device 10.

The availability of additional pushbutton openings 24 in the base panel 14 will enable the control device 10 to be modified as necessary by the addition of further pushbuttons 25 to perform numerous other functions as called for.

This mechanical construction of the upper and lower housing members 12 and 16 and the panels 14 and 18 and circuit board 36 enable the control device 10 to be modified to include additional circuits in the operating circuitry 42 and pushbutton switches 25 for performing additional functions, if desired. In this respect, overlay face panel 18 is easily replaceable to modify the device 10 to include more or less pushbuttons 25 and associated switches 38.

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The simplicity of the construction of the pushbuttons 25, the base panel 14 and the overlay panel 18 is shown in FIGS. 3-6. As shown in FIG. 3, the body panel 26 has a plurality of raised pushbuttons 25 formed thereon. Each raised rectangular button 25 has a recessed area or hollow 48 on the underside 49 of each button 25 in which is mounted a conductive plunger or puck 50 adapted to engage one of the conductive switches 38 on the circuit board 36. With the pushbuttons 25 and the panel 26 being formed from a sheet of elastomeric material it is an easy matter to remove the buttons 25 that are not necessary with a scissors or other cutting element, as shown in FIG. 4.

Then, the pushbutton body panel 26 is moved into engagement with the base panel 14, as shown in FIG. 5, to form the assembly shown in FIG. 6.

After the pushbutton body panel 26 and the base panel portion 14 have been assembled as shown in FIG. 6, the overlay face panel 18 is mounted on top of the base panel 14 and the circuit board 36 is mounted within the housing member 12.

Referring now to FIG. 7, there is illustrated therein the operating circuitry 42 of the control device 10 which includes batteries 46 (FIG. 10) mounted in the compartment 45 for providing power for the circuitry 42 and a lithium battery 52, which backs up a static RAM 54. A central processing unit (CPU) 56, is coupled through a latch 58 to the RAM 54. Three LEDs, LED 1, LED 2, and LED 3 are coupled to the circuitry 42 for communication with the apparatus to be controlled. All elements of the circuitry 42 are mounted on the circuit board 36 mounted in the upper housing member 12. A further LED, LED 4 is coupled to CPU 56 for communication with the user of the device 10 as will be described in greater detail below.

A block schematic circuit diagram of the operating circuitry 42 is shown in FIG. 8 and includes CPU 56, the infrared light emitting diodes, LED 1, LED 2, and LED 3 coupled to the CPU 56, serial input/output ports 60 of CPU 56, the RAM 54 coupled to CPU 56 and backed up by lithium battery 52 and a 4 x 14 keyboard 61 coupled to CPU 56. The four AAA batteries 46 are also shown.

FIGS. 9A and 9B are a detailed schematic circuit diagram of the operating circuitry 42. The operating circuit 42

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includes the central processing unit 56, the latch 58, the random access memory 54 and LED 1, LED 2, LED 3 and LED 4.

The operating circuitry also includes several subcircuits. One of those subcircuits 62 (FIG. 9B) includes the keyboard 61 having pushbuttons 25, each of which is connected to a port 63 of the CPU 56 shown in FIG. 9B and can be referred to as the keyboard circuit 62. The X's in FIG. 9B indicate the pushbuttons 25 and when one of those pushbuttons X is pressed, current flows through a resistor in a column line, e.g., when button 25' is pressed current flows through resistor 64 in column line 138 going to the button or key 25'. That raises the voltage on a supply line VCC to the CPU 56 of the microprocessor.

Accordingly, whenever a button 25 is pressed, it will increase the voltage on line VCC which initiates a switching process in a wake up circuit 70 for "waking up" or energizing the CPU 56 in the manner described below.

In addition to the keyboard circuit 62 and the wakeup circuit 70, the subcircuits include a reset circuit 74, and a write protect circuit 78.

When the voltage on line VCC goes up, a signal is passed through capacitor 102, to the base of a transistor 104 in the wake up circuit 70. This turns on the transistor 104 which in turn turns on transistor 106 This turning on of the transistors 104 and 106 will bring voltage on line VCC to the full DC voltage of about 5 1/2 volts. When the voltage on line VCC reaches 5 1/2 volts, the CPU 56 begins to operate.

When operating, the CPU 56 establishes a signal on line ALE 108 which is passed through a resistor 110 and filtered by capacitor 102. Once the ALE signal is established, it causes a voltage to be generated at the base of transistor 104, maintaining transistor 104 turned on, which in turn maintains transistor 106 turned on, thus enabling the CPU 56 to continue to run. The CPU 56 can turn itself off by executing a HALT instruction which causes the ALE signal to cease, thus turning off transistors 104 and 106 and removing power via line VCC to the CPU 56.

It is to be noted that the wake up circuit 70 can be activated by depression of a key or button 25 or by an input

signal at serial port 3. coupled to an input port 112 of the CPU 56.

The circuit elements described above form the wakeup circuit 70 for activating the operating circuitry 42 of the device 10. This circuit uses substrate static-protection diodes 114 in a CMOS chip coupled to the keyboard 61. With this arrangement, source current is supplied to transmitter 104 via line VCC when a key or pushbutton 25 is depressed.

The RAM 54 is connected to the lithium battery 52 and, when the device 10 is not being used, draws about 20 nanoamps from the battery 52, which gives the device 10 a shelf life between 5 and 10 years. A backup capacitor 116 is coupled to the RAM 54 and has (at 20 nanoamps) a discharge time of about 10 minutes, providing ample time to change (if necessary) the battery 52 without losing the instructions and data stored in the RAM 54. Capacitor 116 is kept charged by battery 46 through diode 117 when the device 10 is operating and, at other times, by battery 52 through diode 118.

After the CPU 56 has been powered up, or awakened, the CPU 56 makes a scan of row lines 121-128 to the keyboard 61 by sequentially forcing each line 121-128 low and then polling the other lines to find out which button 25, such as button 25', has been pressed. As a result of pushbutton 25' being pressed, a low impressed upon row line 121 will cause a low on column line 128 and that will result in the row line 128 being low.

The CPU 56 first sets row line 121 low and then begins scanning, starting with the row line 122, for another row line having a low voltage thereon and by finding the row line with the low voltage, in the above example, row line 128, the CPU 56 knows that button 25' at the intersection of row line 128 and column line 138 has been depressed.

If the CPU 56 had not found a low on another row line, such as row line 128, after having set line row 121 low, line 121 is returned to its previous value and row line 122 is then set low, and the scan continued until a low row line is found to identify which button 25 has been depressed.

When the CPU 56 determines which pushbutton 25 has been depressed the CPU 56 will then know what function is to be carried out.

It is to be noted that the keyboard circuit 62 is uniquely designed to include only eight (8) row lines 121-128 and eight (8) column lines 131-138 each having a resistor 64 and a current directing diode 114 therein and each being arranged across the row lines 131-138 so that 56 switch positions are provided with only eight (8) lines.

All memory cycles exercised must involve the latch 58 because the CPU 56 has its data bus multiplexed with the lower 8 bits of the address bus on lines 141-148.

Coming out of the CPU 56 to the latch 58, is a group of nine (9) lines 108 and 141-148. One of the lines, line 108, carries the ALE signal. The eight (8) lines 141-148 between the latch 58 and the CPU 56 are the multiplexed data and address bus lines. These lines comprise the lower 8 bits of the address bus. A group of multiplex lines are identified with reference numeral 150. Five more lines 151-155 comprise the upper five bits of the address bus, making a total of 13 bits of address.

An inverting OR gate 156 having an output line 158 and two input lines 160 and 162 together with ground line 164 are coupled between the CPU 56 and the RAM 54. The line 158 defines an output enable for the RAM 54.

Accordingly, when the CPU 56 wants to do a read, it actuates either of the two input lines 160 or 162 going into the OR gate 156. Line 160 is a PSEN line for telling the RAM 54 that it is to be enabled to receive data and line 162 is a Read Output line to tell the RAM 54 that the CPU is going to read the information stored in the RAM 54. With OR gate 156 the two lines and functions are combined on one line 158. In other words, the CPU 56 tells the RAM 54, through the OR gate 156, that it wants to read information stored in the RAM 54.

The circuitry 42 also includes the write protect circuit 78 which has the double duty of being a low battery indicating circuit. The circuit 78 includes a resistor 170, a transistor 171, two resistors 172, 173 and a Zener diode 174 connected as shown.

A write enable line 176 is connected between the transistor 171 and the CPU 56.

When the CPU 56 desires to write information into the RAM

54, it places the address on the address bus lines 141-148 and 151-155, strokes the lower 8 bits of the address bus on lines 141-148 into the latch 58 using ALE line 108, places the information on the data bus lines 141-148, and then brings the write enable line 176 low.

When the write enable line 176 goes low, unless the transistor 171 is turned on by virtue of the battery voltage being more than 4.3 volts, a line 178 going into the RAM 54 at the collector 180 of the transistor 171 (which is the "write enable" for the RAM 54), is prevented from going low, maintaining the RAM "Write Protected". This condition also is created when the battery 48 is low. The "write enable" line 176 also functions as a low battery detector because, during execution of the program, a check is made to see whether writing to the RAM 54 is enabled. If it is not, this shows that the batteries are weak and a signal is sent to the user by flashing the red LED, of LED 4, 5 times.

Note that LED 4 includes a red LED and a green LED incorporated into one package so that when both LEDs are turned on, a yellow light is emitted, making LED 4 a tricolor LED. Such tricolor LED 4 enables the device 10 easily to communicate to the user by way of the color, number and sequence of light blinks.

A clock circuit 182 including a crystal resonator is coupled to the CPU 56.

Three serial ports 1-3 are coupled to the CPU 56 and include port 1 which is a transmitting port, port 2 which is ground and port 3 which is a receiving port. Serial port 1 is connected to row line 121 so that data can be serially transmitted in the form of highs and lows by CPU 56 from the RAM 54 over row line 121 to serial port 1. Incoming data is received serially at serial port 3 and conveyed to input port 112, when it is desired to update the code data and/or instructions in the RAM 54.

The three infrared-emitting LEDs, LED 1, LED 2, and LED 3 are connected in the circuitry 42 as shown.

The reset circuit 74 includes two resistors and a capacitor connected as shown and coupled between line VCC and a reset line 184.

As will be described in greater detail in connection with the description of FIGS. 11-14, the manufacturer of the device 10, using known methods or the method described herein with reference to FIGS. 12A-13C, will decipher the infrared codes for operating various pieces of equipment, such as a TV, a VCR, a CD, a Cable Converter or other equipment which is controlled by a remote infrared transmitting device.

After the infrared code is deciphered, the code data therefor and instructions for generating such code (see the flow chart in FIG. 14) are stored in a programming computer 200 (FIG. 10) and the device 10 is programmed as explained below.

It is to be noted that the circuitry 42 has no ROM and all instruction codes and code data are loaded directly into the RAM 54. This allows for infinite upgradability in the field via the serial ports 1, 2, 3.

FIG. 10 is a perspective view of a programming computer 200 coupled by a cable 202 to a special connector 204 which is adapted to be received over the CPU 56 in the operating circuitry 42 for disabling the CPU 56 and for enabling the RAM 54 to be programmed by the programming computer 200. Essentially this is done by tri-stating the CPU 56 and placing the RAM 54 into the address space of the computer 200 which writes initial instruction code including code for the serial port driver, and subsequently serially, other instruction code and code data into the RAM 54. For this purpose the programming computer 200 has instruction codes such as serial port driver instructions and data relative to the infrared codes for operating a multiple number of electronic apparatus, such as televisions, VCR's, etc stored therein. Signals from the programming computer 200, via the connector 204 cause the inputs and outputs 60 of the CPU to be disabled so that instruction codes and data can be input into the RAM 54 quickly and efficiently from the programming computer after the operating circuitry 42 is mounted in the control device 10.

Later, after the device 10 has been in use for some time and the RAM 54 needs to be updated with instruction codes and data relative to new equipment on the market, the control device 10 can be simply and easily updated at a service outlet having an ordinary personal computer with a serial port using

INS C4

~ C4

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a novel nine pin to three pin, 9 volt to 5 volt, signal coupling and converting assembly 206 (FIG. 20). The updating can be done by adding to the data in RAM 54 or by rewriting (writing over) the data in RAM 54. The assembly 206 is described in greater detail hereinafter in connection with the description of FIGS. 20-22.

The infrared codes to be learned include a wide range of different codes for operating different electrical apparatus manufactured by the same or different manufacturers. In FIG. 11, which is identical to FIG. 1 in US Patent No. 4,623,887, there are illustrated several modulation schemes for infrared codes. FIGS. 11a-11g illustrate different types of gated carrier frequencies. Typical carrier frequencies for infrared remote transmitters are 20 Khz to 45 Khz, with the majority being at 38 Khz and 40 Khz. The gating schemes illustrated include both fixed and variable bit periods, non-return to zero (NRZ), variable burst widths, single/double burst modulation schemes, and a final catch-all category called random because there is no readily distinguishable pattern of ones and zeros.

In addition to these schemes, there is also a transmitter which puts out a different continuous frequency (CW) for each key as represented in FIG. 11h.

Finally, several new types of transmitters do not use a carrier frequency at all but instead send a stream of pulses where the data is encoded in the spaces between the infrared pulses as shown in FIG. 11i.

Data modulation schemes for most transmitters have a higher level of data organization which may be called a keyboard encoding scheme which causes different data to be sent depending upon the transmitter and the key pressed. This will be described in greater detail hereinafter in connection with FIGS. 15-19.

The code data for the infrared codes may be obtained from vendor information sheets and specifications, can be determined using the methods disclosed in U.S. Patents Nos. 4,623,887 and 4,626,848, or by the method disclosed herein.

In the method for learning or acquiring code data for infrared codes disclosed herein, no counting of pulses is

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carried out. Instead the method involves the following steps:

(a) receiving a transmission of a train of pulses from a remote control transmitter;

(b) recording the point-in-time of an edge of each pulse in a train of the pulses;

(c) transforming the recorded point-in-time data into a list of instructions for generating a replica of the train of pulses;

(d) timing the duration of a train of the pulses;

(e) timing the period between trains of pulses;

(f) associating a function key of the universal remote control device 10 with the time duration of the train of pulses and the list of instructions for generating a replica of the train of pulses;

(g) determining whether or not repetitions of the transmission of train of pulses is present;

(h) ignoring repetitions of the train of pulses;

(i) noting that repetitions are present; and

(j) storing for use in a universal remote control device, the information acquired in steps (c), (d), (e), (f) and (i).

Typically, each pulse has a fixed duty cycle and in carrying out the above described method it can be assumed that each pulse has a fixed duty cycle.

The manual and computer steps followed in practicing this method are set forth in Figs. 12A and 13A.

FIG. 12A is a flow chart of the first part of this method for capturing an IR code and FIG. 12B is a graph of a pulse train comprising a portion of the code.

There is shown in FIG. 12B, adjacent the transforming step in FIG. 12A, a graph of the waveform of the captured, and later recreated, infrared codes, showing when the infrared signal is on and when it is off. When the CPU 56 executes the instructions set forth below the waveform in FIG. 12B, infrared-emitting LEDs, LED 1, LED 2, and LED 3 are turned on when the instruction IR-ON is executed and turned off when the instruction IR-OFF is executed. No operation is performed when the instruction NOP is called for. In this way the infrared codes are transformed into a bit stream of 0's and 1's.

FIG. 13A is a flow chart of a second part of the method

for capturing an IR code.

FIG. 13B shows the IR infrared bitstream and an envelope of the filtered bitstream.

FIG. 13C shows the filtered waveform that is analyzed for repetition. The.repetition scheme and a pointer to indicate, upon regeneration of the infrared code, which key will generate that code are stored in a memory for later inputting into the RAM 54.

FIG. 14 is a flow chart of a sequence of eleven (11) steps that a user initiates to generate a specific IR code for performing a specific function, namely, for generating a captured IR code stored in the remote control device 10. The code data is stored in the RAM 54 of the remote control device 10 and the sequence of steps the circuitry 42 goes through to take the code data in the RAM 54 and generate the infrared code therefrom is set forth in this Figure.

FIG. 15 is a plan view of the keyboard 61 and shows the different keys or pushbuttons 25 of the control device 10 extending through the base panel 14 of upper housing member 12 and the face panel 18 where the label or identification for each pushbutton or key 25 is shown. The light emitting diode, LED 4, is also indicated.

FIG. 16 is a flowchart of the steps initiated by a user of the device 10 in a step and set procedure for searching for code data in the device 10 for the infrared code needed to operate the user's specific apparatus and to set the device 10 for that code data.

FIG. 17 is a flow chart of the steps initiated by a user in carrying out a direct-entry/quick-set procedure for matching the user's equipment or apparatus to the device 10.

The steps of this procedure include:

STEP 1. Look up make and model number of the controlled apparatus in a table provided to the user in an instruction booklet.

STEP 2. Model number is found and matched with a series of 8 "R"s and "G"s.

STEP 3. Here the operator presses the desired mode button or key.

STEP 4. Press DO, Enter, Recall. This tells the device

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10 to do a Quick-Match.

STEP 5. Next enter the sequence of eight red and green blinks found in TABLE I (set forth below) provided in the instruction booklet. This is done by pressing Channel Down for "R" and Channel Up for "G".

STEP 6. Here a determination is made if a key other than Channel Up or Channel Down. was pressed.

STEP 7. The device 10 tricolor LED 4 will flash red or green depending on what button is pushed.

STEP 8. When all eight codes are entered, the program goes on to STEP 9.

STEP 9. Here a check is made to see if the blink code is in the table in the RAM 54 of the remote control device 10.

STEP 10. If the device 10 has successfully Quick-Matched to the controlled apparatus, the LED 4 will flash green twice.

STEP 11. If it did not match, it will flash yellow indicating that codes for that controlled apparatus are not loaded into the RAM 54.

FIG. 18A is a flow chart of the steps for setting a "DO" command macro, for achieving a function that normally requires the actuation of several buttons, by programming one particular button to perform the functions required of the several buttons to achieve a specific function.

FIG. 18B is a flowchart of the simple two pushbutton steps required for executing the "DO" macro command created in FIG. 18A.

FIG. 19A sets forth the steps initiated by a user to determine the various blink codes which identify what equipment or apparatus the remote control device 10 is set for.

FIG. 19B illustrates a sample blinking grid of eight red and green blinks which will be presented to the user. Once a particular pattern of eight red or green blinks has taken place, the user of the device 10 will look up the blink pattern or code in TABLE I included in a user handbook. This table shows the user which pushbuttons 25 labelled A-H are associated with additional functions stored which may be stored in the RAM 54. Additional functions beyond the eight supported by pushbuttons AH are performed by pushing "DO", and then the two-digit sequence shown in TABLE I.

The instructions for using the control device 10 which are supplied to a purchaser thereof in an instruction booklet are set forth below.

Matching the Device to Your Equipment

The device 10 can control most remote controlled TV's, VCR's, cable converters, and CD players, but it needs the user's input to match it to your particular equipment. The easiest way to do this is to STEP-and-SET your device 10. You will only need to do this once for each different type of device you have.

1. To STEP-and-SET your device 10, first press DO, Enter.

2. Press one of the following equipment selection buttons to tell the device 10 what kind of equipment to match.

VCR1	Cable	TV
VCR2	CD	

3. Aim the device 10 at the equipment and try various function buttons to see if the equipment responds correctly. Make sure you are reasonably close to the equipment and that

T220P

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nothing is blocking the path. The light (LED 4) at the top of the device 10 will shine green whenever it is sending an infrared code, or it will not light at all if it does not send a code for a particular button.

4. If your equipment did not respond correctly or did not respond at all, press D01 to change the device 10 so that it will send the next set of infrared codes in its library, or press D02 to change it so it will send the previous set of codes.

5. When you use D01 or D02 to step the device 10 setting forward or back, its light will blink yellow each time you step it. The settings step around in a circle. Whenever you get back to the setting where you started the device 10 light will blink red to notify you.

6. Use D01 and D02 to step through the sets of codes and keep trying out functions until your equipment responds correctly. The device 10 will then be set to send the proper infrared codes for operating your particular equipment.

7. When you are satisfied that the device 10 is properly matched, press DO, or any of the equipment selection buttons to restore the D01 and D02 buttons to their normal functions.

8. If your equipment is responding to your device 10 but some buttons are causing the wrong thing to happen, keep going. Some equipment responds to the infrared codes of other brands of equipment.

9. If you try out all of the codes in the device 10 library and your equipment still does not respond, it is probably because the code data for generating the infrared codes for operating your equipment is not in the library of your control device 10. The Keyboard 61

Take a look at the keyboard. There are four groups of buttons:

1. Equipment Selection Buttons tell the device 10 which equipment is to be controlled:

T230X

VCR1	Cable	TV
VCR2	CD	

2. Basic Function Buttons are used to control your TV, VCR, CABLE and CD. They work in much the same way as in older remotes which typically have the following buttons.

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				Power
Rec.	TV.VCR		Stop	Pause
Rewind	Reverse		Play	Fast Fwd
				Mute
1	2	3		Vol.Up
4	5	6		Vol.Dn
7	8	9		
	0		EnterChan.Up	
			Recall	Chan.Dn

3. Extended Function Buttons perform any special functions your equipment may have, such as color control, picture control,tint control, etc. These buttons are identified with the following alphabet letters.

A	C	E	G
B	D	F	H

4. DO Buttons are used to perform very powerful DO Commands which are explained below.

Special Features

Besides the basic functions such as channel up/down and volume up/down that most TV remote controls have, there could be special features as well, for example:

Color up/down.

Picture up/down.

Tint up/down.

Sleep.

Your VCR's remote control can also have special features such as:

Frame advance

Channel up/down

Your cable converter remote control can also have additional features such as:

Channel recall

Delete

Your CD player remote control can have special features such as:

Repeat

Track programming

Once you have matched the device 10 to your TV, VCR, Cable Converter and CD player, all functions that were controlled by

TABLE I

DEVICE BLINK CODES AND SPECIAL FEATURE BUTTONS

TELEVISION SETS.

Blink Code	A	B	C	D	E	F	G	H
RRRR RRRR	Display	MTS	Pict +	Pict -	Sleep	TV/Video	Ant	Tone
	25-Col Up	26-Col Dn	27-Brt Up	28-Brt Dn	29-Hue Up	30-Hue Dn	31-Mtx	32-Reset
RRRG RRRG	Screen Dn	Sp Phne/ Prnt Ctl	AutoOn/ Data Ent	AutoOff/ Data Clr	Ant	Stereo		
RRRG RGRG	Add	Clear						
RRRG GRRR	A Ch	Hi Fi						
RRRG GRGR	Ant/Aux	Time/Ch	Program	TV/VCR				
RRRG GGGR	Ant/Aux	Time/Ch						
RRRG GGGG	Pwr On	Pwr Off	Display	Ant				
GRRG RRRG	Aux	Last Ch	Timer					
GRRG RRGG	Fine Up	Fine Dn	L Ctl	R Ctl	OBC	Func	Review	BiLing
	25-Stereo	26-TimeFa	27-Timer	28-TimeSt	29-TV/AV			
GRRG RGRR	Fine Up	Fine Dn	L Ctl	R Ctl	OBC	Func	Review	BiLing
	25-Stereo	26-TimeFa	27-Timer	28-TimeSt	29-TV/AV			
GRRG RGGR	Tint R	Tint L	Color R	Color L	Contr R	Contr L	Timer	Stereo
	24-SAP	25-Reset	26-Q/V	27-EXP	28-Disp	29-Mono	30-Lock	31-TV
	32-Ext 1	33-Ext 2	34-Ant					
GRRG GRRG	TV/Video	Time						
GRRG GRGR	TV/Video	Wide	Lvl Up	Lvl Dn	Memory	Func	MTC	Stereo
	25-Timer	26-100	27-BiLing					
GRRG GRGG	10	11	12	13				
GRRG GGRR	RF12	Ch Rtn	Str SAP	Mono	Timer	T Set	TV/CATV	TV/Vid
	26-100	27-Audio	28-CCC1	29-CCC2	30-CCC3	31-CCC4	32-ContDn	33-ContUp
	34-Pict	35-Reset						
GRGG RRRR	Sleep	Review						
GRGG RRRG	K	L						
GRGG RRGR	SAP	Sleep	TV/Video					
GRGG RRGG	Program	Q Rev	SAP	Sleep	TV/Video	Add	Delete	
GRGG RGRG	Sleep	St/SAP	TV/Video					
GRGG RGGR	11	12	13	14	15	16		
GRGG RGGG	K	L						
GRGG GRRR	K	L						

TABLE I is set forth below:

19a
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TABLE I
(continued)

VIDEO CASSETTE RECORDERS

Blink Code	A	B	C	D	E	F	G	H
RRRR RRRR	Nse Cncl							
RRGR RRRG	Ant							
RRGR RRGR	Ant							
RRGR RRGG	Frm Adv	Slow	Slow Up	Slow Dn	Srch Fwd	Srch Rev		
RRGR RGRR	A	B	C	D	E	F	Slow	
RRGR GGGR	Slow							
RRGR RGGR	Slow +	Slow -	Eject	CM Skip	Program	Input	Mode	AM/PM
	28=Shift	29=Reset	30=Mem/PS	31=SR				
RRGR RGGG	Forward	FlshBack	Ant	Vol +	Vol -	Reverse	Sp Phne	PC
RRGR GRRR	Ant/Aux							
RRGR GRRG	11	12	13	14	15	16		
RRGR GRGR	Frm Adv	Memory	Reset	Chg Time				
RRGR GGRR	Pwr On	Pwr Off						
RRGR GGGG	Slow	Slow Up	Slow Dn	Set Up	Set Dn	Timer	Clear	Display
	29=Frame 37=Clock	30=Memory 38=APS	31=Prog 39=100	32=Qtr	33=QtrStr	34=Quick	35=Remain	36=Rst
GGRG RRRR	K	L						
GGRG RRRG	CFM	Slow						
GGRG RRGR	Slow	OSP	Shift L	Shift R	Slow Dn	Slow Up	St +	St -
	28=Timer							
GGRG RRGG	11	12	13	14	15	16	Slow	
GGRG RGRR	Slow Dn	Slow Up	Slow					

CABLE CONVERTERS

Blink Code	A	B	C	D	E	F	G	H
RRRR RRGR	A/B	Add	Delete	Set	Lock	Last Ch		
RRRR RRGG	A	B	Event(*)	#	Arrow Up	Arrow Dn	AP	Delete
	25=F	26=K	27=Learn	28=PGM	29=TCP	30=Enter		
RRRR RGRR	Skew L	Skew R	Audio	SAT	Ant East	Ant West		
RRRR RGRG	Plus	Minus	Dot	Box	Str	Clear	Time	Auth
	22=C/R	23=#						
RRRR RGGR	Prog	Auth						
RRRR RGGG	Auth							
RRRR GRRR	Auth	Prog						
RRRR GRRG	Plus	Minus	Rcp	*	M1	M2	M3	M4
RRRR GRGR	A-B	Dot 1	Dot 2	#	Am	Dm	F	
RRRR GRGG	Arrow Up	Arrow Dn						

COMPACT DISK PLAYERS

Blink Code	A	B	C	D	E	F	G	H
RRRR RRRR	CD Fwd	CD BckUp						
GRRG GRGG	Fwd Indx	Rev Indx	Repeat	Memory				

* For numbered functions, press "10" then the two-digit number.

your old remote control devices can now be controlled by the device 10. You may even notice some extra features that weren't controlled by your old remote.

Since the device 10 can control such a wide range of equipment, there is not enough room on it for buttons for every possible feature of every remote control. Instead, there are eight extended function buttons at the bottom labelled A through H. To find out what these eight buttons control for your particular TV, VCR, cable converter and CD player:

1. Get your pen and paper ready.

2. Press DO and then the button (TV VCR1 VCR2 Cable CD) of the device you want to know the special features of.

3. The device 10 will blink "red" or "green" 8 times. Every time it blinks "red" write down an "R". Every time it blinks "green" write down a "G". When you're finished writing it should look something like this:

R R R G R R R G

This is the "Blink Code" for your device. If you miss it the first time around, just press DO and the device button a second time.

4. Look at TABLE I and find the sequence of "R"s and "G"s that matches the one you wrote down.

5. Read the special features chart next to your Blink Code sequence which tells you what functions the A through H buttons control for your particular device.

For example, the feature chart of your TV might read:

A: Color Up	C: Picture Up
B: Color Down	D: Picture Down

6. To turn the color up in this example, you would press TV (of course if the device 10 is already set to control your TV, you do not have to press TV again but it doesn't hurt if you do so), then A.

7. To turn the color back down, you would just press B.

8. Write down what special functions are controlled by the A through H buttons on the handy stick-on labels enclosed with the control device 10.

9. After writing down the special functions on the labels, stick them on to the back of the control device 10 for quick and easy reference.

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If The Controlled Equipment Has More Than 8 Extended Functions

Usually, the eight A through H buttons are enough for most controlled equipment. If they're not, don't worry. If your controlled equipment has more than eight special features these too are controlled by the device 10.

Beyond the A through H function buttons, any additional functions are performed by pressing DO then two of the 0-9 number buttons. For example, your TV's feature chart may show additional functions like these:

25: SAP	26: Reset	27: Q/V
28: Display	29: Mono	30: Stereo

If you did have these features and wanted to use them, you would press DO and then the two-digit number for that feature. For example, you might:

Press D0,3.0. This would turn your TV's stereo broadcast feature on.

If you use a feature like this frequently you may want to assign it to a DO command, our next topic of discussion.

Setting DO Commands

DO Commands give you the power to perform a multitude of different functions with the push of just one or two buttons. DO Commands let you assign any of the following buttons to tell the device 10 to automatically perform a series of keystrokes you use often:

		D01	D02
Rec	TV.VCR	Stop	Pause
Rewind	Reverse	Play	Fast Fwd.
			Mute
			Vol. Up
			Vol. Dn
		Enter	Chan. Up
			Chan. Dn
A	C	E	G
B	D	F	H

To tell the device 10 to do what you want, you must teach it. As an example, you can teach the device 10 to turn your whole system on and set the TV to channel 4 by doing the following:

1. Press DO, Recall. This tells the device 10 that you

want to teach it something to do.

2. Next, you must assign a button 25 you will use to DO whatever you teach it. You can use any of the device 10's buttons 25 set forth above. For example, let's use D01 at the top of the keyboard: Press D01.

3. Now, you must tell the device 10 what button sequence you would press to turn your whole system on and set the TV to channel 4.

4. Press TV Power.This tells the device 10 to turn your TV on.

5. Press 4, Enter (pressing Enter may not be required for your TV). This tells the device 10 to set your TV to channel 4.

6. Press VCR. Power. This tells the device 10 to turn your VCR on.

7. Press Cable, Power.This tells the device 10 to turn your cable converter on.

Now you have pressed all the buttons you want the device 10 to learn for this example.

8. Press DO, Recall. This tells the device 10 that you are finished teaching it and to remember what you have taught it.

Now the device 10 knows how to turn your TV, VCR, and cable converter on and set the TV to channel 4, just by pressing one button.

9. Aim the device 10 at your equipment and press D01. Make sure you keep the device 10 pointed at your equipment while the light is flashing.

Now that you know how DO Commands work, you can teach the device 10 to "DO" practically any sequence of keystrokes. Just remember to keep the following in mind:

To perform a DO Command, press DO then the button you assigned to remember the DO Command. However, if you assigned the D01 or D02 buttons to remember a DO Command, you do not have to press DO first, just press D01 or D02.

If the device 10 light (LED4) starts blinking green, yellow, red while you are trying to teach it, it is telling you that RAM 54 is full. The DO command you are teaching is automatically erased. You can teach the device 10 a shorter DO

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command, or erase some other DO command you have already taught the device 10 to obtain more memory space.

After the DO Command is finished, the last apparatus 10 selected within the DO Command will be the apparatus the device 10 will work with next.

Erasing a DO command

If you just want to change a DO Command, you do not have to erase it first - just set up the new DO Command in its place. However, to get rid of a DO Command without replacing it with a new one:

1. Press DO Recall.

2. Press the button you have assigned to the DO command that you want to erase. For example, to erase the DO command you taught the device 10 in the above example:

Press DO1.

3. Press DO, Recall again. The old DO Command is now erased.

QUICK-MATCHING To Your Equipment

There is a quicker way to match your equipment to the device 10 by Quick-Matching. Quick-Matching is a way to set the device 10 directly to match any controlled equipment in its library. Follow the steps below to do a Quick-Match:

1. Match the device 10 to your equipment using STEP-and-SET.

2. Press DO. then the desired device button (TV, VCR1, VCR2 or Cable. The device 10 light will blink red or green eight times.

3. Write down the sequence of red and green blinks. This is the "Blink Code" for the particular device.

4. Press DO Enter Recall. This tells the device 10 to do a Quick-Match.

5. Enter the correct sequence by pressing Ch Dn for "R" and Ch Up for "G". The device 10 light (LED 4) will flash "red" or "green" depending on what button you push. The Ch Dn and Ch Up buttons 25 are labelled with the correct color for each.

6. When the device 10 has successfully Quick-Matched your equipment it will automatically flash green twice. If it did not match, it will flash yellow. If it fails to Quick-Match,

it is probably because the requisite code data is not stored in the library in your device 10.

QUICK-MATCHING Between Controlled Equipment

One of the great benefits of Quick-Matching is that you can switch the device 10 functions between the remote controlled TVs, VCRs and cable converters you may own. This is done by using "Quick-Match" within a "DO command".

Let's suppose you have two TVs in your house and only one device 10. Here's how to switch between them:

1. Press DO Recall. the button you want to use to switch to your other TV set.

For example, press D02. This tells the device 10 that you want to teach it a DO Command.

2. Press DO Enter Recall. This tells the device 10 that you want to do a Quick-Match.

3. Enter the R and G blink sequence of the second TV you want to control by pressing Ch Dn for "R" and Ch Up for "G".

4. Press DO. Recall. This tells the device 10 that you are finished teaching it a "DO command".

Now, to set the device 10 to control your second TV, press D02. This tells the device 10 that you will be controlling your second TV.

To go back to controlling your first TV, simply teach device 10 another "DO command". Just repeat the steps above, except use a different button and the correct R and G sequence for your first TV.

The device 10 can easily be taught to control a whole houseful of infrared remote controlled equipment - just teach the device 10 a DO Command to QUICK-MATCH each additional piece of equipment.

In FIG. 20 is shown a unique signal coupling and converting assembly 206 which includes a connector assembly 207, a cable 208 and a special cover plate 210 for the battery compartment 45. The cover plate 210 has on the underside thereof three pins 212, 214 and 216 which are positioned to connect with the three serial ports 1, 2 and 3. The pins 212, 214 and 216 mounted to the cover plate 210 are connected by three wire conductors 224, 226 and 228 in cable 208 to connector assembly 207 which has conversion circuitry 230

therein. The connector assembly 207 has a nine pin array 250 of sockets 251-259 for receiving nine pins and the conversion circuitry 230 which enables one to use some of the nine sockets 250 of the connector assembly 207 for communication with the three pins 212, 214, 216 that are connected to the serial ports 1, 2 and 3 as shown in FIGS. 21 and 22.

FIGS. 21 and 22 are a schematic diagram of the conversion circuitry 230.

In FIG. 21 is shown circuit portion 230A. In this circuit portion, plus nine volts goes into pin 4 of connector DB-9 or pin 20 of connector DB-25 and minus 9 volts goes into pin 7 of DB-9 or pin 4 of connector DB-25, which are connected to the circuit portion 230A of the conversion circuitry 230. This provides a constant source of positive and negative voltage and is used as the power supply for the circuit. Note that two different types of personal computer host female connectors can be used, namely, female connector DB-9 or female connector DB-25 in the connector assembly 207.

Serial information is transmitted by the hand held control device 10 via line HTXD at serial port 1 and is level translated by the operating circuitry 42 from a range of from plus 5 volts to zero volts to a range of from minus 9 volts to plus 9 volts.

In this respect, when 0 volts is present at serial port 1, transistors Q1 and Q2 are turned on such that +9 volts is supplied from pin 4 of connector DB-9 or pin 20 of connector DB25 through transistor Q1 to pin 2 of connector DB-9 or pin 3 of connector DB-25.

Then, when +5 volts is present at serial port 1, the emitter-base of transistor Q2 is reverse biased, turning off transistor Q2 which turns off transistor Q1. As a result, the 9 volts at pin 7 of connector DB-9 or pin 4 of connector DB-25 is supplied through resistor 270 to pin 2 of connector DB-9 or pin 3 of connector DB-25.

The circuit portion 230B is shown in FIG. 22 and performs a receiving function for the control device 10. When pin 3 of connector DB-9 or pin 2 of connector DB-25 is at -9 volts, its normal resting state, then HTXD at serial port 3 is at 0 volts. When pin 3 of connector DB-9 or pin 2 of connector DB-25 goes

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to +9 volts, HTXD at serial port 3 goes to plus 5 volts. Pin 5 of connector DB-9 or pin 7 of connector DB-25 is directly connected to serial port 2 and always stays at ground.

In transmitting data to the control device 10, the programming computer supplies +9v or -9v to pin 3 of connector DB-9 or pin 2 of connector DB-25. When +9v is present on IBMTXD, 4.3 volts established by Zener diode 272 is passed through diode 274 to serial port 3.

When -9v is present on IBMTXD, the Zener diode 272 clamps to -0.6 volts resulting in conduction through transistor Q3 pulling serial port 3 to 0 volts.

The diode 274, the transistor Q3 and a resistor 276 connected as shown are provided to allow pressing a key 25 on keyboard 26 to "wake up" CPU 56 (actuate the wake up circuit 70) even though circuit portion 230B is connected to the control device 10.

An important feature of the universal remote control system of the present invention is the inclusion therein of a data transmission system which enables all types of data and particularly code data relating to codes for generating infrared signals for operating various control devices to be input into the memory, such as the RAM, of the universal remote control. With this capability, the user of the universal remote control can quickly and simply input data into the universal remote control, whether it had code operating data therein or not, to control a variety of controllable devices.

It is even possible that data can be input into the universal remote control which will enable the remote control to become a video game or perform any number of functions in addition to controlling controllable devices such a VCR or television set.

The data transmission systems are illustrated in FIGS. 23-26 and will now be described below with reference to those FIG.'s.

Referring now to FIG. 23 in greater detail, there is shown a data transmission system 300 which includes a conventional telephone jack 302, such as an RJ11 jack, which is connected to a telephone line and which has a cable 304 extending therefrom to a telephone 306. A handset 308 of the telephone is then

adapted to be attached to a listen-only acoustic coupler modem 310 which will pick up and convert acoustic telephone signals to digital signals for transmission to a universal remote control 312. In other words, once the user has accessed a code number such as a 900 number, has pressed a sequence of keys on the telephone and receives a signal over the telephone 306 that the telephone 306 is ready to communicate code data to him, he then places the handset 308 on the modem 310.

Then an RS232 connector 314 is connected to the modem 310 and a cable 316 extends therefrom to a three-prong jack 318 which is adapted to mate with and connect to three serial ports, which, in the universal remote 312, are located on the bottom edge of the remote control 312. It will also be noted that the remote control 312 has a visual display 320 which can be a liquid crystal display or other type of visual display whereby information regarding the data being input can be communicated to the user.

FIG. 24 illustrates a modified data transmission system 400 which includes a telephone jack 402 which is typically an RJ11 jack that connects to a telephone line and which has a cable 404 leading to a telephone 406. A handset 408 of the telephone 406 has a pick-up coil 410 connected thereto. The pick-up coil 410 then extends to a listen-only modem 412 which is connected by an RS232 serial port 414 to a cable 416 leading to a three-prong jack 418 that is connected to the bottom of a universal remote control 420 in the same manner as in FIG. 23.

In FIG. 25 there is illustrated still another data transmission system 500. In this system, a television 502 has a vertical blanking interval decoder 504 connected thereto whereby data that is stored on the vertical blanking interval as a raster scan is made across the television screen 506 of the television 502 is picked up by the decoder 507 and decoded. Then, this data is supplied via a cable 508 and a three-prong jack 510 and the serial ports in a universal remote control 512 to the memory of the remote control 512. With this data transmission system 500, data is obtained directly from the television set for inputting data into the memory of the universal remote control 512.

In FIG. 26 is illustrated a simplified data transmission

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system 600 which is based upon the use of a digital data telephone line or integrated services digital network (ISDN) whereby data can be input directly over the telephone line to the universal remote control 602.

In the data transmission system 600, the universal remote control 602 has a modem (not shown) therein which includes a direct access arrangement to enable communication via a cable 604 connected to a telephone jack 606 and to a three-prong jack 608 directly with a source of data that can be a large mainframe computer that is connected to the ISDN for transmitting data to the universal remote control 602.

From the foregoing description, it will be apparent that the universal remote control 10, the signal coupling and converting assembly 206, and the data transmission system 300, 400, 500 or 600 of the present invention have a number of advantages, some of which have been described above and others of which are inherent in the invention disclosed herein. For example:

1) With no ROM in the circuitry 42, the instruction codes and code data in the RAM 54 can be upgraded at any time via the serial ports 1, 2 and 3.

2) By loading the instruction codes and initial code directly into the RAM 54 by tri-stating the CPU 56, the circuitry 42 is enabled to function without a ROM.

3) The serial ports 1, 2 and 3 together with the signal coupling and converting assembly 206 and the data transmitting system 300, 400, 500 or 600 enable data to be input into the circuitry 42 from a telephone line or a television set, an RS-232 interface device and a three pin jack to the serial ports 1, 2 and 3.

4) The visible LED 4 providing red/green/yellow/off blink code provides a means for communicating to the user where the device 10 has "landed" after searching for codes to control a specific apparatus. The user can then look up in the instruction booklet what extended functions are available via the letter keys A-H or number keys, plus the DO key for that particular apparatus or equipment.

5) The write-protect circuit 78 prevents corruption of the operating program or data in the RAM 54 during transient states

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when the microprocessor is being turned on or turned off.

6) The multiplexing of the address and data lines between the RAM 54 and the CPU 56 enables scrambling of the instruction codes and the code data so that the memory image in the RAM 54 is encrypted.

7) The construction of the keyboard 61 enables one to have 56 keys which can be decoded using only 8 bidirectional input (and output) ports 63.

8) The keyboard 61 including the keyboard circuitry 62 plus the wakeup circuit 70 provides a system whereby pressing any key turns on power to the CPU 56.

9) The provision of three infrared LEDs 1, 2 and 3 with no current-limiting resistors enables the device 10 to use maximum energy to create the infrared control pulses with a minimum amount of energy wasted.

10) The DO keys together with the numeral and letter keys allow a number of DO functions to be performed with the device 10 by a user.

11) Any combination of products can be controlled with the universal remote control device 10.

12) The step-and-set method for locating the code data for generating the infrared code necessary to operate the user's equipment or for the user to learn that such code data is not present in the library in the RAM 54.

CLAIMS

I claim:

1. A universal remote control system including a universal remote control comprising input means for inputting commands, infrared signal output means for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to said input means and to said signal output means, a single, non-volatile, read-write memory coupled to said CPU and data coupling means including terminal means coupled to said CPU for enabling code data for a variety of devices to be controlled to be supplied from outside said remote control through said terminal means and said CPU to said memory to set up said remote control for controlling the devices to be controlled and a data transmission system for coupling a telephone line or a television set to said terminal means of said remote control.

2. The universal remote control system of claim 1 wherein said data-transmission system includes a serial port connector for connecting to said remote control, a cable connected to said serial port connector and means for coupling said connector to a telephone line or to a television set.

3. The universal remote control system of claim 2 wherein said coupling means includes a vertical blinking interval decoder connected to a television set and to said cable.

4. The universal remote control system of claim 2 wherein said remote control includes a direct access arrangement and said coupling means includes a telephone jack connected to the other end of said cable for ISDN data line transmission.

5. The universal remote control system of claim 2 wherein said data transmission system includes an RS232 serial port connector, a modem to which the RS232 serial port connector is connected to, and telephone line coupling means for coupling said modem to a telephone line.

6. The universal remote control system of claim 5 wherein said modem is a listen only modem.

7. The universal remote control system of claim 5 wherein said telephone line coupling means includes pick-up coil that couples to a handset of a telephone and is coupled by a line to said modem.

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8. The universal remote control system of claim 5 wherein said modem is an acoustic coupler modem which is adapted to receive therein a handset of a telephone and acoustically pick up the sound transmission from the handset.

5

Add A3

Add B1 C6

PRINT OF DRAWINGS
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New US Pat Appl
Universal Remote Control System
Atty Tom Vigil Ref 2313

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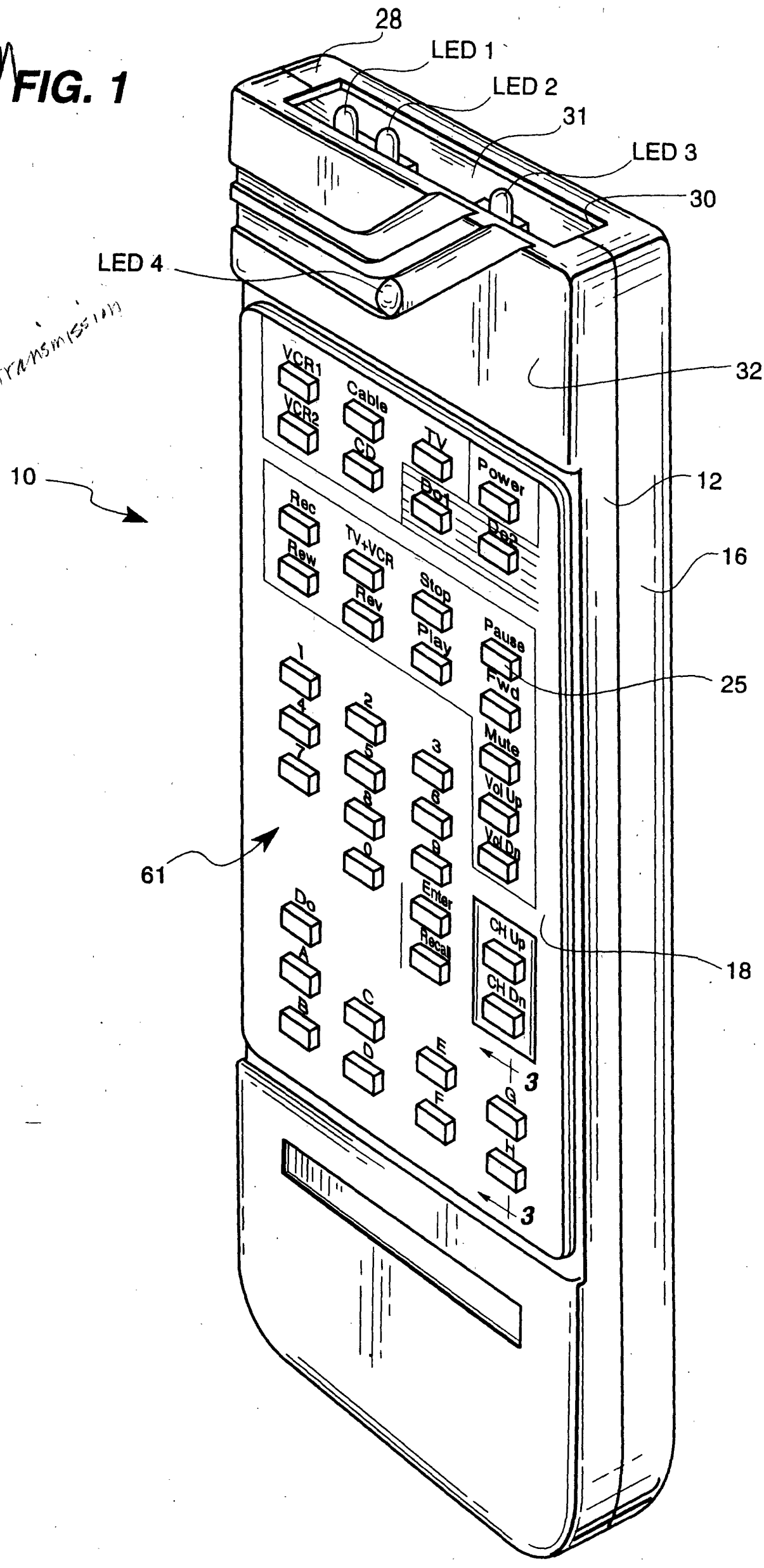
379/102
Art 2608
E. W. Chan

FIG. 1



Universal Remote Control, Inc.
Atty: Tom Hall 4-13-3

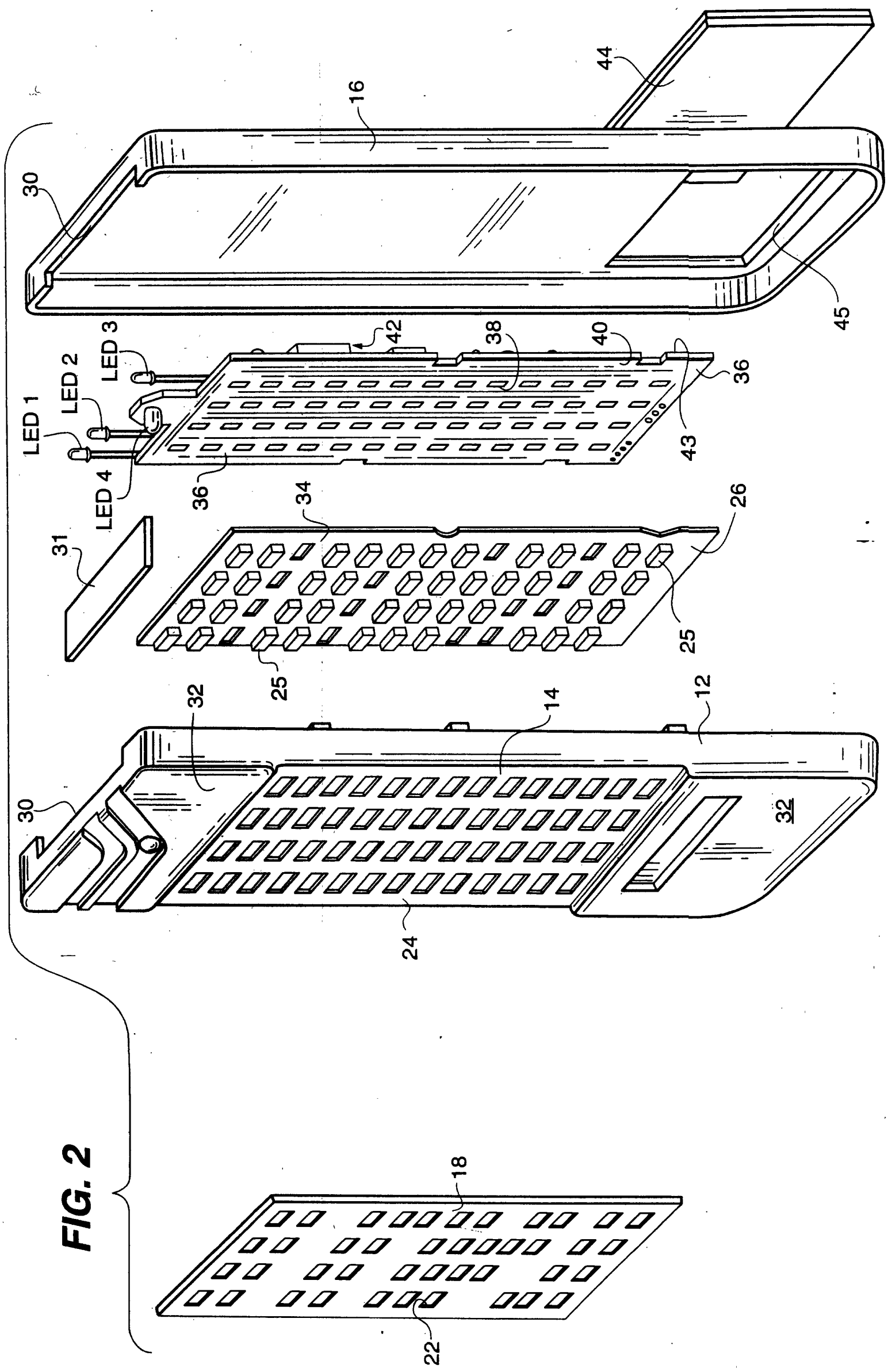


FIG. 2

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Universal Remote Control Sys
Atty: Tom Vigil (#93-3)

FIG. 3

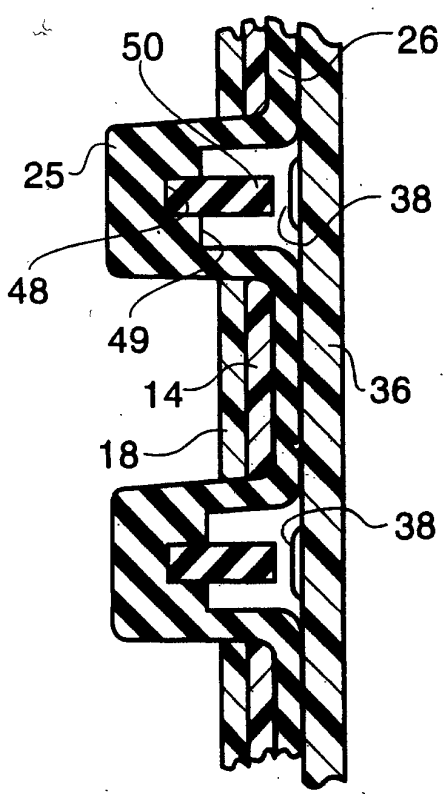


FIG. 4

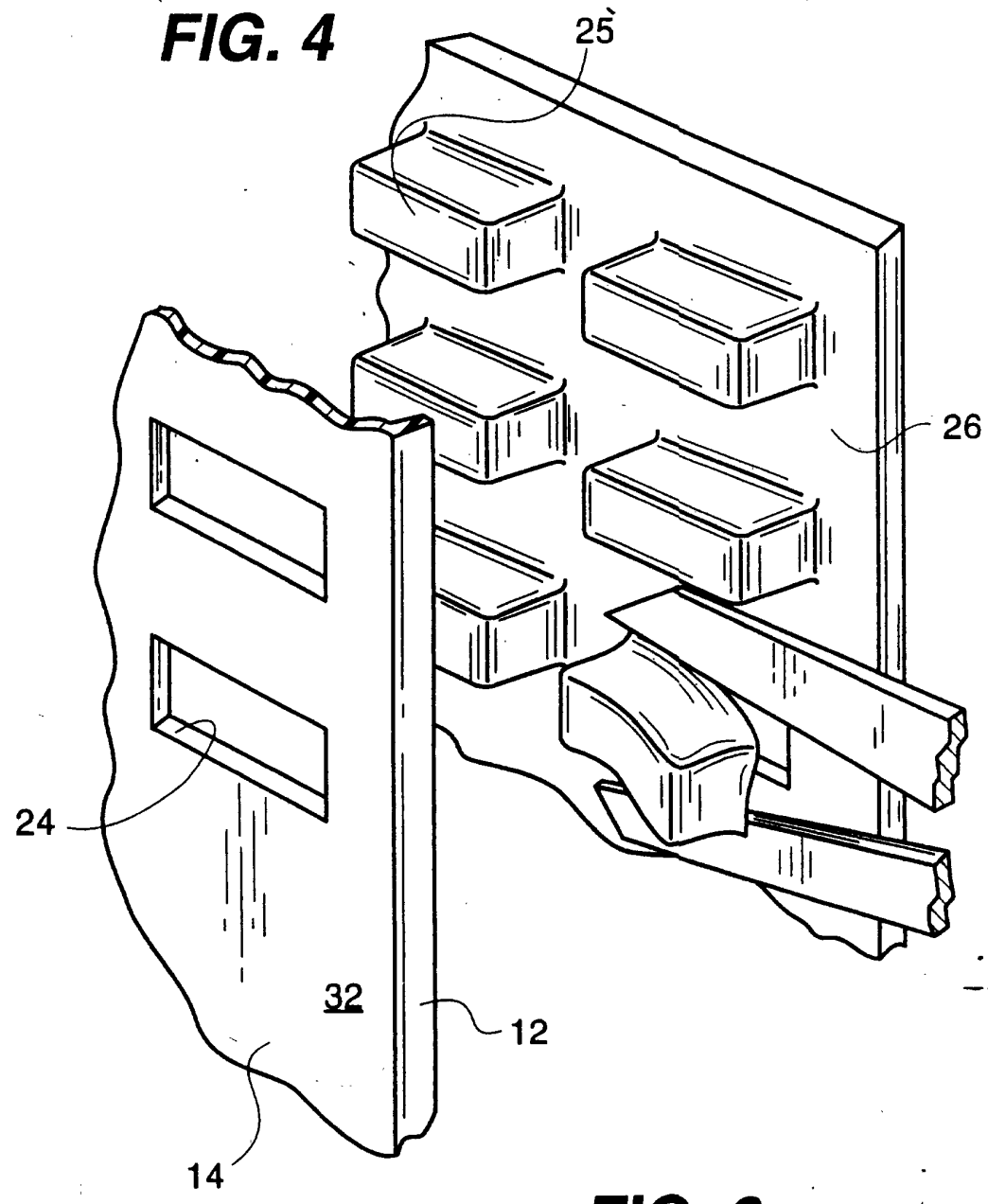


FIG. 5

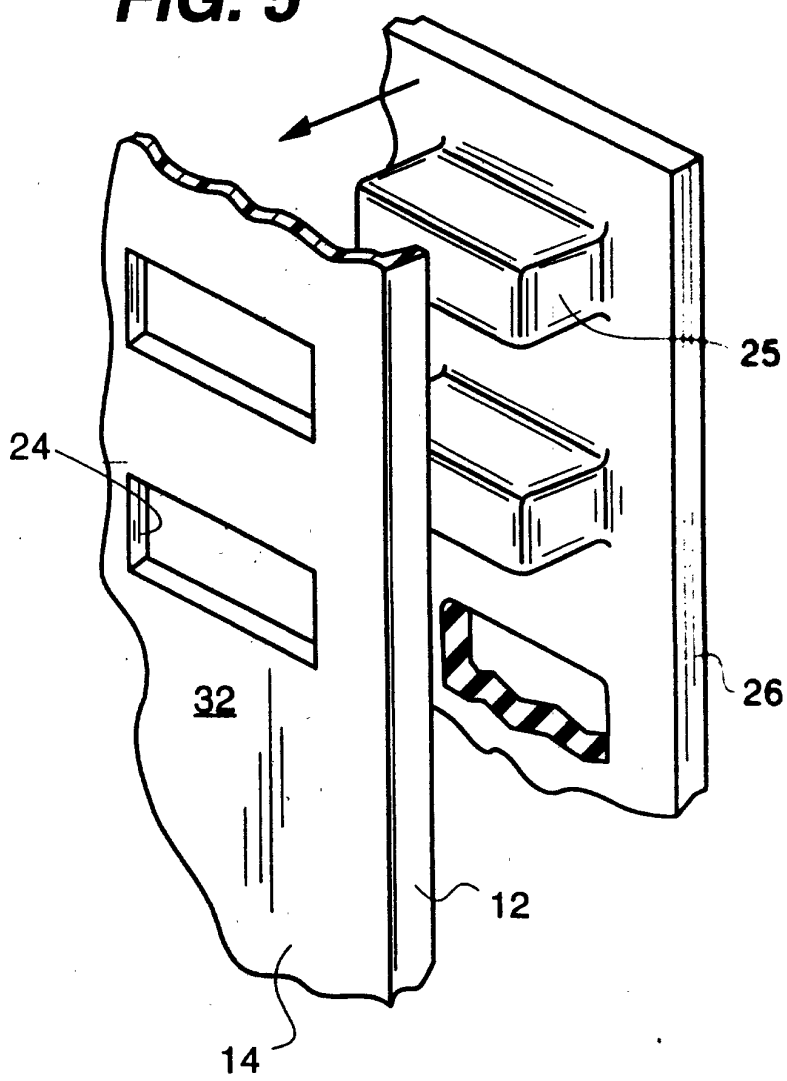


FIG. 6

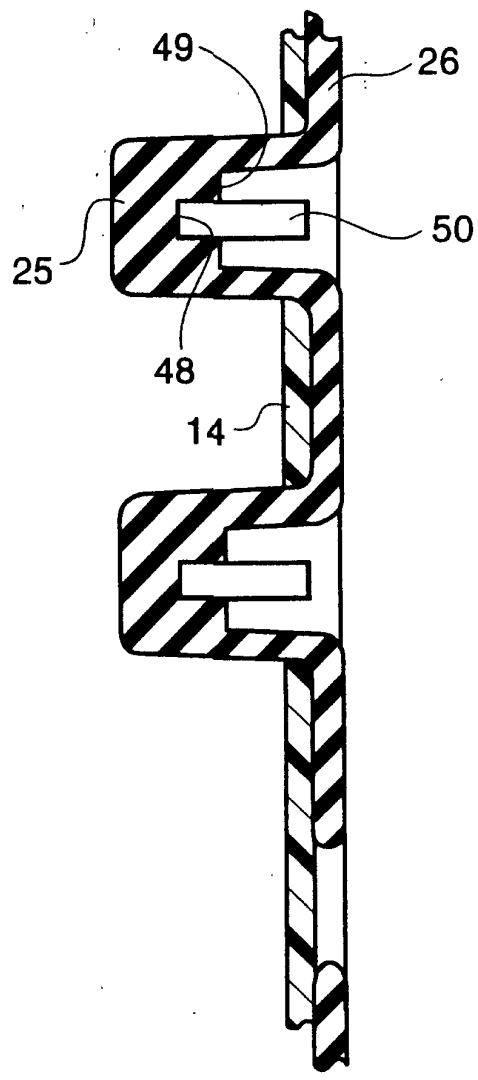
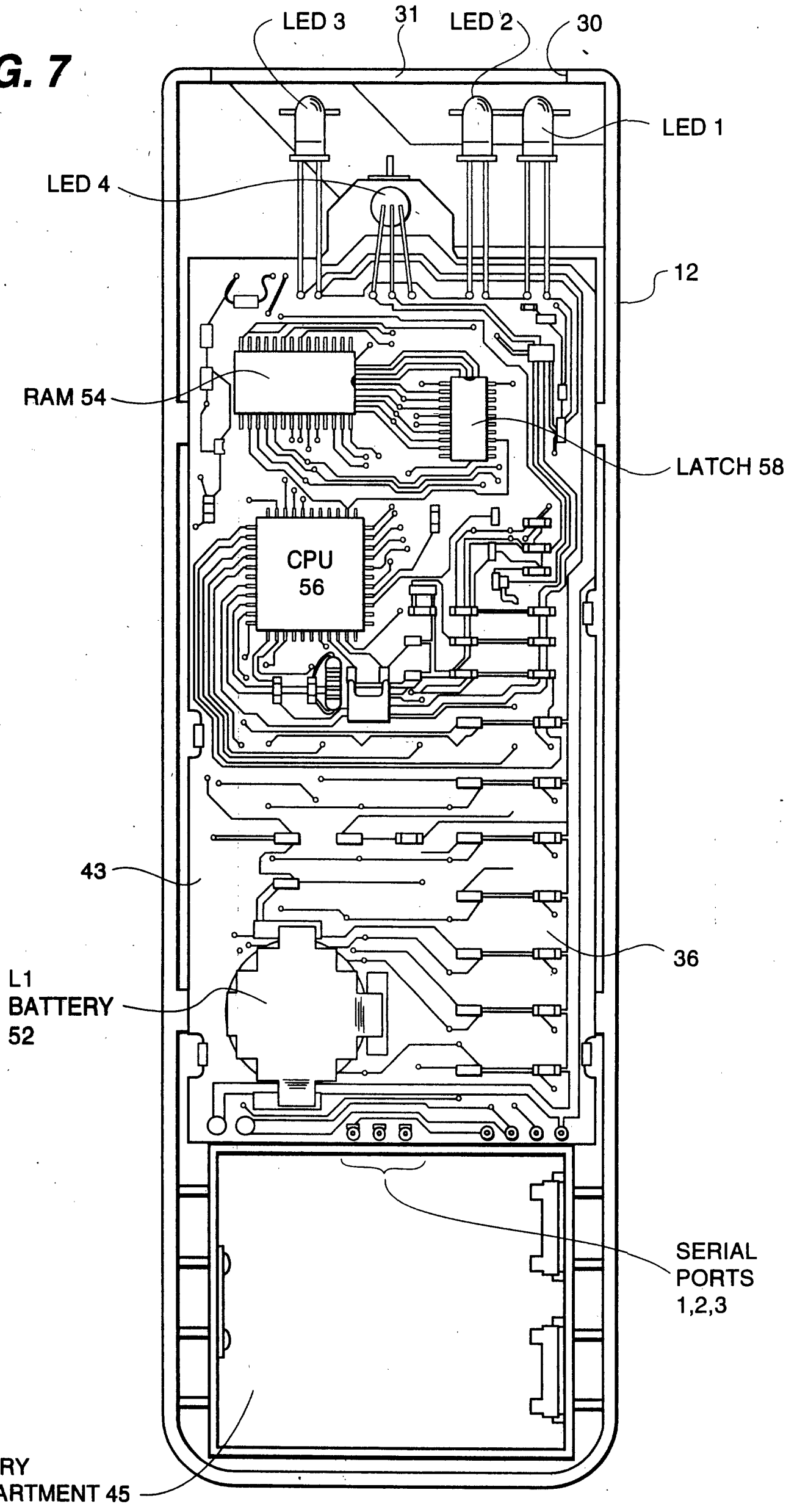


FIG. 7



Now U.S. Cont. App.
Universal Remote Control Sys.
Atty: Tom Lia # 13,143

FIG. 8

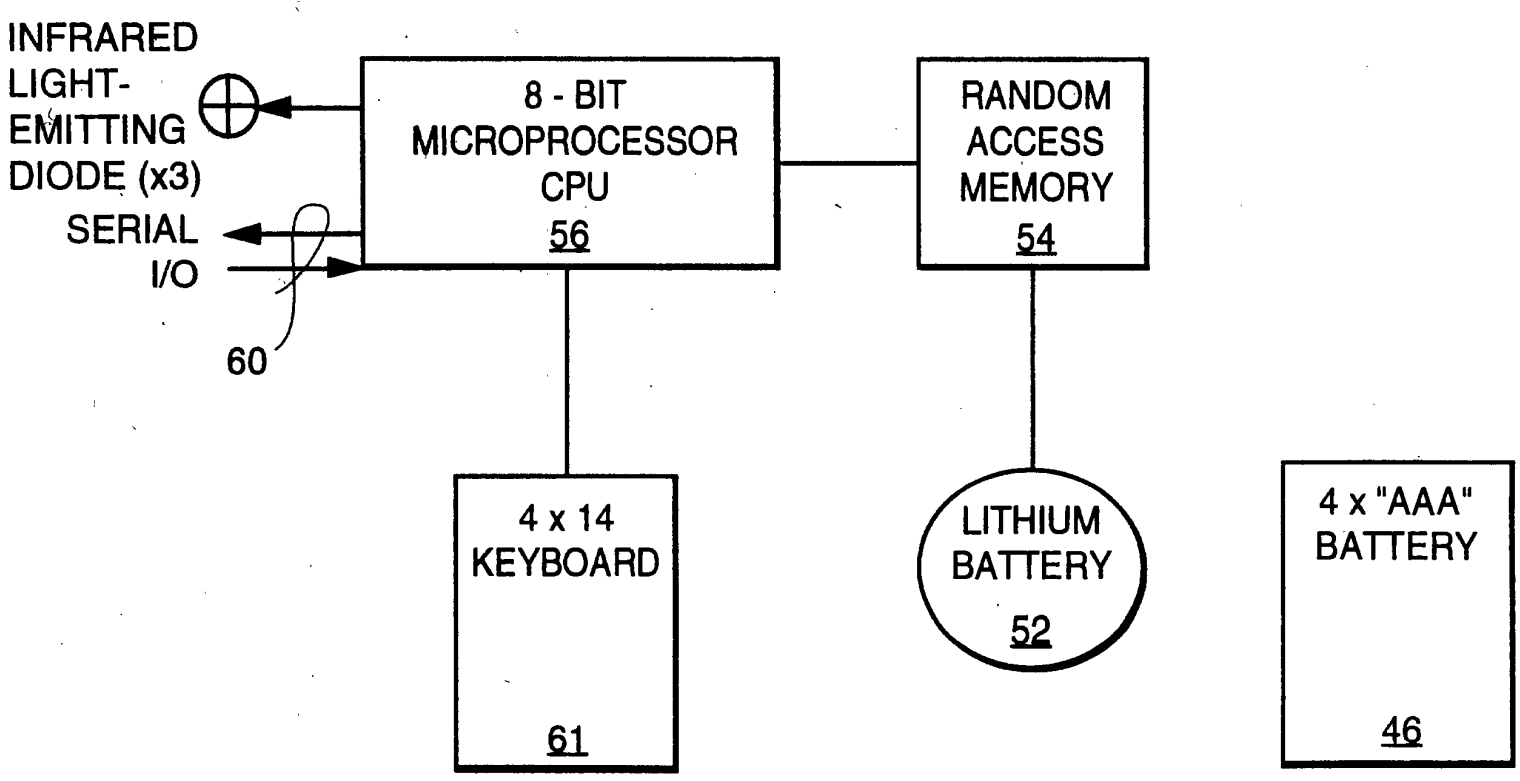
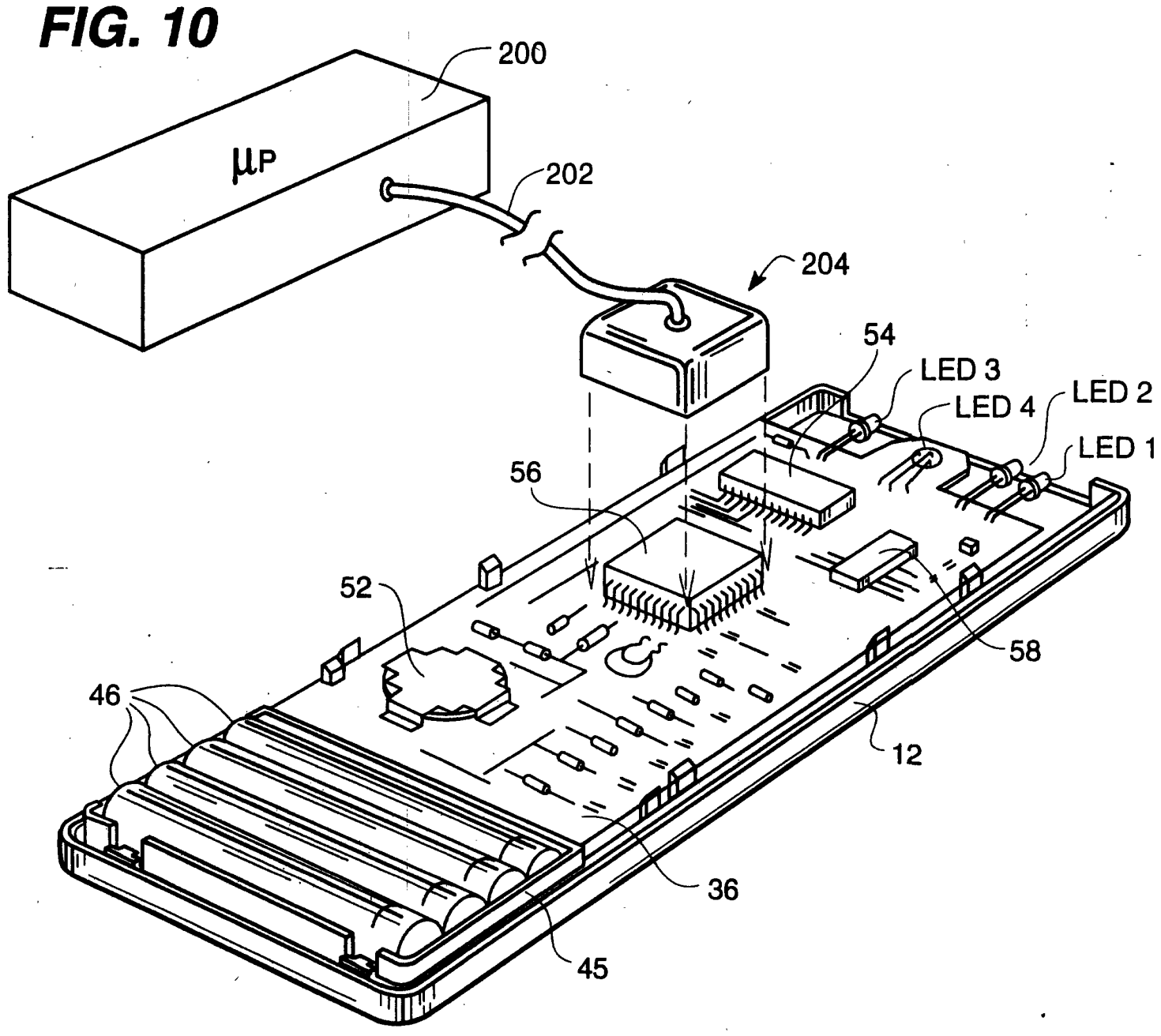


FIG. 10



New U.S. Cor - Appl
In re Issa Remote Control Sys.
Atty. Tom Vig. (#23-3)

FIG. 9A

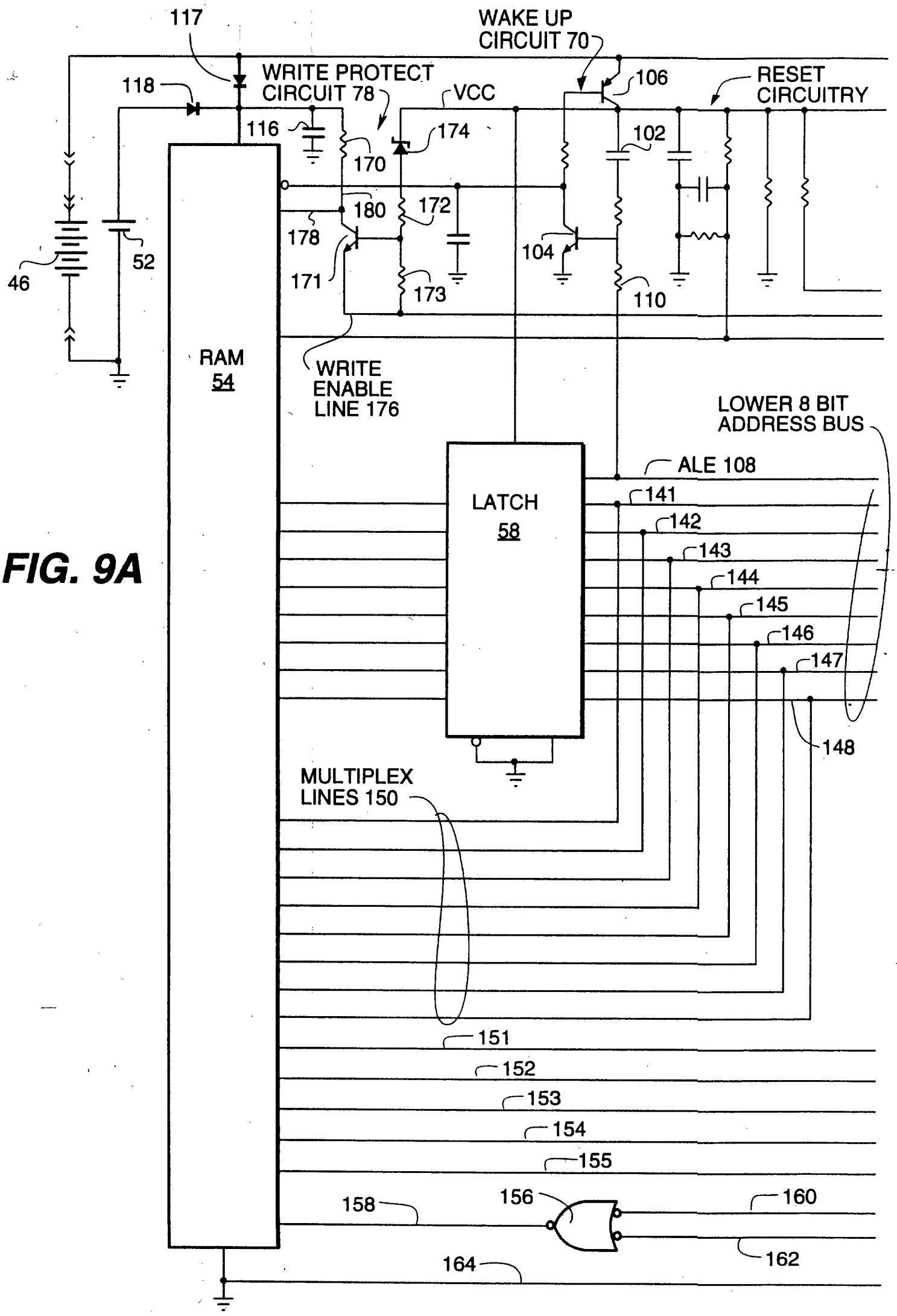
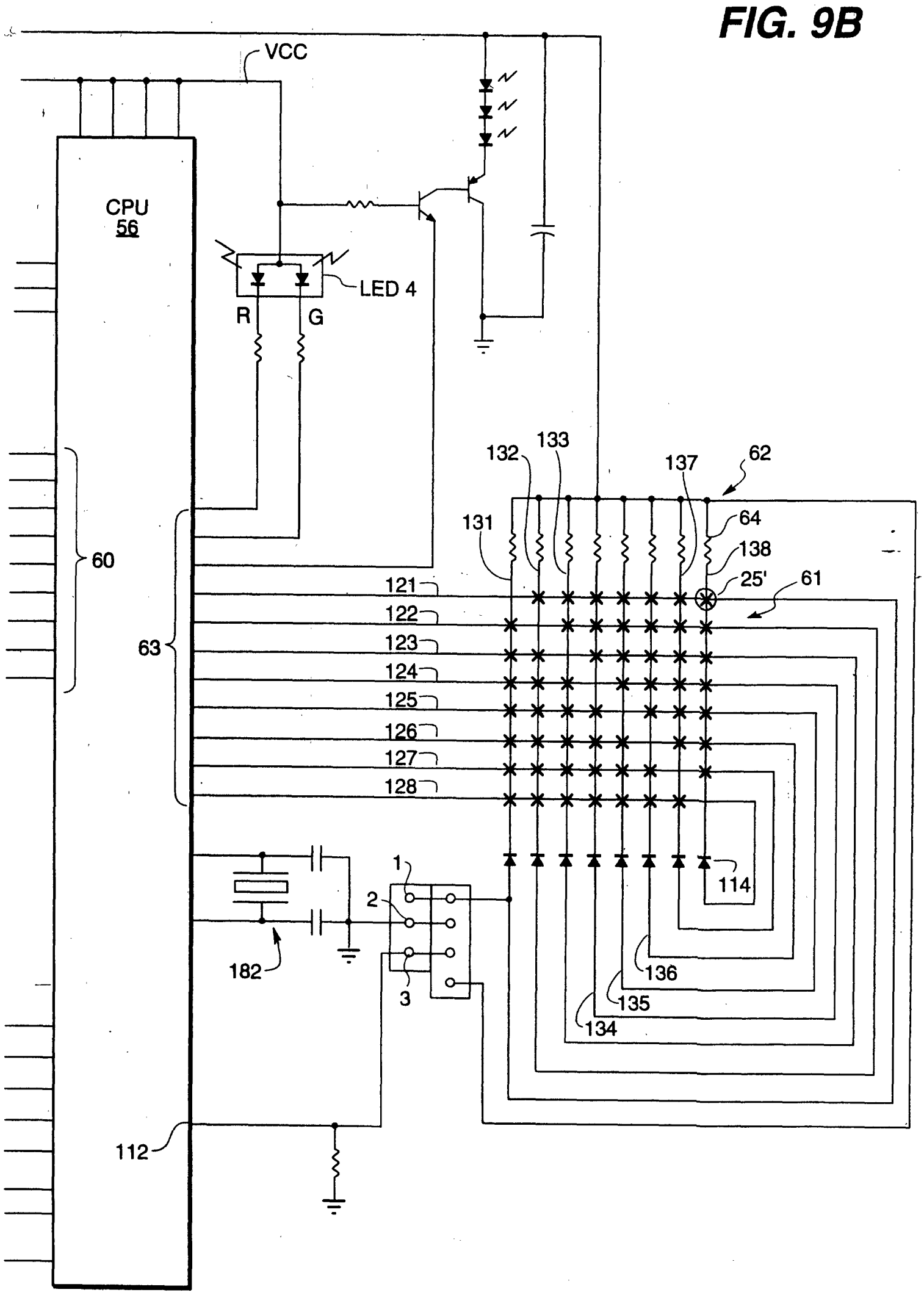


FIG. 9B


VCC
CPU
56
LED 4
R
G
60
63
121
122
123
124
125
126
127
128
131
132
133
137
62
64
138
25'
61
114
136
135
134
1
2
3
182
112

Ser. No. 08/134,086
Ver. U.S. Cont. App.
Universa Remote Contro Sys-
Atty Tom Vigil (=2E-3

08/134086

FIG. 11

MODULATION SCHEMES

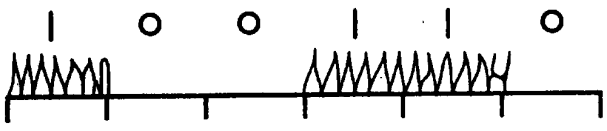


FIG. 11a — FIXED BIT TIME, FULL WIDTH BURST

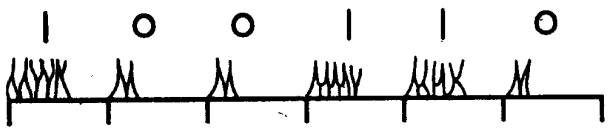


FIG. 11b — FIXED BIT TIME, BURST WIDTH MODULATED

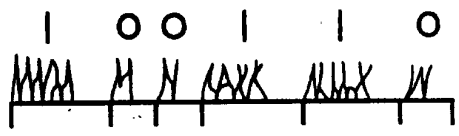


FIG. 11c — FIXED OFF TIME, BURST WIDTH MODULATED

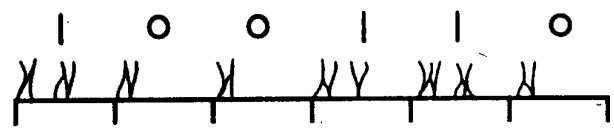


FIG. 11d — FIXED BIT TIME, SINGLE / DOUBLE BURST

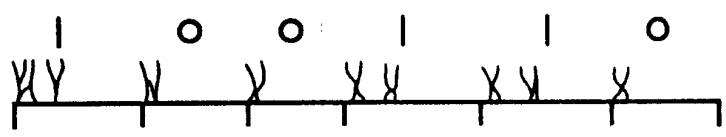


FIG. 11e — FIXED OFF TIME, SINGLE / DOUBLE BURST

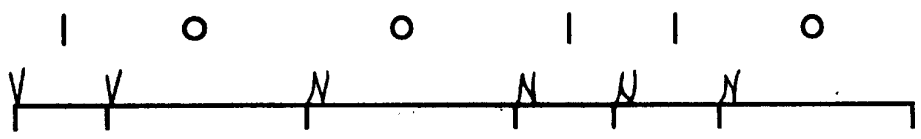


FIG. 11f — FIXED BURST TIME, OFF TIME MODULATED

FIG. 11g — RANDOM

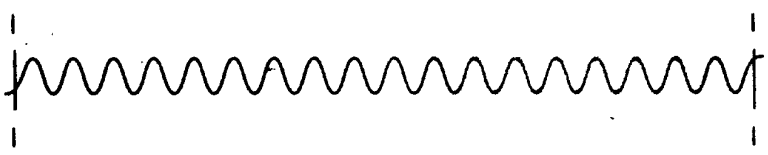


FIG. 11h — ONE FREQUENCY FOR EACH KEY

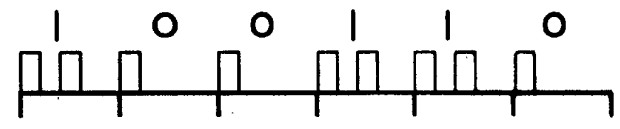


FIG. 11i — SINGLE / DOUBLE PULSE, FIXED BIT TIME

Paul V. Moore 7/8
New US Cont. Appl.
Universal Remote Control System
Atty: Tom 1/31 (23:3)

FIG. 12A

CAPTURING IR CODE

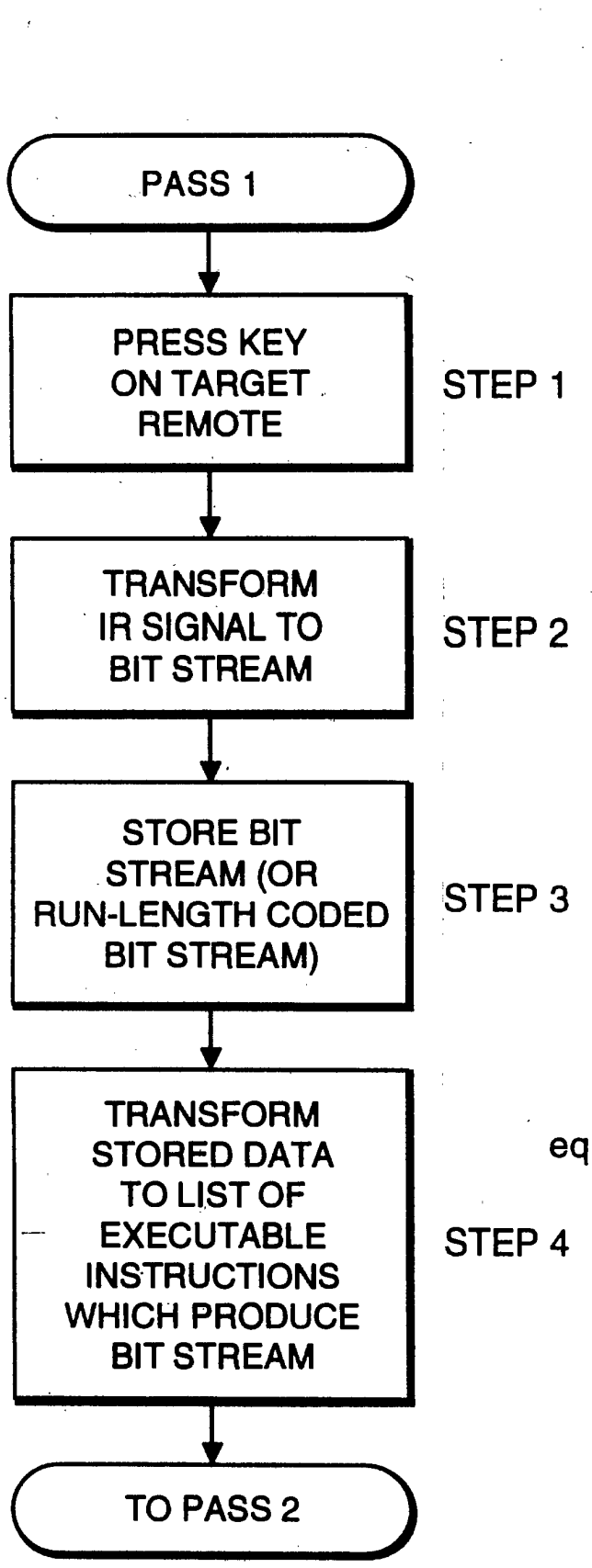


FIG. 12B

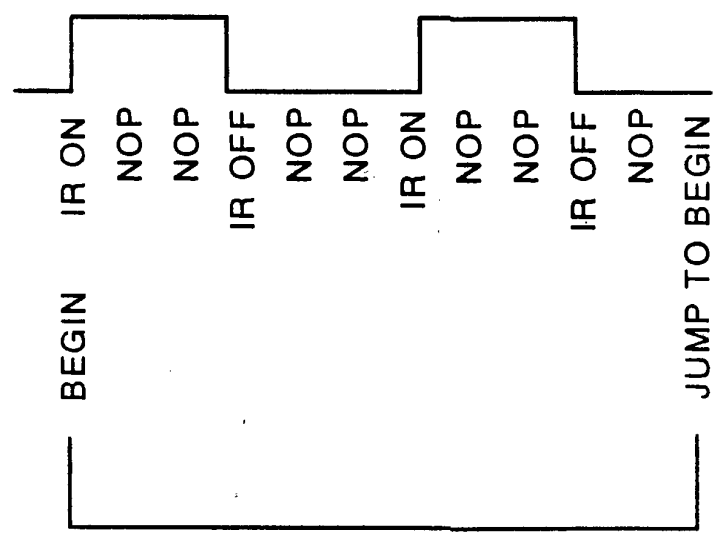


FIG. 13A

CAPTURING IR CODE

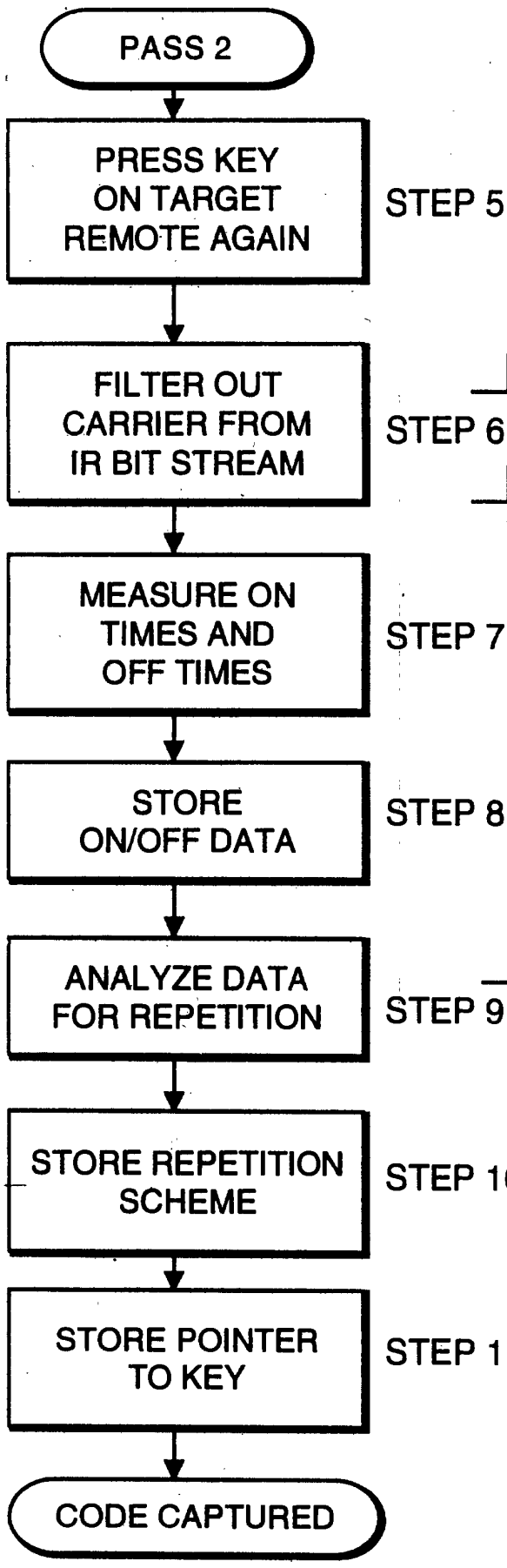


FIG. 13B

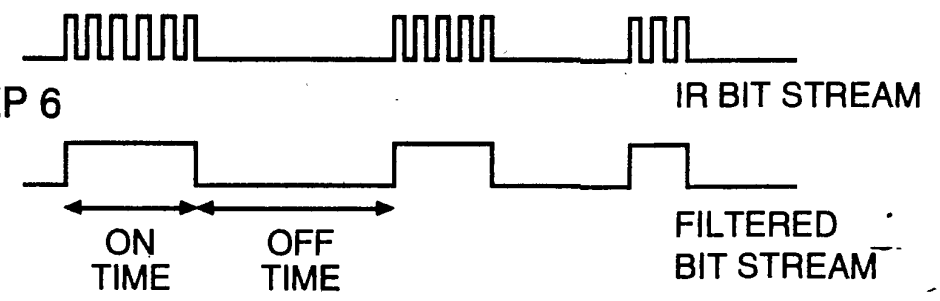


FIG. 13C

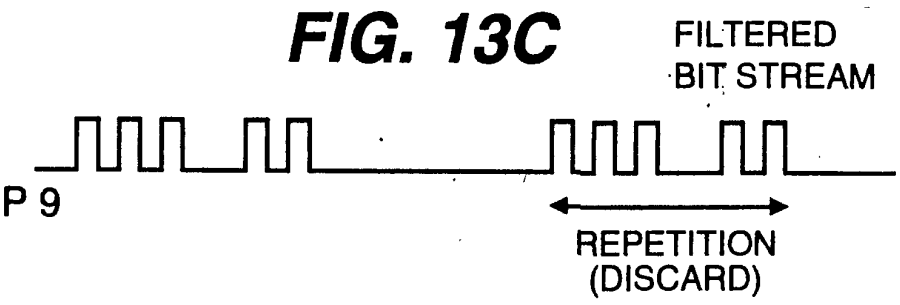
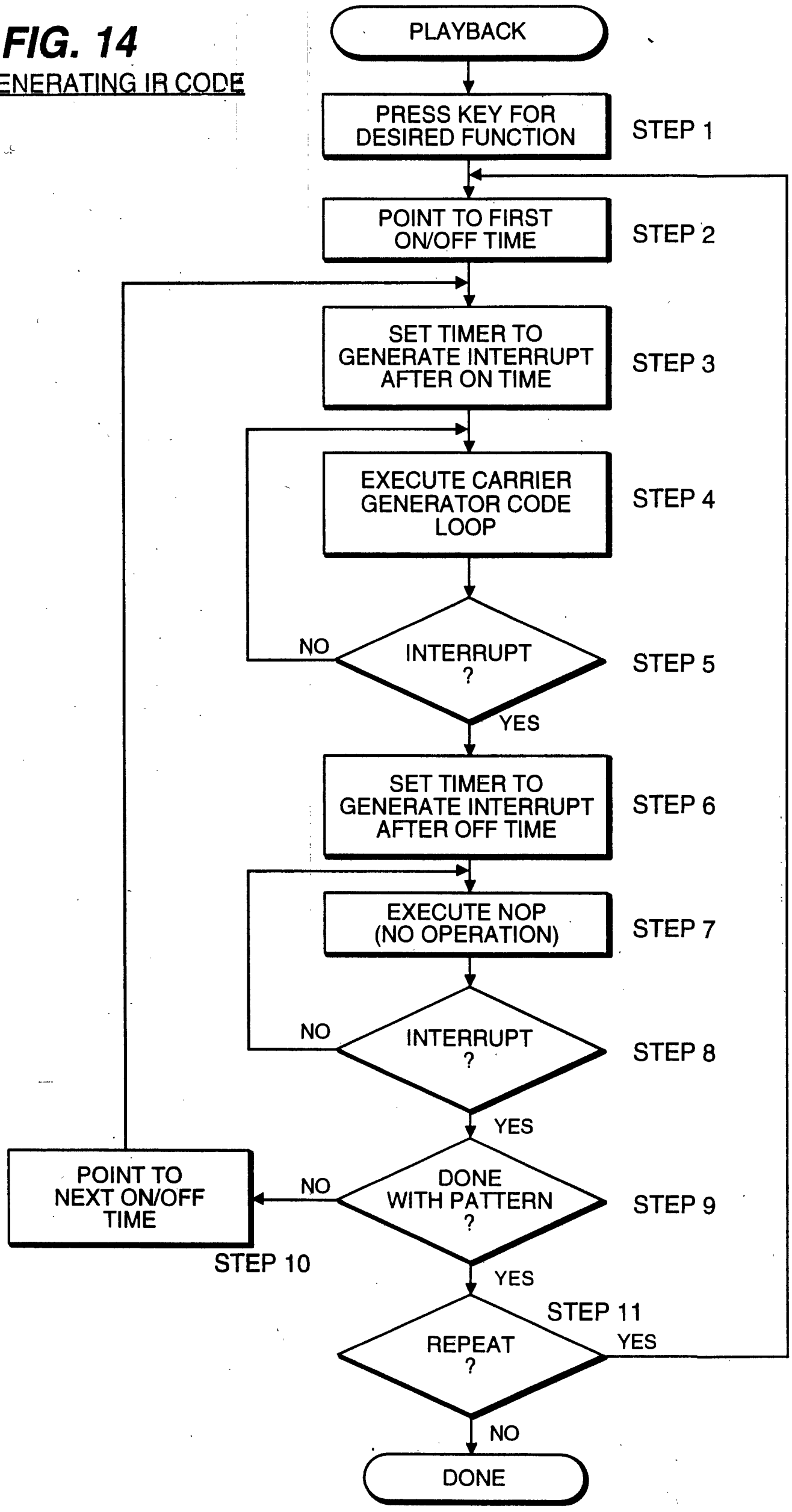


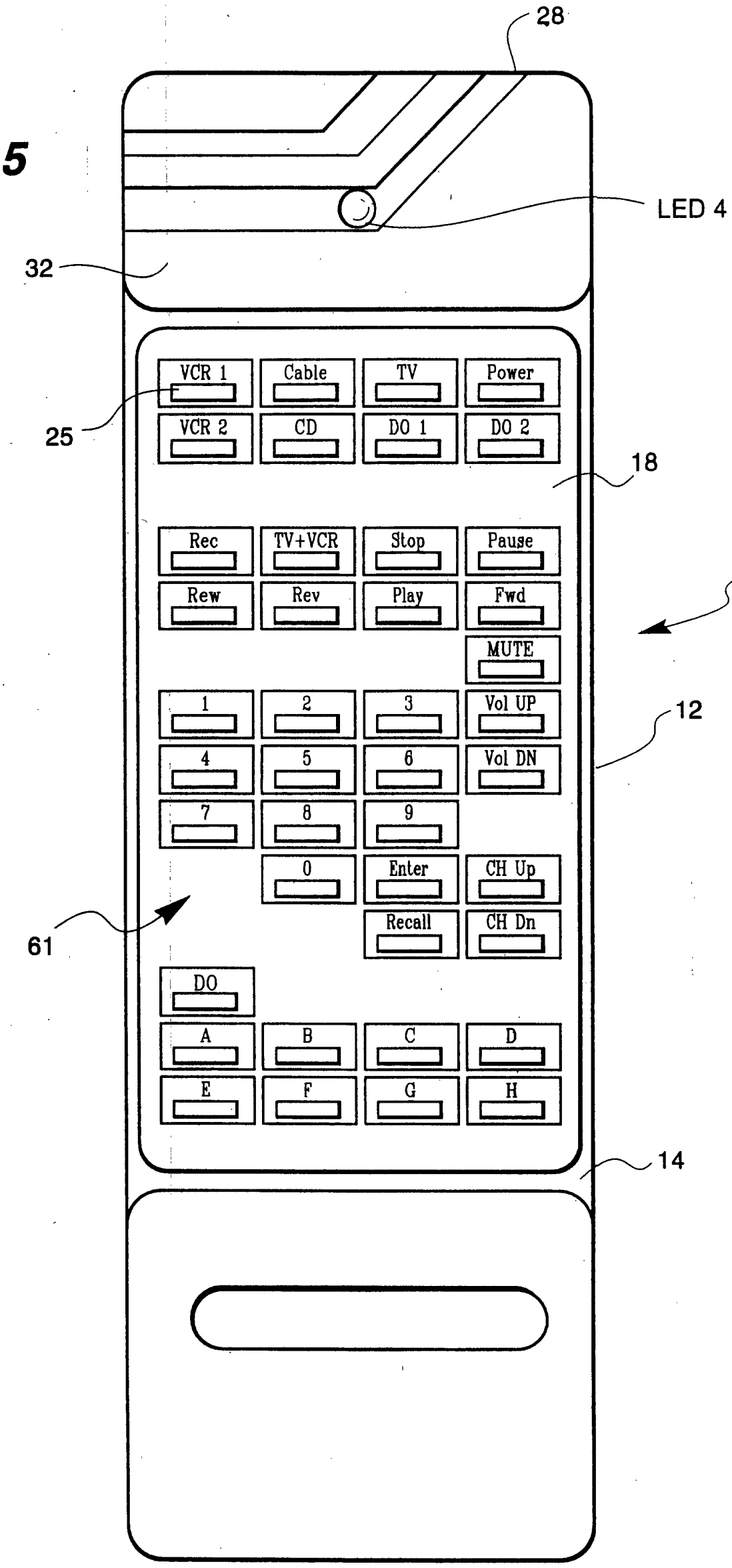
FIG. 14

GENERATING IR CODE



New US. Con-App.
Universal Remote Contr. Sys-
Fig. Tom Fig. 1-23-3.

FIG. 15



New U.S. Cor-App
Universal Remote Control Syst.
Atty: Tom Vigil (#43-3)

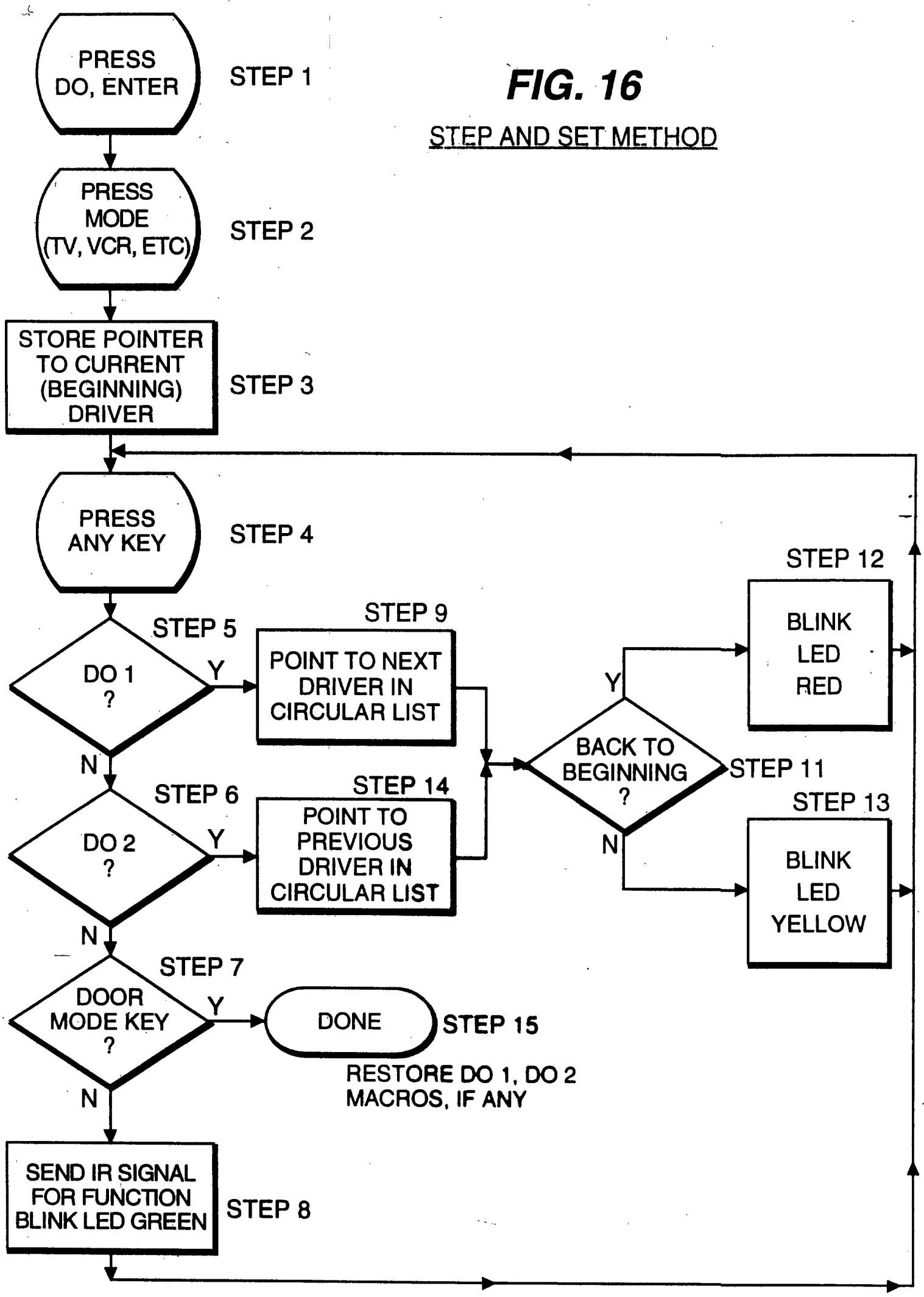
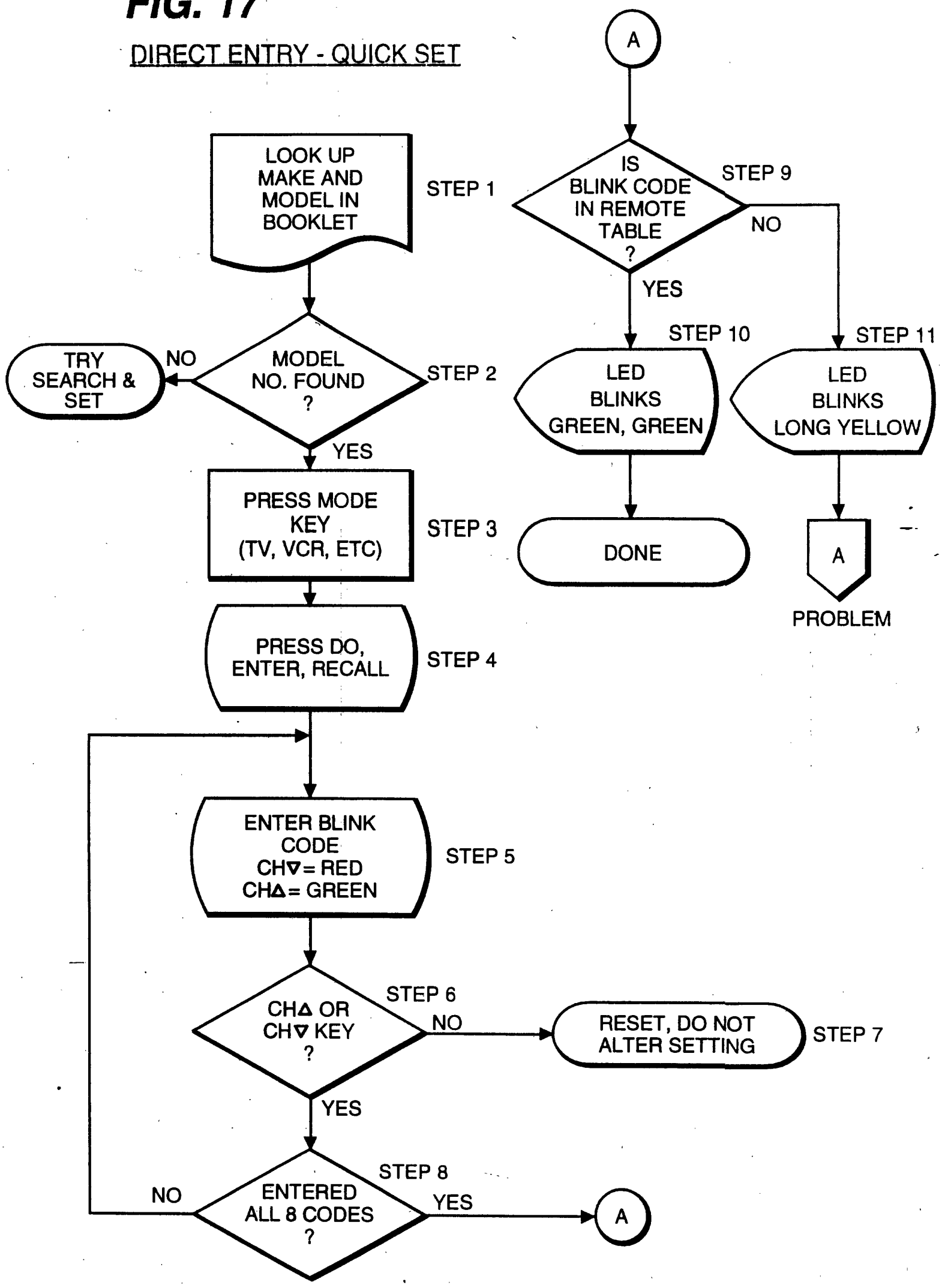


FIG. 16

STEP AND SET METHOD

FIG. 17

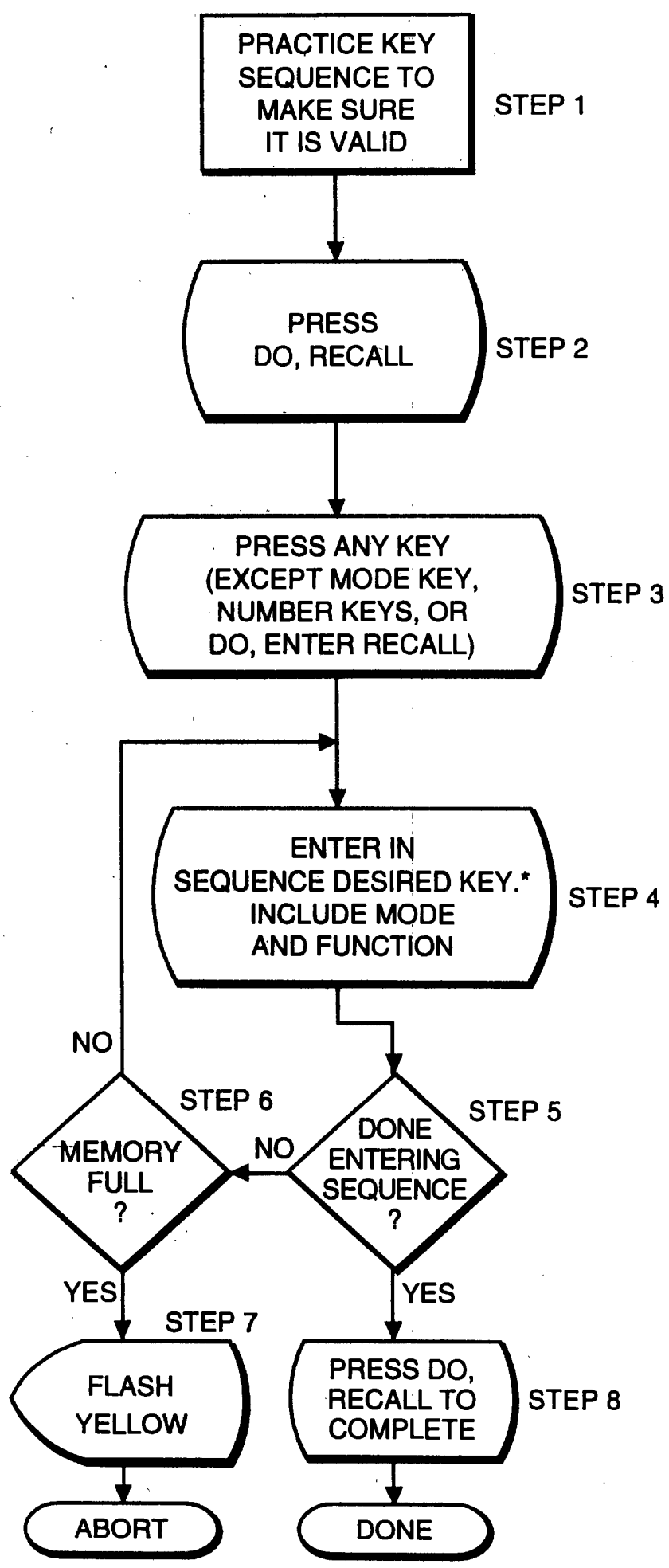
DIRECT ENTRY - QUICK SET



New US Pat App
Universal Remote Control Syste
Atty: Tom Vigil (703-3

FIG. 18A

SETTING A "DO" COMMAND MACRO



* eg. TV, POWER, VCR 1, POWER, PLAY, TV, 3, ENTER

FIG. 18B

EXECUTING A MACRO "DO" COMMAND

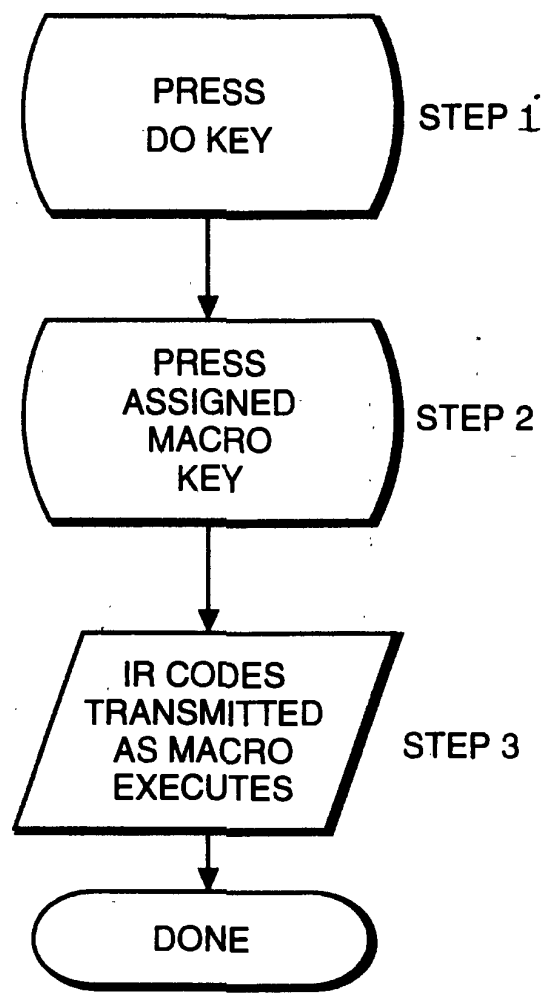


FIG. 19A

TO IDENTIFY WHAT DEVICE REMOTE IS SET FOR - BLINK CODE

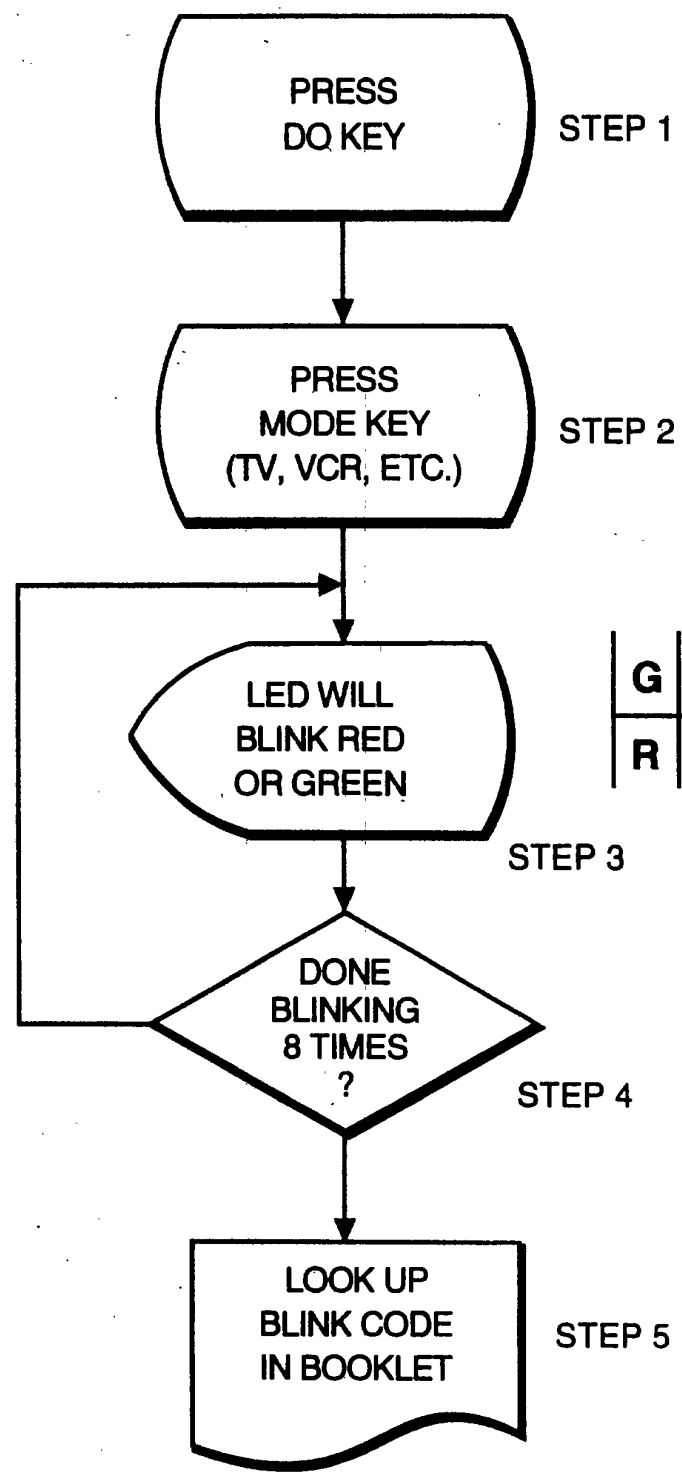


FIG. 19B

G	G	G	G	G	G	G	G
R	R	R	R	R	R	R	R

New US Cont. App
Universal Remote Control Sy.
Atty: Tom Vigil (#4373)

FIG. 20

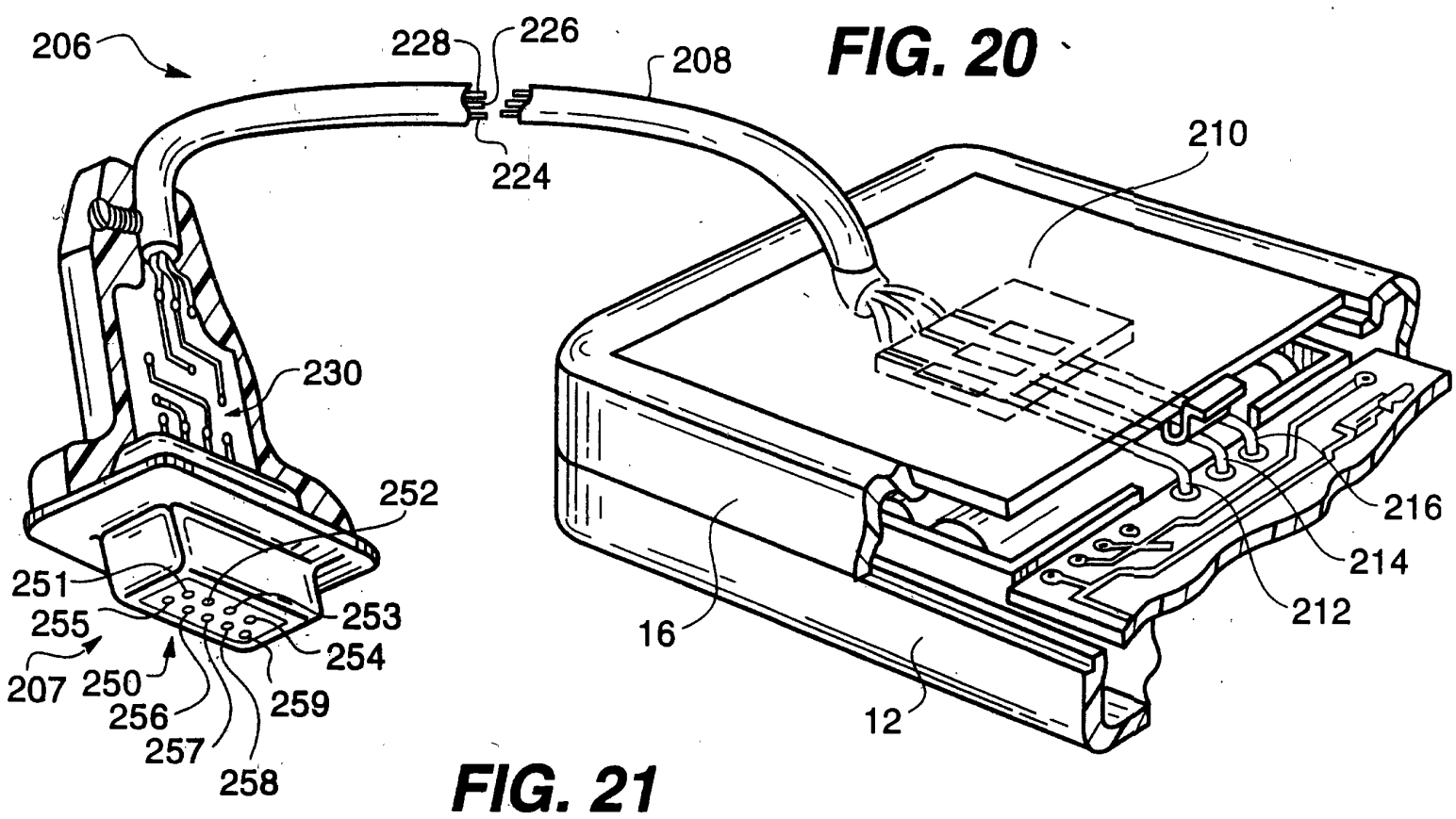


FIG. 21

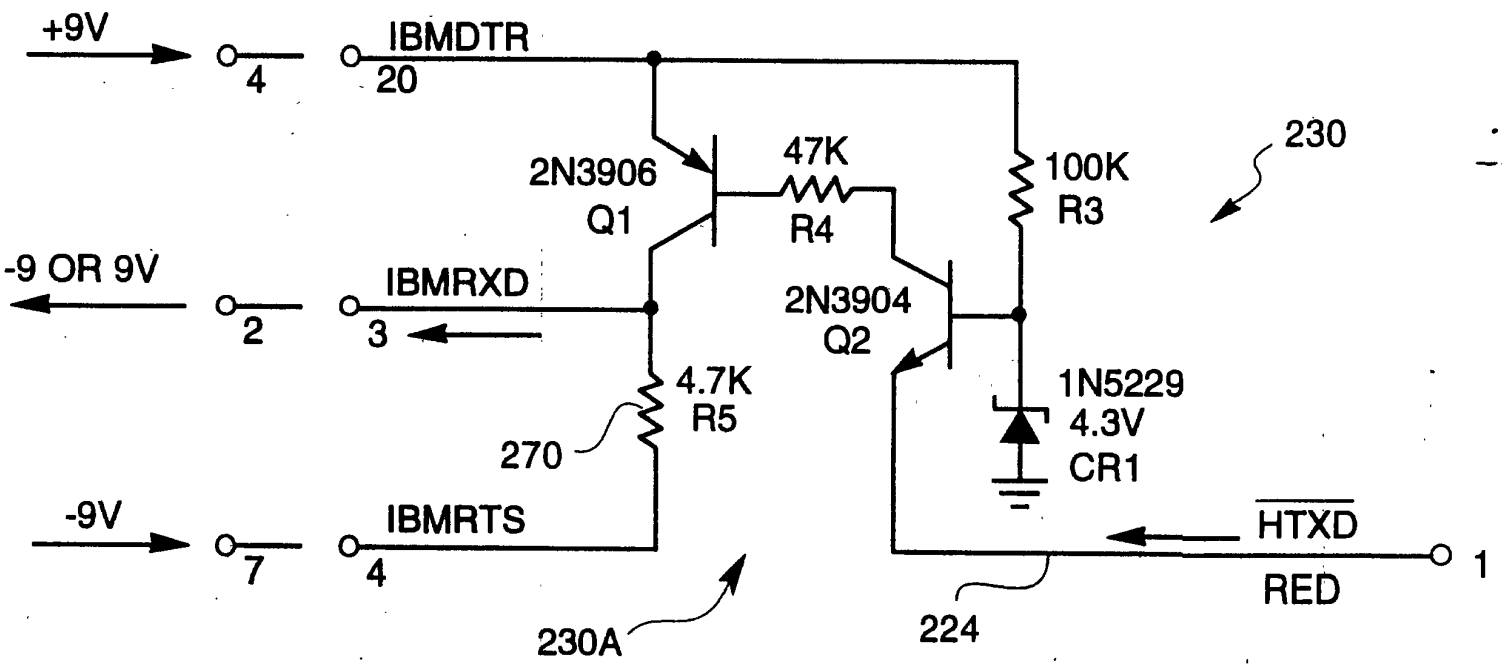
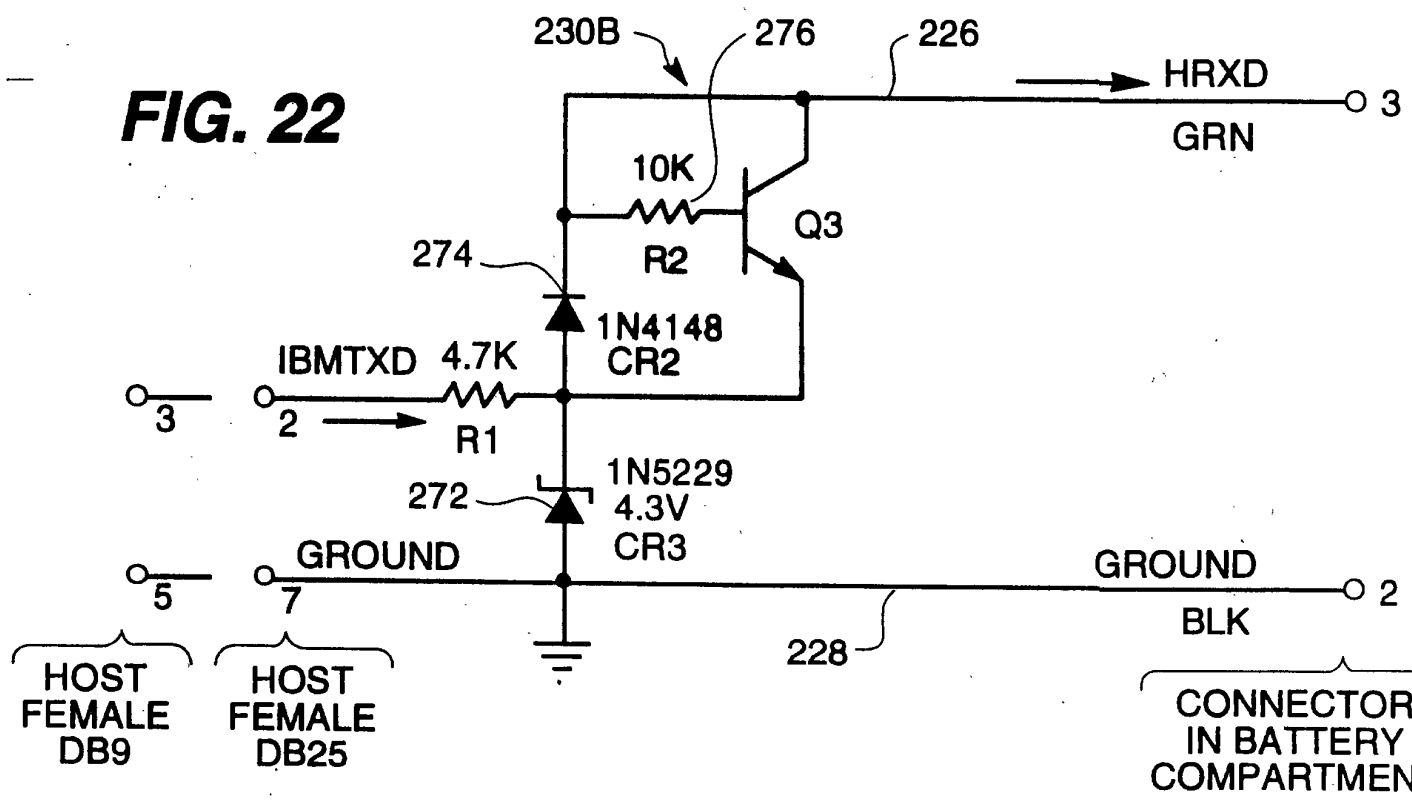


FIG. 22



New US Cont Appl
Universal Remote Control Sys
Atty: Tom Vigil (#2373)

FIG. 23

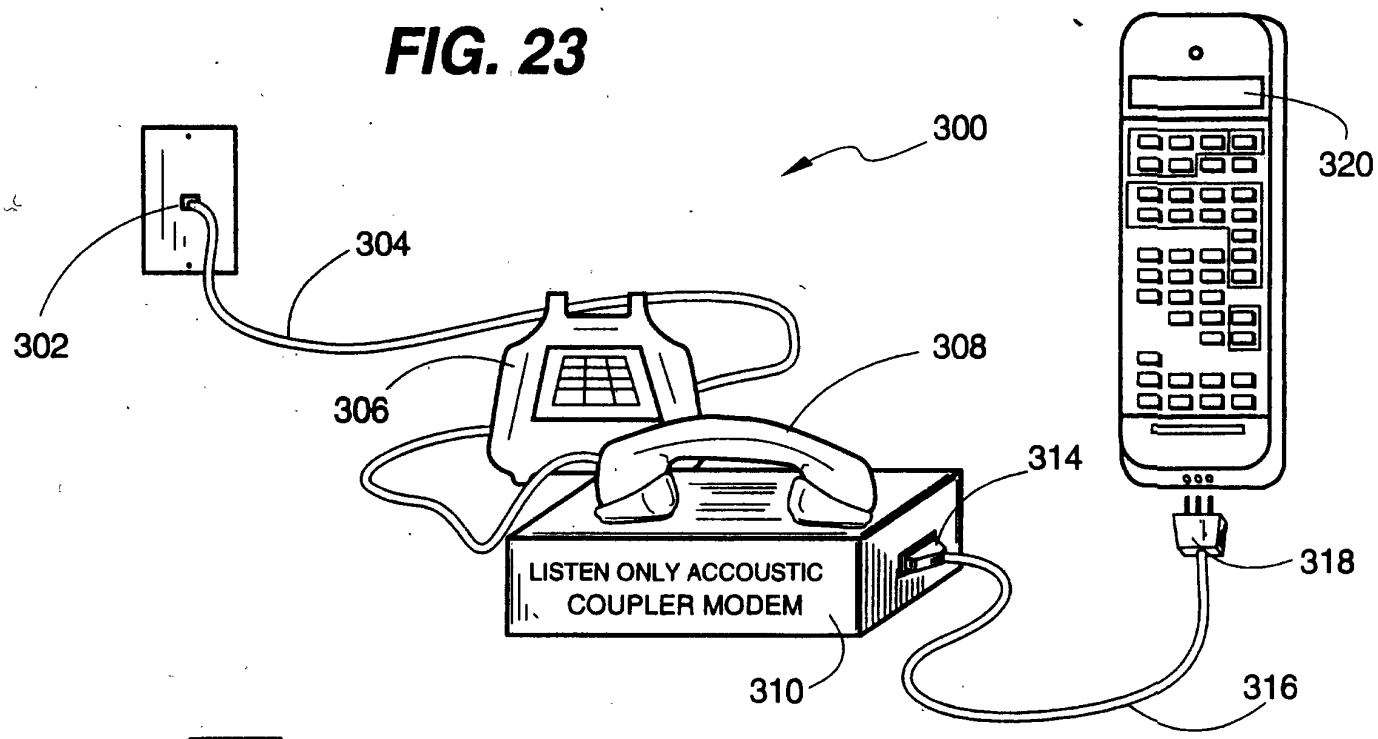


FIG. 24

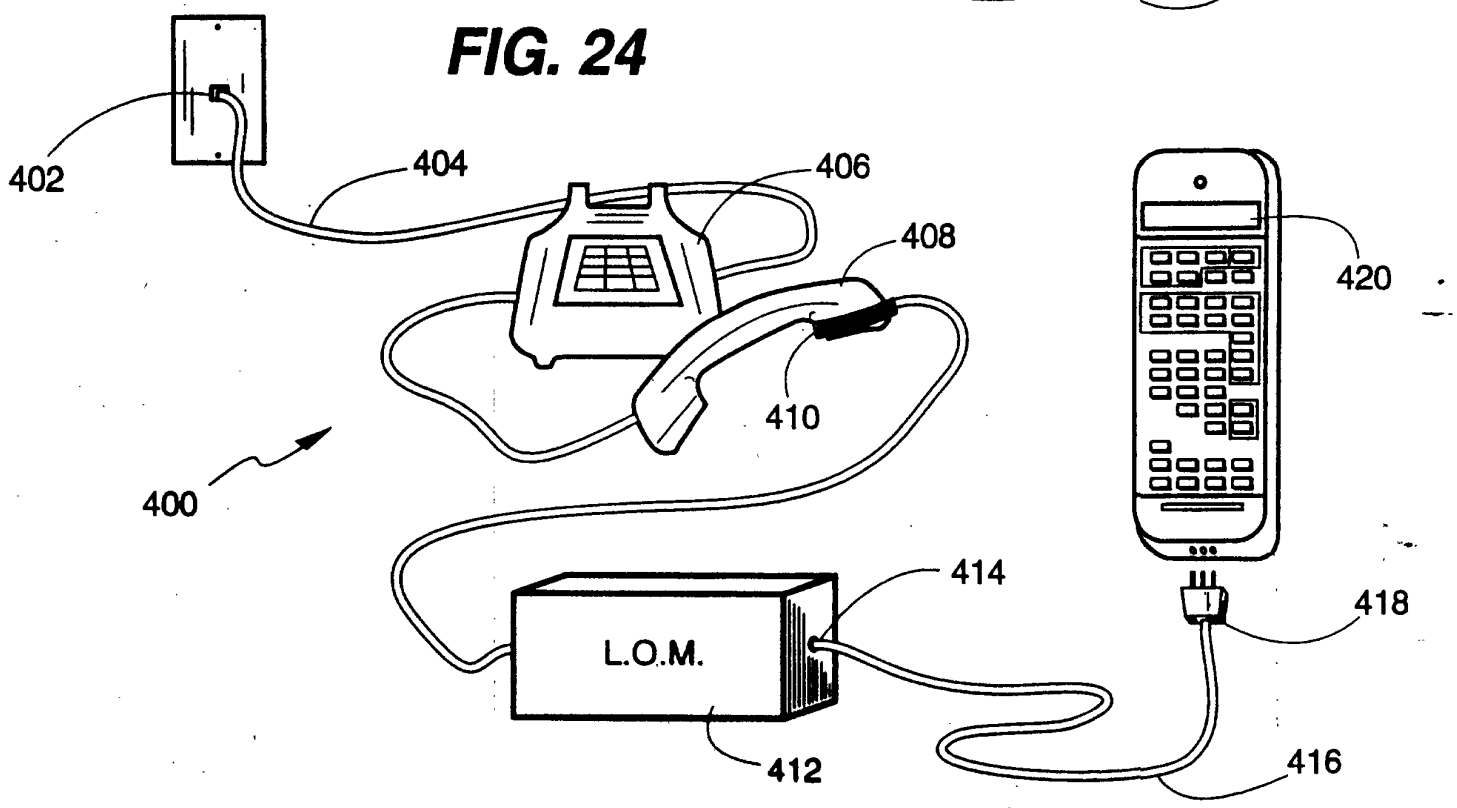


FIG. 25

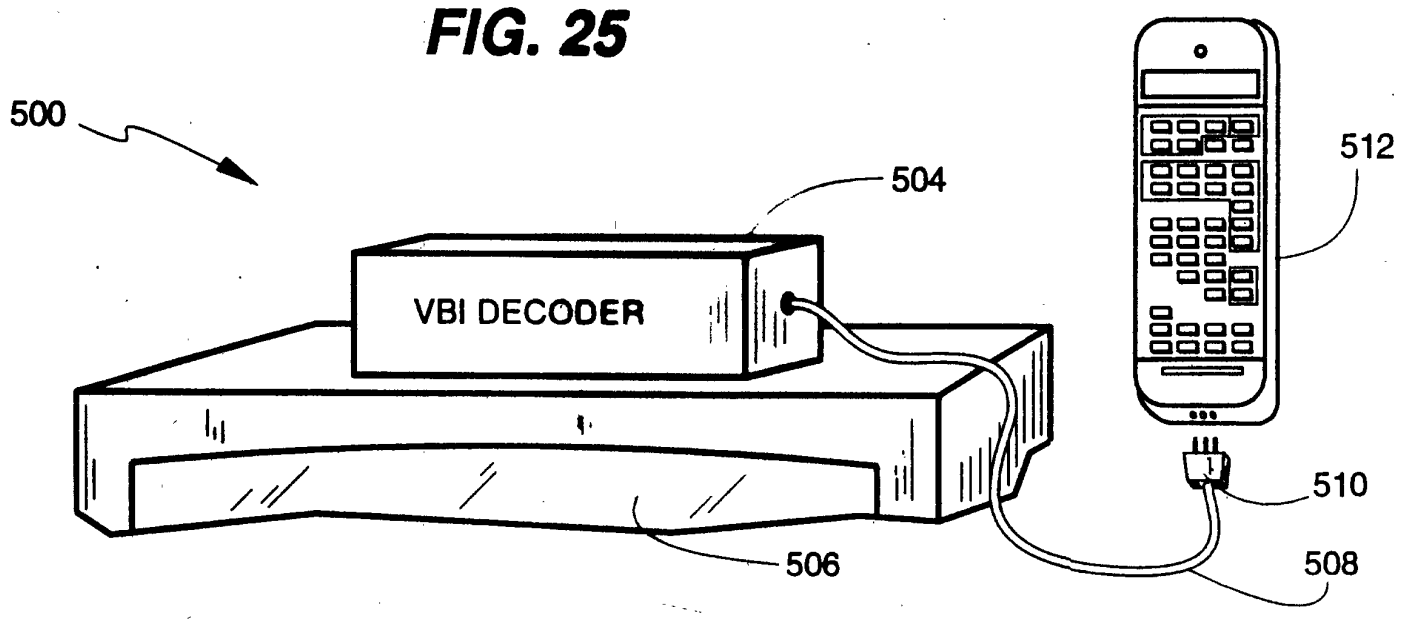
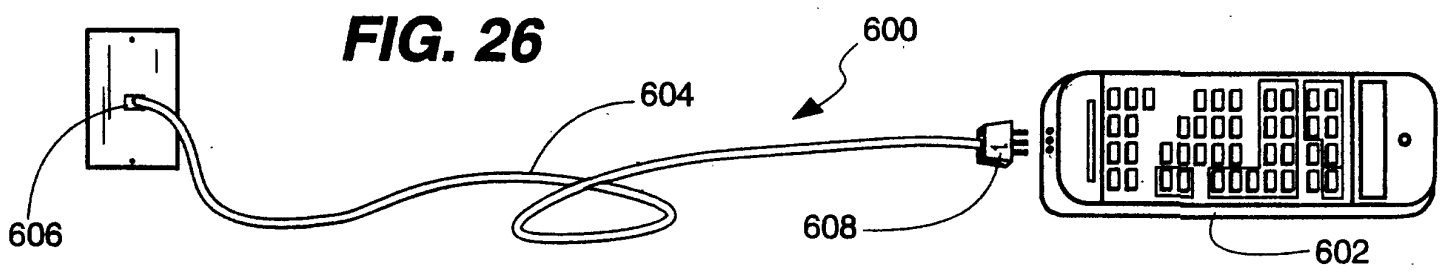


FIG. 26



08/134086 29-201

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Attorney Docket: 93173

Anticipated Classification:

Class 379 Subclass 102

Prior Application:

Examiner Chan, W.

Art. Unit 2608

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

This is a request for filing a:

☒ Continuation or

☐ Divisional application under 37 CFR 1.60 of pending prior application Serial No. 08/046,105 filed on April 8, 1993

for: UNIVERSAL REMOTE CONTROL SYSTEM

1. ☒ Enclosed is a complete copy of the prior application including the oath or declaration as originally filed with an Affidavit, Certification or Declaration (Section 19 below) verifying it as a true copy.

2. ☒ A small entity declaration form including a verified statement to establish small entity status under 37 CFR 1.9 ☐ is enclosed or ☒ was filed in the prior application and such status is still proper and desired (37 CFR 1.28(a)).

3. ☒ The filing fee is calculated below:

CLAIMS AS FILED, LESS ANY CLAIMS CANCELLED BY AMENDMENT IN SECTION 8 BELOW

CLAIMS AS FILED

FOR	NO. FILED	NO. EXTRA	SMALL ENTITY RATE	SMALL ENTITY FEE	OR	OTHER THAN SMALL ENTITY RATE	OTHER THAN SMALL ENTITY FEE
BASIC FEE				$355	OR		$710
TOTAL CLAIMS	16 - 20=	0 *	x $ 11=	0	OR	x $22=	
INDEPENDENT CLAIMS	5 - 3=	2 *	x $37=	74	OR	x $74=	
MULTIPLE DEPENDENT CLAIM PRESENT			+ $115=		OR	+ $230=	
			TOTAL	429	OR	TOTAL	

* If the difference in col. 1 is less than zero, enter "0" in col.2

4. ☐ Please charge my Deposit Account No. 22-0355 in the amount of _____. A duplicate copy of this sheet is enclosed.

5. ☒ A check in the amount of $429.00 is enclosed.

6. ☒ The Commissioner is hereby authorized to charge payment of the following fees associated with this communication or credit any overpayment to Deposit Account No. 22-0355. A duplicate copy of this sheet is enclosed.

   ☒ Any additional filing fees required under 37 CFR 1.16.

   ☒ Any patent application processing fees under 37 CFR 1.17.

7. ☒ The Commissioner is hereby authorized to charge payment of the following fees during the pendancy of this application or credit any overpayment to Deposit Account No. 22-0355. A duplicate copy of this sheet is enclosed.

   ☒ Any filing fees under 37 CFR 1.16 for the presentation of extra claims.

   ☒ Any patent application processing fees under 37 CFR 1.17.

   ☐ The issue fee set in 37 CFR 1.18 at or before mailing of the Notice Allowance, pursuant to 37 CFR 1.311(b).

8. [X] Cancel in this application original claim~~s~~ 1 of the prior application before calculating the filing fee (At least one original claim must be retained for filing purposes).

9. [X] Amend the specification by inserting before the first line, the sentence:
This is a [X] continuation [ ] ~~division~~ of application Serial No. 08/046,105 filed on April 8, 1993**

10. [ ] Transfer the drawings from the prior application to this application and abandon said prior application as of the filing date accorded this application. A duplicate copy of this sheet is enclosed for filing in the prior application.

11. [ ] Enclosed are _____ sheets of informal drawings.

12. [X] Enclosed are 18 sheets of formal drawings.

13. [ ] Priority of Application No. _____ filed on _____
in _____ (country) is claimed under 35 USC. 119.
[ ] The certified copy of the priority application has been filed in prior application Serial No. _____
filed _____

14. [X] The prior application is assigned to Universal Electronics Inc.

15. [X] The Power of Attorney in the prior application is to: Thomas R. Vigil

a. [X] The Power appears in the original papers of the prior application.

b. [ ] Since the Powere does not appear in the original papers, a copy of the Power in the prior application is enclosed.

c. [ ] Recognize as associate attorney:

16. [X] Direct all correspondence to:
Thomas R. Vigil
VIGIL & HANRATH
836 S. Northwest Highway
Barrington, IL 60010

17. [X] Enclosed is a Preliminary Amendment amending the specification and/or drawings and/or canceling claims and/or amending claims and/or adding new claims (Claims added by this amendment have been properly numbered consecutively beginning with the number next following the highest numbered original claim in the prior application).

[ ] Form PTO-FB-A 520 is also enclosed.

18. [X] Enclosed is a ~~Disclosure Statement~~, PTO form 1449 ~~and copies of the documents cited~~.

19. [X] I herby verify that the attached papers are a true copy of prior application Serial No. 07/587,326 as originally filed on September 24, 1990 (date)

The undersigned declare further that all statements made herein of his or her own knowledge are true and that *all statements made on information and belief are believed to be true;* and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing theron.

Dated: Oct. 8, 1993

Thomas R. Vigil
Reg. No. 24,542

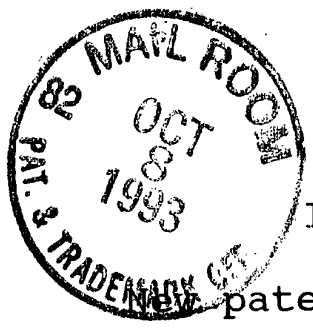
Address of Signator:

VIGIL & HANRATH
836 S. Northwest Highway
Barrington, IL 60010

[ ] Inventor(s)
[ ] Assignee of Complete Interest
[X] Attorney or Agent of record in prior
[ ] application
[ ] Filed under 37 CFR 1.34(a)

**which is a continuation of application Serial No. 07/587,326 filed September 24, 1990, now U.S. Patent No. 5,228,077, which is a continuation-in-part of application serial No. 07/127,999, now U.S. Patent No. 4,959,810 which is a continuation-in-part of application Serial No. 07/109,336 now abandoned.

08/13[illegible]86



PATENT
USSN
Atty Docket 93173

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

New patent application:
_____ Regular
_____ Convention
_____ File Wrapper Continuation
_____ Divisional
_X_ Continuation-in-Part
_____ Reissue Application
_____ PCT National Phase
_____ PCT Application

Applicant(s):
Paul Darbee

Serial No.
Title: UNIVERSAL REMOTE CONTROL SYSTEM

PCT No._____

CERTIFICATE OF EXPRESS MAIL DEPOSIT

"Express Mail" Mailing Label No. TB 518 500 730 US
Date of Deposit: October 8, 1993

I hereby certify that this paper, or fee, is being deposited with the U.S. Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231.

Leticia Mondragon
(Typed or printed name of person mailing fee or paper)

Leticia S Mondragon
(Signature of person mailing paper or fee)

The documents enclosed with and being filed with this paper are:

_X_ application transmittal letter
_X_ Patent application:
_X_ Copy of prior application _32_ pages including _18_ sheets of original drawings
_X_ Letter to Chief Draftsman
_8_ sheets of revised drawings.
_____ executed Declaration and Power of Attorney
_____ copy of Declaration and Power of Attorney from parent application
_____ translation of PCT Article 19 Amendment
_____ Assignment
_X_ Copy of PTO Form 1449 from prior application

_____ translation of amended specification and/or claims
_X_ Check in the amount of: _$429.00_
_____ Petition for Extension of Time in prior Application Serial No. _____ for _____ month(s)
_X_ Preliminary Amendment Before Action including new pages 16a, 16b and 16c
_____ Disclosure Statement including USPTO Form 1449 and copies of _____ reference(s)

File History Report

☐ Paper number _____ is missing from the United States Patent and Trademark Office's original copy of the file history. No additional information is available.

☐ The following page(s) _____ of paper number _____ is/are missing from the United States Patent and Trademark Office's original copy of the file history. No additional information is available

Additional comments: **PAPER#2 IS VOID**

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
08/134,086	10/08/93	DARBEE	P 93173

03B1/1103

THOMAS R. VIGIL
VIGIL & HANRATH
836 S. NORTHWEST HWY.
BARRINGTON, IL 60010

0000

DATE MAILED:
11/03/93

NOTICE TO FILE MISSING PARTS OF APPLICATION FILING DATE GRANTED

An Application Number and Filing Date have been assigned to this application. However, the items indicated below are missing. The required items and fees identified below must be timely submitted **ALONG WITH THE PAYMENT OF A SURCHARGE** for items 1 and 3-6 only of $ 130 for large entities or $ 65 for small entities who have filed a verified statement claiming such status. The surcharge is set forth in 37 CFR 1.16(e).

If all required items on this form are filed within the period set below, the total amount owed by applicant as a ☑ large entity, ☐ small entity (verified statement filed), is $ 417.

Applicant is given **ONE MONTH FROM THE DATE OF THIS LETTER, OR TWO MONTHS FROM THE FILING DATE** of this application, **WHICHEVER IS LATER,** within which to file all required items and pay any fees required above to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

1. ☑ The statutory basic filing fee is: ☐ missing ☑ insufficient. Applicant as a ☑ large entity ☐ small entity, must submit $ 281 to complete the basic filing fee.

2. ☐ Additional claim fees of $_____ as a ☐ large entity, ☐ small entity, including any required multiple dependent claim fee, are required. Applicant must submit the additional claim fees or cancel the additional claims for which fees are due.

3. ☑ The oath or declaration:
   ☑ is missing.
   ☐ does not cover items omitted at time of execution.

   An oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date is required.

4. ☐ The oath or declaration does not identify the application to which it applies. An oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.

5. ☐ The signature to the oath or declaration is: ☐ missing; ☐ a reproduction; ☐ by a person other than the inventor or a person qualified under 37 CFR 1.42, 1.43, or 1.47. A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.

6. ☐ The signature of the following joint inventor(s) is missing from the oath or declaration:

   _____ An oath or declaration listing the names of all inventors and signed by the omitted inventor(s), identifying this application by the above Application Number and Filing Date, is required.

7. ☐ The application was filed in a language other than English. Applicant must file a verified English translation of the application and a fee of $_____ under 37 CFR 1.17(k), unless this fee has already been paid.

8. ☐ A $_____ processing fee is required for returned checks. (37 CFR 1.21(m)).

9. ☐ Your filing receipt was mailed in error because check was returned without payment.

10. ☐ The application does not comply with the Sequence Rules. See attached Notice to Comply with Sequence Rules 37 CFR 1.821-1.825.

11. ☐ Other.

~~Direct the response and any questions about this notice to~~ Cynthia Lentz, Application Processing Division, Special Processing and Correspondence Branch (703) 308-1202.

A copy of this notice MUST be returned with the response.

FORM PTO-1533 (REV. 5-93) **OFFICE COPY**

#4 65.00 -205

A/N
#H

PATENT
USSN 08/134,086
Atty Docket 93173

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	
PAUL V. DARBEE	Group Art Unit: Unknown
For: UNIVERSAL REMOTE CONTROL SYSTEM	Examiner: Unknown
Serial No. 08/134,086	
Filed: October 8, 1993	

LETTER IN RESPONSE TO NOTICE
TO FILE MISSING PARTS OF APPLICATION

TO:
Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

In response to the Notice to File Missing Parts Of Application - Filing Date Granted (copy enclosed) mailed on November 3, 1993, applicant is hereby filing the enclosed documents and submitting the enclosed check to complete the above identified application:

1. Copy of the Oath and Declaration which was filed in the parent application, U.S. Patent Application Serial No. 07/587,326.

2. Check in the amount of $65.00 to cover the Government surcharge for a small entity for the late filing of the above identified executed Oath and Declaration.

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first-class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, DC 20231 on

Date 11/8/93

050 MS 11/17/93 08134086 1 205 65.00 CK

3. Copy of the Small Entity Declaration Independent Inventor executed by Paul V. Darbee filed in the parent application, U.S. Application Serial No. 07/587,326.

4. Copy of the Small Entity Declaration Small Business Concern executed by Thomas C. Tyler also filed in the parent application, U.S. Application Serial No. 07/587,326.

5. Copy of the transmittal letter filed with the subject application indicating that a verified statement to establish small entity status was filed in the prior application and such status is still proper and desired. Applicant believes that the filing fee paid as a small entity, $429.00, is correct and no further fees are necessary.

The Commissioner is authorized to charge the payment of any additional filing fees required under 37 C.F.R. 1.16 or credit any overpayment to Deposit Account No. 22-0355.

The subject application is a continuation of U.S. Application Serial No. 08/046,105 filed April 8, 1993 now U.S. Patent No. 5,255,313 which is a Continuation Application of U.S. Application Serial No. 07/587,326 filed September 24, 1990, now U.S. Patent No. 5,228,077.

Respectfully submitted,

Thomas R. Vigil
Reg. No. 24,542

Dated:
November 8, 1993.

836 South Northwest Highway
Barrington, Illinois 60010
(708) 382-6500

COMBINED DECLARATION FOR PA[illegible]AT[illegible]CATION AND POWER OF ATT[illegible]EY (Includes Reference to PCT International Applica[illegible])	ATTORNEY'S DOCKET NUMBER 90116

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

UNIVERSAL REMOTE CONTROL SYSTEM

the specification of which (check only one item below):

☐ is attached hereto.

☒ was filed as United States application

Serial No. 07/587,326

on September 24, 1990,

and was amended

on _____(if applicable).

☐ was filed as PCT international application

Number _____

on _____,

and was amended under PCT Article 19

on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby authorize the U.S. attorney or agent named herein to accept and follow instructions from _____

as to any action taken in the Patent and Trademark Office regarding this application without direct communication between the U.S. attorney or agent and the undersigned. In the event of a change in the persons from whom instructions may be taken, the U.S. attorney or agent named herein will be so notified by the undersigned.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other that the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C.119:

COUNTRY (If PCT, indicate "PCT")	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 USC 119
			☐ YES ☐ NO
			☐ YES ☐ NO
			☐ YES ☐ NO
			☐ YES ☐ NO
			☐ YES ☐ NO

Combined Declaration For Patent Ap[illegible] and Power of Attorney (Continued)
(Includes Reference to PCT International Applica[illegible])

ATTORNEY'S DOCKET NUMBER
90116

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowlege the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application(s) and the national or PCT international filing date of this application:

PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U.S.C. 120:

U.S. APPLICATIONS		STATUS (Check one)		
U.S. APPLICATION NUMBER	U.S. FILING DATE	PATENTED	PENDING	ABANDONED
07/127,999	December 2, 1987	x		

PCT APPLICATIONS DESIGNATING THE U.S.					
PCT APPLICATION NO	PCT FILING DATE	U.S. SERIAL NUMBERS ASSIGNED (if any)			

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(List name and registration number)*

3 — Thomas R. Vigil, Reg. No. 24,542
James P. Hanrath, Reg. No. 31,965
Joseph P. O'Halloran, Reg. No. 20,879

Send Correspondence to:
Thomas R. Vigil
836 South Northwest Highway
Barrington, Illinois 60010

Direct Telephone Calls to: *(name and telephone number)*
Thomas R. Vigil
708/382-6500

		FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
1 00 201	FULL NAME OF INVENTOR	DARBEE	PAUL	VERNON
	RESIDENCE & CITIZENSHIP	CITY: SANTA ANA	STATE OR FOREIGN COUNTRY: CA	COUNTRY OF CITIZENSHIP: US
	POST OFFICE ADDRESS	POST OFFICE ADDRESS: 9852 BRENTWOOD	CITY: SANTA ANA	STATE & ZIP CODE/COUNTRY: CA 92705
202	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY
203	FULL NAME OF INVENTOR	FAMILY NAME	FIRST GIVEN NAME	SECOND GIVEN NAME
	RESIDENCE & CITIZENSHIP	CITY	STATE OR FOREIGN COUNTRY	COUNTRY OF CITIZENSHIP
	POST OFFICE ADDRESS	POST OFFICE ADDRESS	CITY	STATE & ZIP CODE/COUNTRY

I hereby declare under penalty of perjury under the laws of the United States of America that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

SIGNATURE OF INVENTOR 201	SIGNATURE OF INVENTOR 202	SIGNATURE OF INVENTOR 203
DATE: 2-14-91	DATE	DATE

Applicant or Patentee: Paul Darbee Attorney's
Serial or Patent No.: 07/587,326 Docket No.: 90116
Filed or Issued: September 24, 1990
For: UNIVERSAL REMOTE CONTROL SYSTEM

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY
STATUS (37 CFR 1.9 (f) and 1.27 (c)) — SMALL BUSINESS CONCERN

I hereby declare that I am

[ ] the owner of the small business concern identified below:
[X] an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF CONCERN Universal Electronics, Inc.
ADDRESS OF CONCERN 1630B South Sunkist Street, Anaheim, California 92806

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9 (d), for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention, entitled UNIVERSAL REMOTE CONTROL SYSTEM by Paul Darbee (by inventor(s)) described in

[ ] the specification filed herewith
[X] application serial no. 07/587,326, filed September 24, 1990.
[ ] patent no. _____, issued _____.

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below* and no rights to the invention are held by any person, other than the inventor, who could not qualify as a small business concern under 37 CFR 1.9 (d) or by any concern which would not qualify as a small business concern under 37 CFR 1.9 (d) or a nonprofit organization under 37 CFR 1.9 (e).

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27).

NAME _____
ADDRESS _____
[ ] INDIVIDUAL [ ] SMALL BUSINESS CONCERN [ ] NONPROFIT ORGANIZATION

NAME _____
ADDRESS _____
[ ] INDIVIDUAL [ ] SMALL BUSINESS CONCERN [ ] NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28 (b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING Thomas C. Tyler
TITLE OF PERSON OTHER THAN OWNER President
ADDRESS OF PERSON SIGNING 6138 Riverview Road, Peninsula, OH 44264

SIGNATURE _____ DATE 10/11/50

OMB No. 0651-0011 (12/31/86)

Applicant or Patentee: Paul Darbee
Serial or Patent No.: 07/587,326
Filed or Issued: September 24, 1990
For: UNIVERSAL REMOTE CONTROL SYSTEM

Attorney's Docket No.: 90116

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 CFR 1.9 (f) and 1.27 (c)) — INDEPENDENT INVENTOR

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9 (c) for purposes of paying reduced fees under section 41 (a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled UNIVERSAL REMOTE CONTROL SYSTEM

- ☐ the specification filed herewith
- ☒ application serial no. 07/587,326, filed September 24, 1990
- ☐ patent no. _____, issued _____

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9 (c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9 (d) or a nonprofit organization under 37 CFR 1.9 (e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

- ☐ no such person,concern or organization
- ☒ persons, concerns or organizations listed below*

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27).

FULL NAME Universal Electronics, Inc.
ADDRESS 1630B South Sunkist Street, Anaheim, California 92806
☐ INDIVIDUAL ☒ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

FULL NAME _____
ADDRESS _____
☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

FULL NAME _____
ADDRESS _____
☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28 (b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Paul Darbee		
NAME OF INVENTOR	NAME OF INVENTOR	NAME OF INVENTOR
Signature of Inventor	Signature of Inventor	Signature of Inventor
11-5-90		
Date	Date	Date

Form PTO-FB-A410 (8-83)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Attorney Docket: 93173
Anticipated Classification:
Class 379 Subclass 102
Prior Application:
Examiner Chan, W.
Art. Unit 2608

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

This is a request for filing a:

☒ Continuation or

☐ Divisional application under 37 CFR 1.60 of pending prior application Serial No. 08/046,105 filed on April 8, 1993
for: UNIVERSAL REMOTE CONTROL SYSTEM

1. ☒ Enclosed is a complete copy of the prior application including the oath or declaration as originally filed with an Affidavit, Certification or Declaration (Section 19 below) verifying it as a true copy.

2. ☒ A small entity declaration form including a verified statement to establish small entity status under 37 CFR 1.9 ☐ is enclosed or ☒ was filed in the prior application and such status is still proper and desired (37 CFR 1.28(a)).

3. ☒ The filing fee is calculated below:

CLAIMS AS FILED, LESS ANY CLAIMS CANCELLED BY AMENDMENT IN SECTION 8 BELOW

CLAIMS AS FILED			SMALL ENTITY			OTHER THAN SMALL ENTITY	
FOR	NO. FILED	NO. EXTRA	RATE	FEE	OR	RATE	FEE
BASIC FEE				$355	OR		$710
TOTAL CLAIMS	16 - 20=	0 *	x $ 11=	0	OR	x $22=	
INDEPENDENT CLAIMS	5 - 3=	2 *	x $37=	74	OR	x $74=	
MULTIPLE DEPENDENT CLAIM PRESENT			+ $115=		OR	+ $230=	
* If the difference in col. 1 is less than zero, enter "0" in col.2			TOTAL	429	OR	TOTAL	

4. ☐ Please charge my Deposit Account No. 22-0355 in the amount of _____. A duplicate copy of this sheet is enclosed.

5. ☒ A check in the amount of $429.00 is enclosed.

6. ☒ The Commissioner is hereby authorized to charge payment of the following fees associated with this communication or credit any overpayment to Deposit Account No. 22-0355. A duplicate copy of this sheet is enclosed.

   ☒ Any additional filing fees required under 37 CFR 1.16.

   ☒ Any patent application processing fees under 37 CFR 1.17.

7. ☒ The Commissioner is hereby authorized to charge payment of the following fees during the pendancy of this application or credit any overpayment to Deposit Account No. 22-0355. A duplicate copy of this sheet is enclosed.

   ☒ Any filing fees under 37 CFR 1.16 for the presentation of extra claims.

   ☒ Any patent application processing fees under 37 CFR 1.17.

   ☐ The issue fee set in 37 CFR 1.18 at or before mailing of the Notice Allowance, pursuant to 37 CFR 1.311(b).

8. ☒ Cancel in this application original claim 1 of the prior application before calculating the filing fee (At least one original claim must be retained for filing purposes).

9. ☒ Amend the specification by inserting before the first line, the sentence:
This is a ☒ continuation ☐ ~~division~~ of application Serial No. 08/046,105 filed on April 8, 1993**

10. ☐ Transfer the drawings from the prior application to this application and abandon said prior application as of the filing date accorded this application. A duplicate copy of this sheet is enclosed for filing in the prior application.

11. ☐ Enclosed are _____ sheets of Informal drawings.

12. ☒ Enclosed are 18 sheets of formal drawings.

13. ☐ Priority of Application No. _____ filed on _____
in _____ (country) is claimed under 35 USC. 119.
☐ The certified copy of the priority application has been filed in prior application Serial No. _____
filed _____

14. ☒ The prior application is assigned to Universal Electronics Inc.

15. ☒ The Power of Attorney in the prior application is to: Thomas R. Vigil

a. ☒ The Power appears in the original papers of the prior application.

b. ☐ Since the Powere does not appear in the original papers, a copy of the Power in the prior application is enclosed.

c. ☐ Recognize as associate attorney:

16. ☒ Direct all correspondence to:
Thomas R. Vigil
VIGIL & HANRATH
836 S. Northwest Highway
Barrington, IL 60010

17. ☒ Enclosed is a Preliminary Amendment amending the specification and/or drawings and/or canceling claims and/or amending claims and/or adding new claims (Claims added by this amendment have been properly numbered consecutively beginning with the number next following the highest numbered original claim in the prior application).

☐ Form PTO-FB-A 520 is also enclosed.

18. ☒ Enclosed is a ~~Disclosure Statement~~, PTO form 1449 ~~and copies of references cited~~.

19. ☒ I herby verify that the attached papers are a true copy of prior application Serial No. 07/587,326 as originally filed on September 24, 1990 (date)

The undersigned declare further that all statements made herein of his or her own knowledge are true and that *all statements made on information and belief are believed to be true;* and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing theron.

Dated: Oct. 8, 1993

Thomas R. Vigil
Reg. No. 24,542

Address of Signator:

VIGIL & HANRATH
836 S. Northwest Highway
Barrington, IL 60010

☐ Inventor(s)
☐ Assignee of Complete Interest
☒ Attorney or Agent of record in prior
☐ application
☐ Filed under 37 CFR 1.34(a)

**which is a continuation of application Serial No. 07/587,326 filed September 24, 1990

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
08/134,088	10/08/93	BARBEE	P 93173

03B1/1103

THOMAS R. VIGIL
VIGIL & HANRATH
836 S. NORTHWEST HWY.
BARRINGTON, IL 60010

0000

DATE MAILED: 11/03/93

NOTICE TO FILE MISSING PARTS OF APPLICATION FILING DATE GRANTED

An Application Number and Filing Date have been assigned to this application. However, the items indicated below are missing. The required items and fees identified below must be timely submitted **ALONG WITH THE PAYMENT OF A SURCHARGE** for items 1 and 3-6 only of $_____ for large entities or $_____ for small entities who have filed a verified statement claiming such status. The surcharge is set forth in 37 CFR 1.16(e).

If all required items on this form are filed within the period set below, the total amount owed by applicant as a ☒ large entity, ☐ small entity (verified statement filed), is $_____.

Applicant is given **ONE MONTH FROM THE DATE OF THIS LETTER, OR TWO MONTHS FROM THE FILING DATE** of this application, **WHICHEVER IS LATER,** within which to file all required items and pay any fees required above to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

1. ☒ The statutory basic filing fee is: ☐ missing ☒ insufficient. Applicant as a ☒ large entity ☐ small entity, must submit $_____ to complete the basic filing fee.

2. ☐ Additional claim fees of $_____ as a ☐ large entity, ☐ small entity, including any required multiple dependent claim fee, are required. Applicant must submit the additional claim fees or cancel the additional claims for which fees are due.

3. ☒ The oath or declaration:
   ☒ is missing.
   ☐ does not cover items omitted at time of execution.

   An oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date is required.

4. ☐ The oath or declaration does not identify the application to which it applies. An oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.

5. ☐ The signature to the oath or declaration is: ☐ missing; ☐ a reproduction; ☐ by a person other than the inventor or a person qualified under 37 CFR 1.42, 1.43, or 1.47. A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.

6. ☐ The signature of the following joint inventor(s) is missing from the oath or declaration:

   _____ An oath or declaration listing the names of all inventors and signed by the omitted inventor(s), identifying this application by the above Application Number and Filing Date, is required.

7. ☐ The application was filed in a language other than English. Applicant must file a verified English translation of the application and a fee of $_____ under 37 CFR 1.17(k), unless this fee has already been paid.

8. ☐ A $_____ processing fee is required for returned checks. (37 CFR 1.21(m)).

9. ☐ Your filing receipt was mailed in error because check was returned without payment.

10. ☐ The application does not comply with the Sequence Rules. See attached Notice to Comply with Sequence Rules 37 CFR 1.821-1.825.

11. ☐ Other.

Direct ~~the response and any questions about this notice~~ to _____, Application Processing Division, Special Processing and Correspondence Branch (703) 308-1202.

A copy of this notice MUST be returned with the response.

COPY TO BE RETURNED WITH RESPONSE

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO./TITLE
08/134,086	10/08/93	DARBEE	P 93173

03B1/1230

THOMAS R. VIGIL
VIGIL & HANRATH
836 S. NORTHWEST HWY.
BARRINGTON, IL 60010

EXAMINER	
ART UNIT	PAPER NUMBER
0000	5

DATE MAILED: 12/30/93

NOTICE OF INCOMPLETE RESPONSE

Dear Sir:

Thank You for your response received on 11/10/93.

The office regrets, however, that the response is incomplete because you did not submit A Signed Declaration & Verified Statement as required by the Notice to File Missing Parts of the application mailed on 11-3-93.

To prevent **ABANDONMENT** of the application, a complete response is required.

The period for response remains as set forth in the office letter mailed on 11-3-93. However, you can obtain EXTENSIONS OF TIME under the provisions of 37 CFR 1.136 by filing a petition accompanied by the appropriate fee (37 CFR 1.17).

Please submit your response to the Special Processing Branch.

A copy of this notice **MUST** be returned with your response.

Sincerely,

Dorothy Dixon

SPECIAL PROCESSING AND CORRESPONDENCE BRANCH
ONIAR, APPLICATION PROCESSING DIVISION
(703)308-1202

PTOL-478 (REV. 12-90)

PART 1–OFFICE COPY

08/134086
5/1/94
#6/Atty 1e
Dftsmn

PATENT
New Continuation Appln.
Atty Docket 93173

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
PAUL V. DARBEE	)	Group Art Unit: Unknown
	)	
For: UNIVERSAL REMOTE CONTROL SYSTEM	)	Examiner: Unknown
	)	
Serial No.	)	
	)	
Filed:	)	

LETTER TO CHIEF DRAFTSMAN

TO:
Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

Applicant is replacing the drawing sheets initially filed in this application containing FIG's. 11-14 and 16-19B with a copy of the drawing sheets containing FIG's. 11-14 and 16-19b as amended and published in U.S. Patent No. 5,228,077 issued on the grandparent application, U.S. Application Serial No. 07/587,326, for: UNIVERSAL REMOTE CONTROL SYSTEM.

Respectfully submitted,

Thomas R. Vigil
Reg. No. 24,542

Dated:
October 8, 1993.

836 South Northwest Highway
Barrington, ILLINOIS 60010
(708) 382-6500

FIG. 11

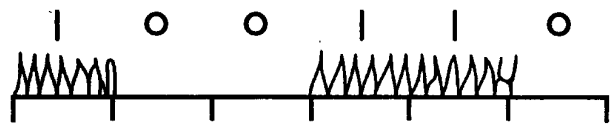
FIG. 11a 
FIXED BIT TIME,
FULL WIDTH BURST

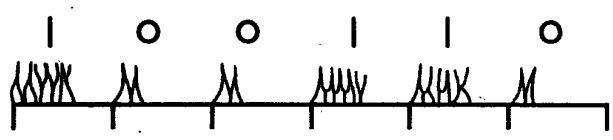
FIG. 11b 
FIXED BIT TIME,
BURST WIDTH MODULATED

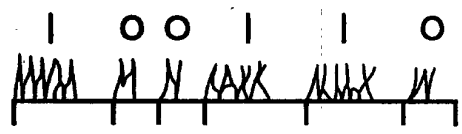
FIG. 11c 
FIXED OFF TIME,
BURST WIDTH MODULATED

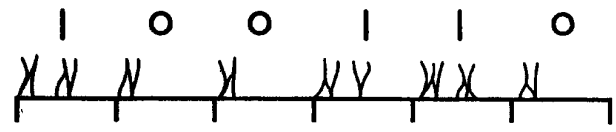
FIG. 11d 
FIXED BIT TIME,
SINGLE / DOUBLE BURST

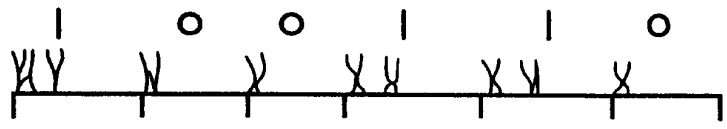
FIG. 11e 
FIXED OFF TIME,
SINGLE / DOUBLE BURST

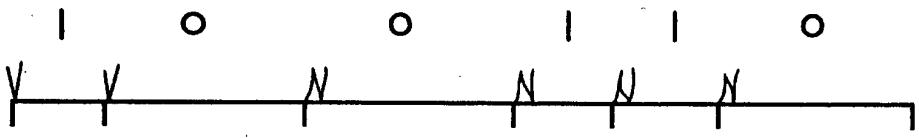
FIG. 11f 
FIXED BURST
TIME, OFF TIME
MODULATED

FIG. 11g 
RANDOM

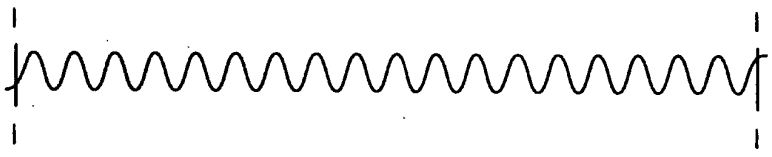
FIG. 11h 
ONE FREQUENCY
FOR EACH KEY

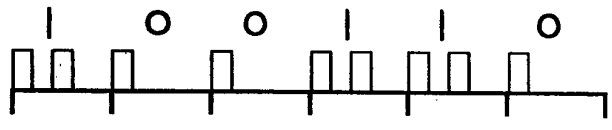
FIG. 11i 
SINGLE / DOUBLE PULSE,
FIXED BIT TIME

FIG. 12A

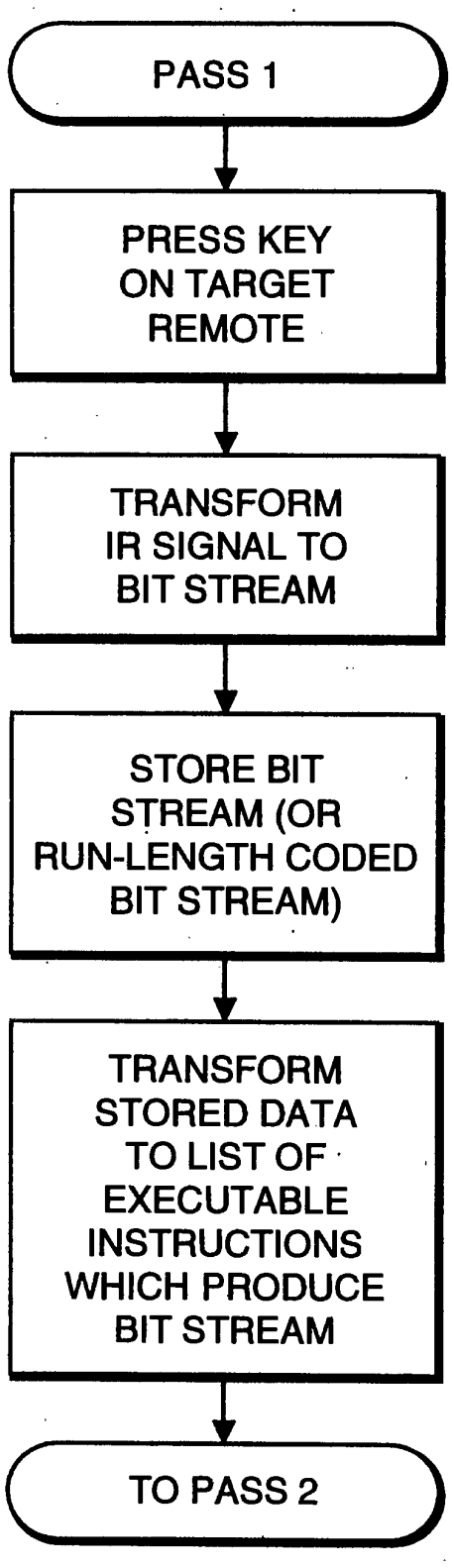


FIG. 12B

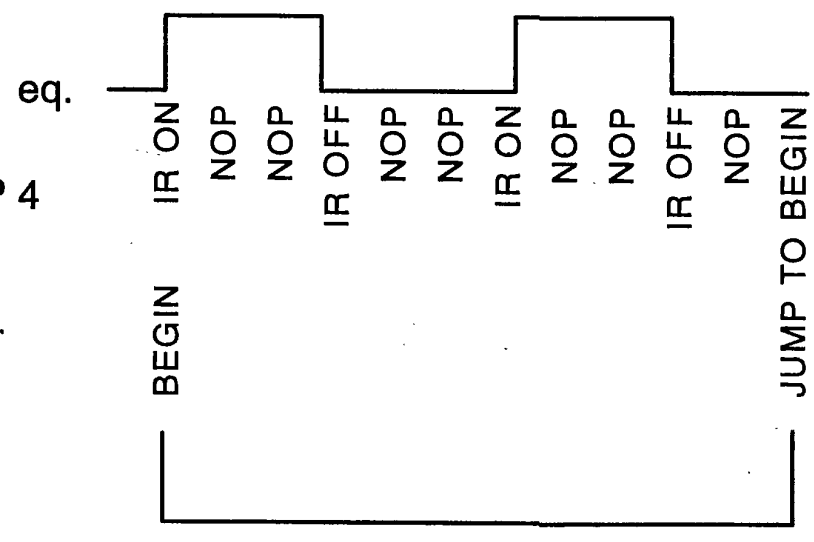


FIG. 13A

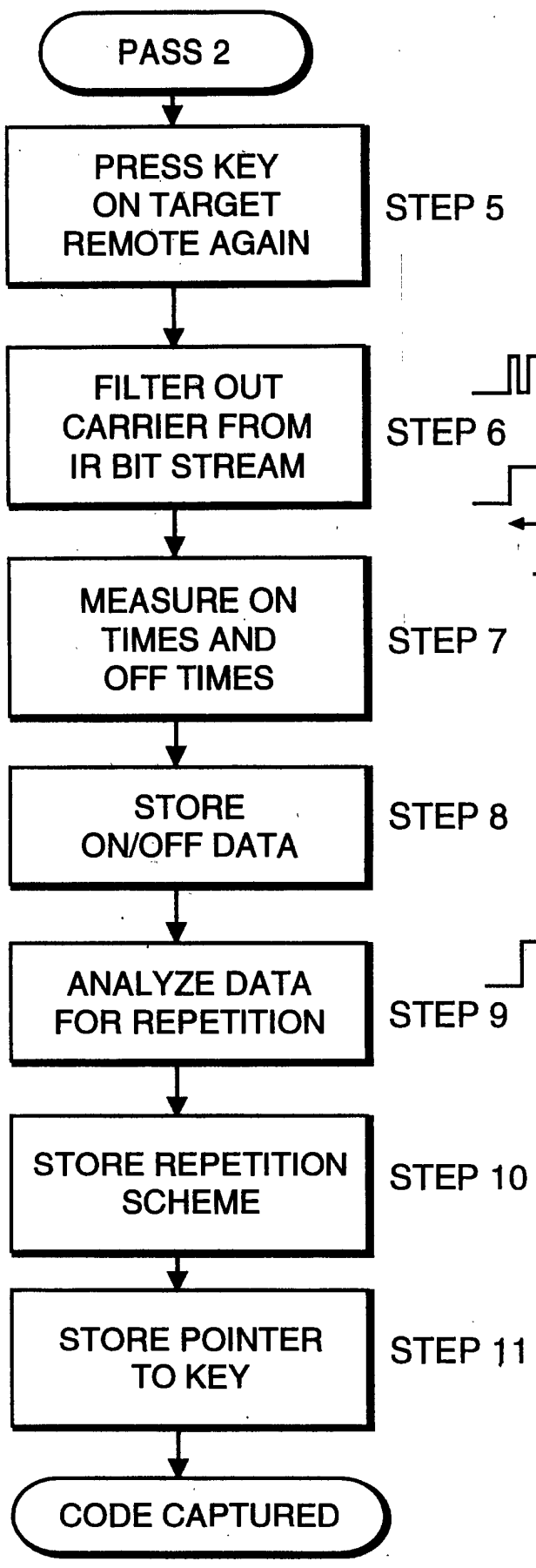


FIG. 13B

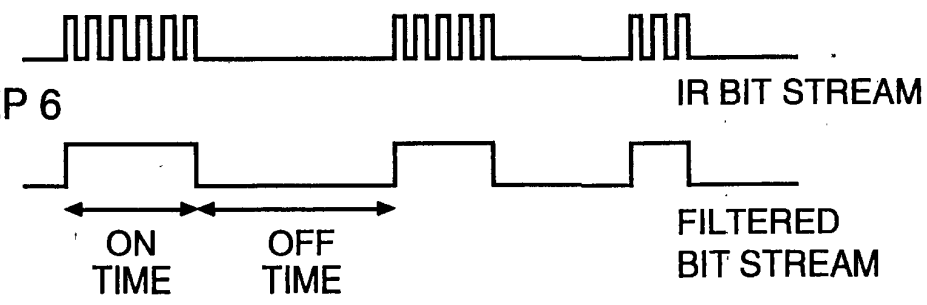


FIG. 13C

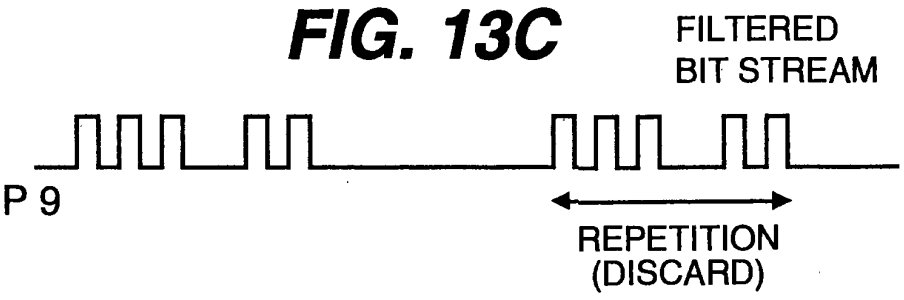
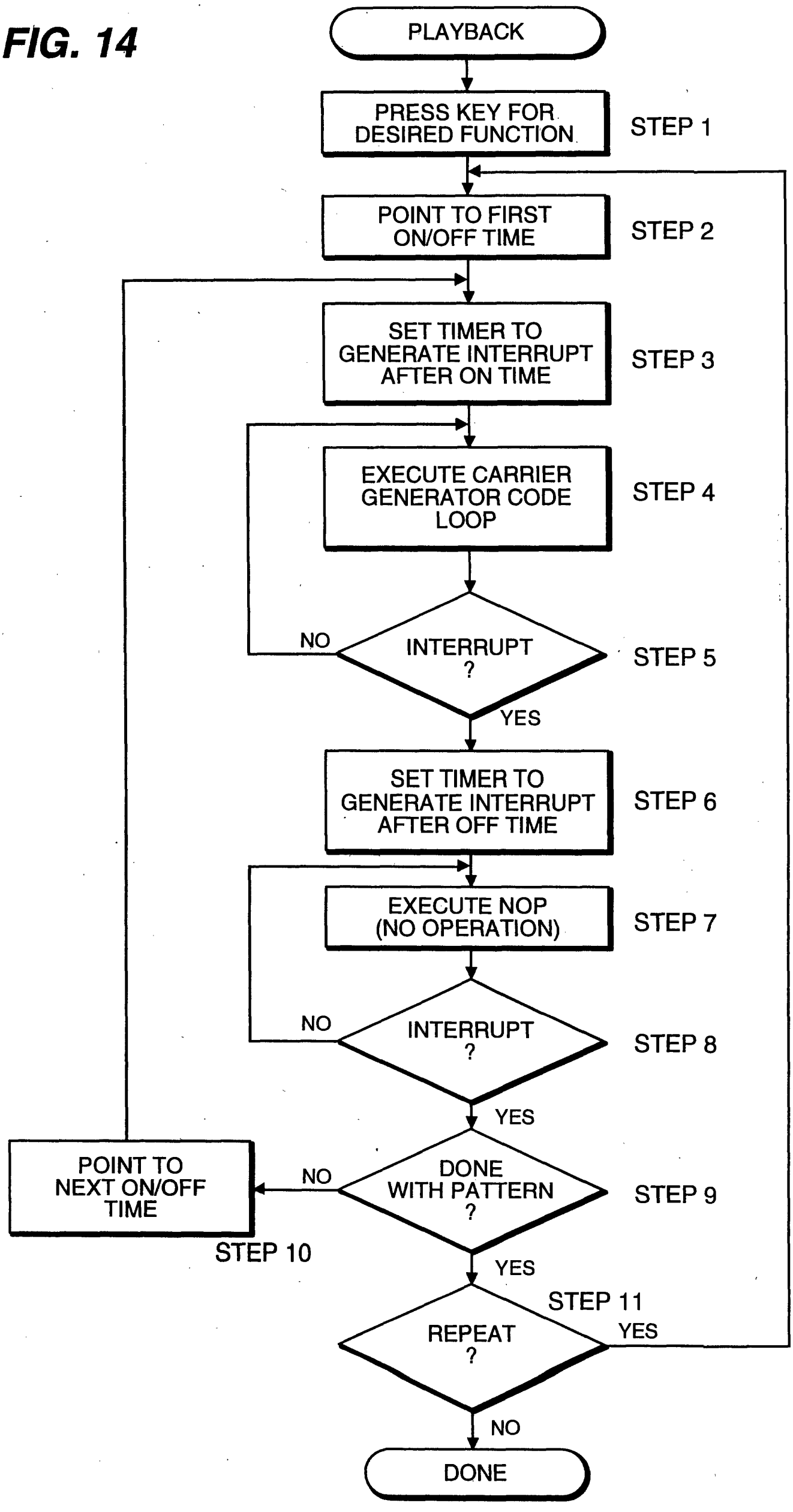


FIG. 14



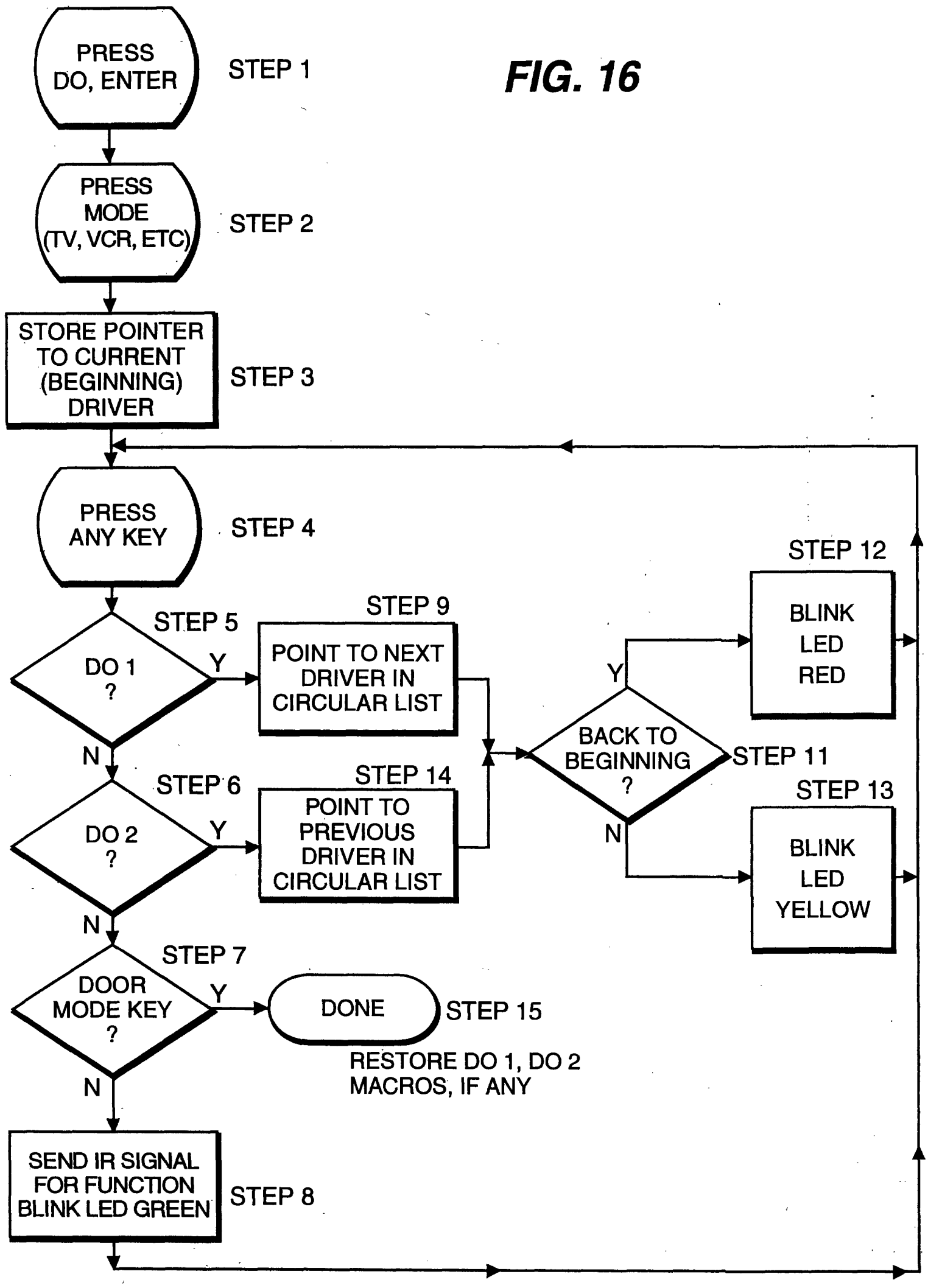


FIG. 16

FIG. 17

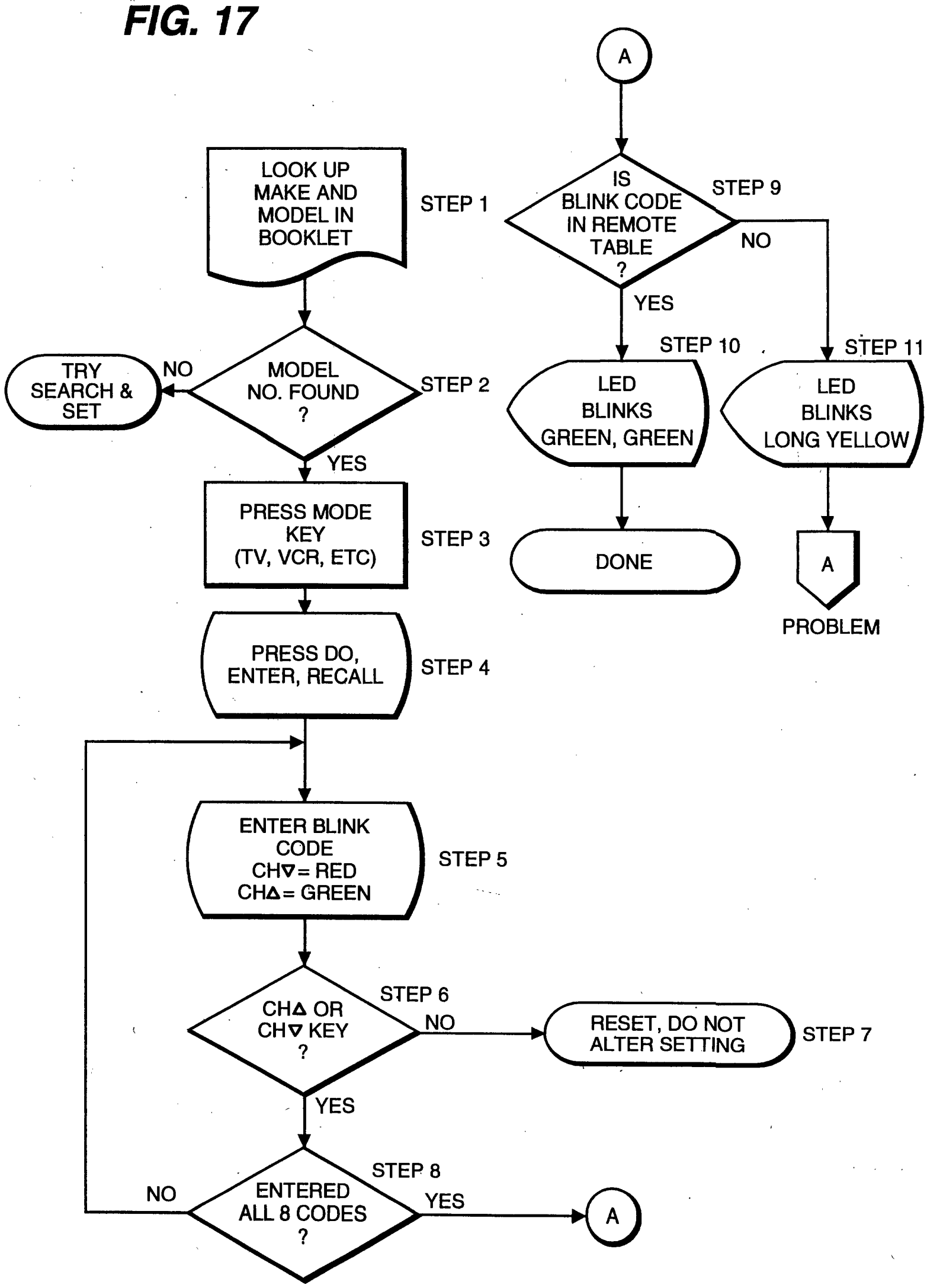


FIG. 18A

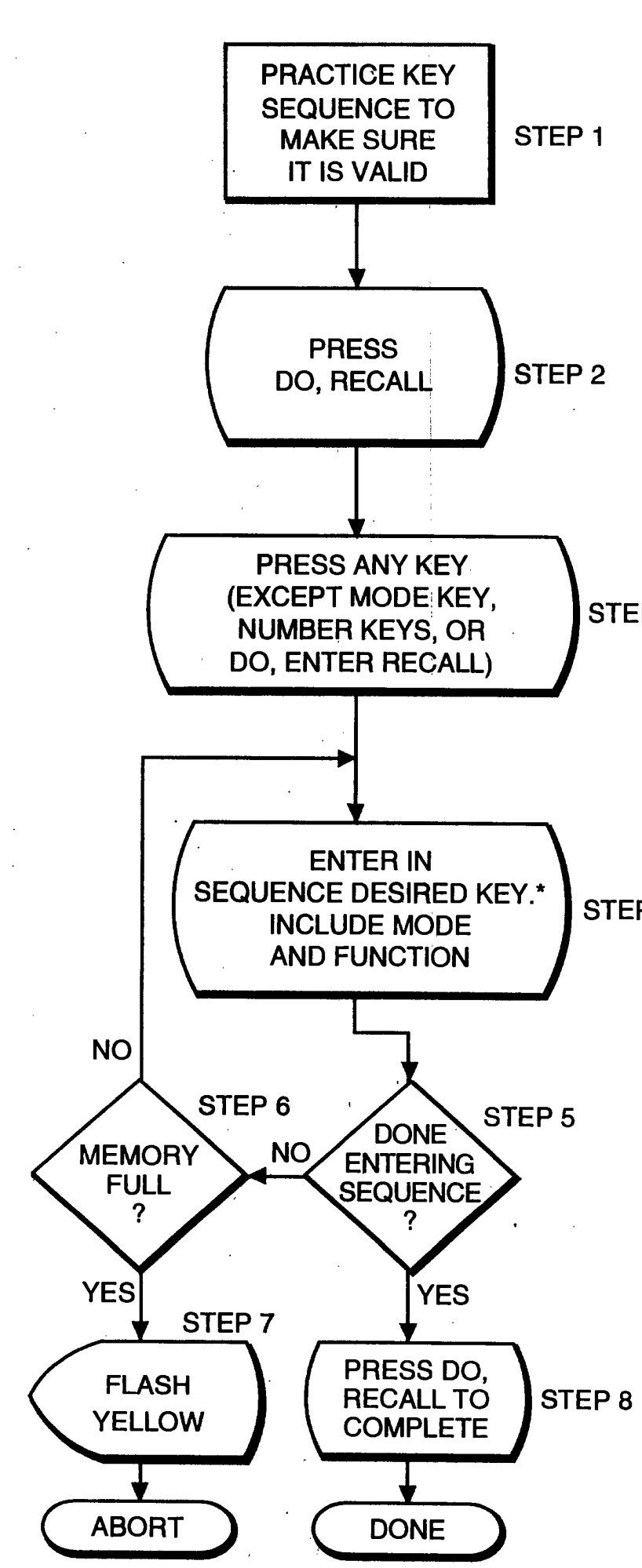
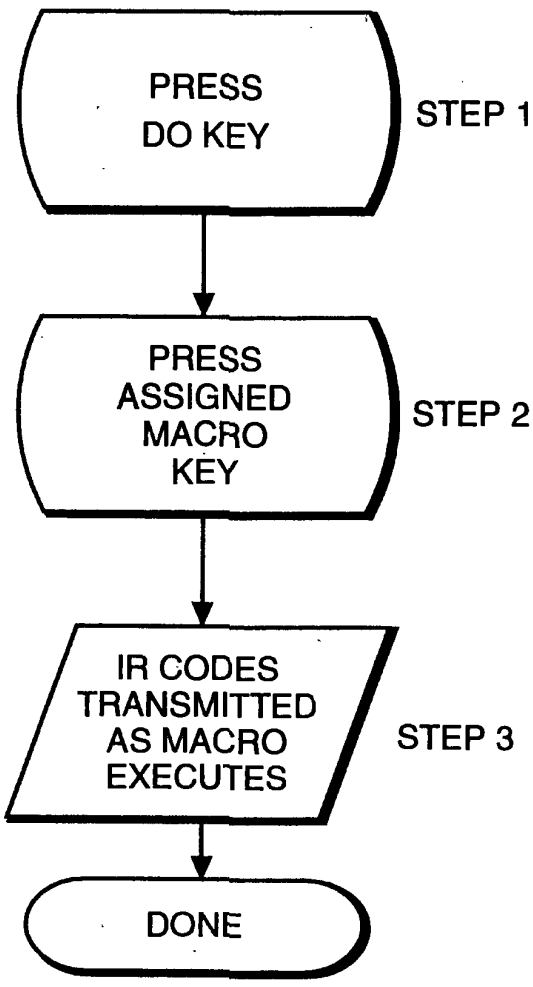


FIG. 18B



* eg. TV, POWER, VCR 1, POWER, PLAY, TV, 3, ENTER

FIG. 19A

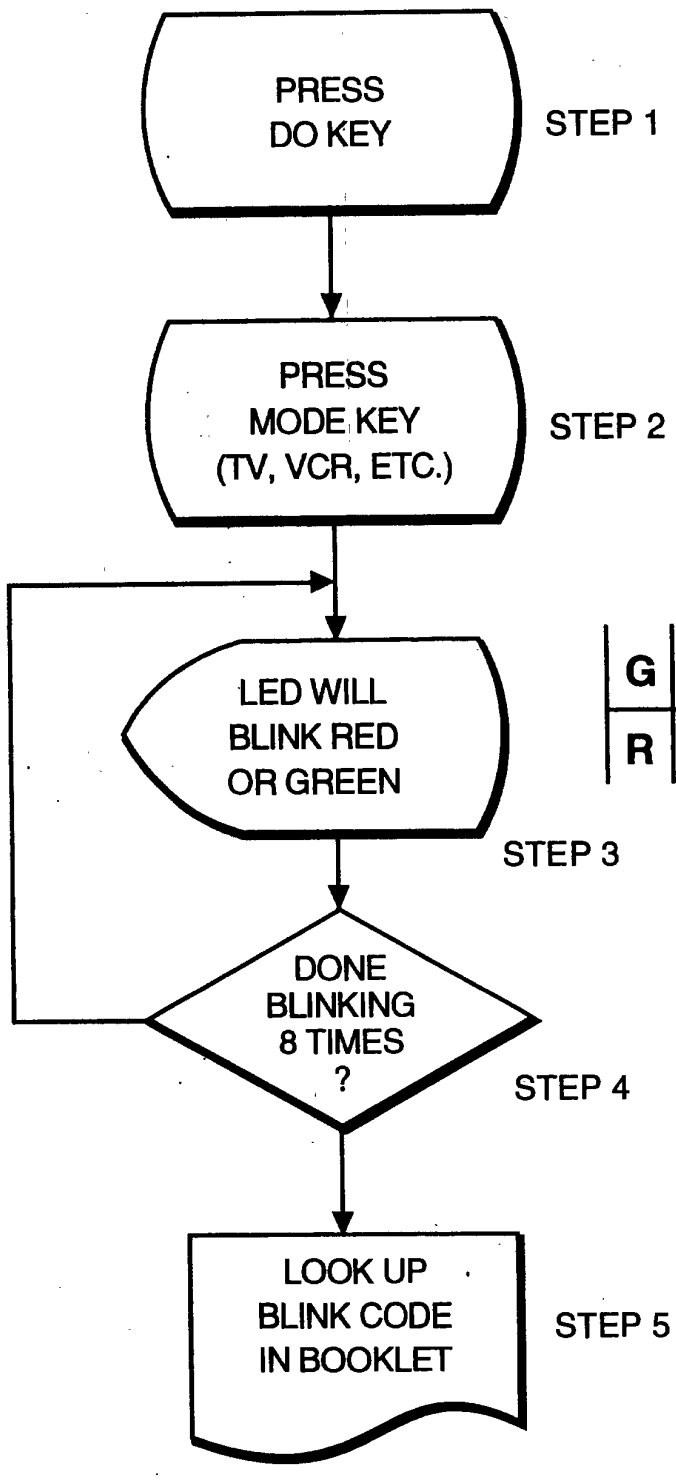


FIG. 19B

G	G	G	G	G	G	G	G
R	R	R	R	R	R	R	R

K. Ward
5/1/94
#7
Re Amdt
A Ent.

PATENT
New Continuation Appln.
Atty Docket 93173

w/prior art

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	
PAUL V. DARBEE	Group Art Unit: Unknown
For: UNIVERSAL REMOTE CONTROL SYSTEM	Examiner: Unknown
Serial No.	
Filed:	

PRELIMINARY AMENDMENT BEFORE ACTION

TO:
Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

Applicant requests that the subject application be amended as follows before examination:

IN THE TITLE OF THE INVENTION:

Please change the title of the application to read as follows:

--UNIVERSAL REMOTE CONTROL SYSTEM WITH DATA COUPLING--

IN THE SPECIFICATION:

Page 2, lines 19 through 33, containing the Summary Of The Invention, delete in their entirety and substitute in place thereof the following new Summary Of The Invention:

SUB C2

SUMMARY OF THE INVENTION

According to the present invention there is provided a universal remote control system with data coupling including: a universal remote control, a computer having a memory, instructions for operating the remote control and/or code data for creating appropriate infrared (IR) lamp driver instructions for causing an infrared signal generator to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, stored in the memory of the computer, the universal remote control comprising input circuitry including a set of keys or pushbuttons for inputting commands into the remote control, infrared signal output circuitry including IR

A1 Cont.

lamp driver circuitry for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to the input circuitry and to the signal output circuitry, a memory coupled to the CPU, and data coupling circuitry and structure for periodically coupling the computer to the remote control for receiving from the computer memory and inputting into the memory of the remote control (a) the instructions for operating the remote control and/or (b) the code data for creating appropriate IR lamp driver instructions, the code data causing the infrared signal output circuitry to emit infrared signals which will cause specific functions to occur in a specific controlled device when the input circuitry are operated, and the code data operating a variety of devices to be controlled and enabling the remote control to control various devices to be controlled upon the inputting of commands to the keys of the input circuitry.

A1 Cont.

Further according to the invention there is provided a universal remote control system with data coupling including: a universal remote control, a computer having a memory, instructions for operating the remote control and/or code data for creating appropriate infrared (IR) lamp driver instructions for causing an infrared signal generator to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, stored in the memory of the computer, a universal remote control comprising input circuitry including a set of keys or pushbuttons for inputting commands into the remote control, infrared signal output circuitry including IR lamp driver circuitry for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to the input circuitry and to the signal output circuitry, a memory coupled to the CPU, and data coupling circuitry and structure for periodically coupling the computer to the remote control for receiving from the computer memory and inputting into the memory of the remote control (a) the instructions for operating the remote control and/or (b) code data for creating appropriate IR lamp driver instructions for causing the infrared signal output circuitry to emit infrared signals which will cause specific functions to occur in a specific controlled

device, for operating a variety of devices to be controlled into the memory of the remote control to enable the remote control to control various devices to be controlled upon the inputting of commands to the keys of the input circuitry and a data transmission system including the data coupling circuitry and structure for coupling the remote control to the computer, directly, through a telephone line, through a modem and a telephone line, or through decoding circuitry and a television set which receives a television signal containing the instructions and/or the code data.

Still further according to the present invention there is provided a universal remote control system with data coupling including a universal remote control comprising input circuitry including a set of keys or pushbuttons for inputting commands into the remote control, infrared signal output circuitry including IR lamp driver circuitry for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to the input circuitry and to the signal output circuitry, a memory coupled to the CPU and data coupling circuitry and structure including terminal structure comprising a receiving port coupled to the CPU for enabling (a) instructions for operating the remote control and/or (b) the code data for creating appropriate IR lamp driver instructions for causing the infrared signal output circuitry to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, to be supplied from outside the remote control through the receiving port of the terminal structure directly to the CPU for direct entry to the memory to enable the remote control to control various devices to be controlled upon the inputting of commands to the keys of the input circuitry and a data transmission system including coupling circuitry for coupling the terminal structure to a computer, directly, through a telephone line, through a modem and a telephone line, or through decoding circuitry and a television set which receives a television signal containing the instructions and/or the code data.

After page 16, please insert pages 16a, 16b and 16c attached hereto.

Pages 19a and 19b, delete in their entirety.

IN THE CLAIMS:

Please cancel claim 1, amend claims 2 and 3 in the manner set forth below and add new claims 9-16 set forth below.

2. (Amended) The universal remote control system of claim [1] wherein said data-transmission system includes a serial port connector for connecting to said remote control, a cable connected to said serial port connector and means for coupling said connector to a telephone line or to a television set.

3. (Amended) The universal remote control system of claim 2 wherein said coupling means include a vertical blanking interval decoder, defining a decoding means, connected to a television set.

New Claims:

A universal remote control system with data coupling including: a universal remote control comprising input means including a set of keys or pushbuttons for inputting commands into the remote control, infrared signal output means including IR lamp driver means for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to the input means and to the signal output means, memory means coupled to the CPU and data coupling means including terminal structure comprising a receiving port coupled to the CPU for enabling (a) instructions for operating the remote control and/or (b) code data for creating appropriate IR lamp driver instructions for causing the infrared signal output means to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, to be supplied from outside the remote control through the receiving port of the terminal structure directly to the CPU for direct entry to the memory to enable the remote control to control various devices to be controlled upon the inputting of commands to the keys of the input means and a data transmission system including coupling means for coupling the terminal structure to a computer, directly, through a telephone line, through a modem and a telephone line, or through decoding means and a television set which receives a television signal containing the instructions and/or the code data.

10. The universal remote control system of claim 9 wherein said memory means include a non-volatile, read-write memory.

11. The universal remote control system of claim 9 wherein said universal remote control further includes a visual display coupled to the CPU whereby various data including information about the data being input into said memory means can be displayed on said visual display to a user.

12. The universal remote control system of claim 9 wherein said terminal means comprise three serial ports coupled to said CPU, one port being coupled to the ground for the CPU, one port, forming said receiving port, being coupled to an input of said CPU and one port, forming a sending port, being coupled to an output of said CPU.

13. The universal remote control system of claim 9 wherein said coupling means includes a cable, first connector means at one end of said cable for connection to said terminal means, and interface connector means at the other end of said cable for connecting to a computer, directly, through a telephone line, through a modem and a telephone line, or through decoding means, a television set, and a television signal which is picked up by the television set and which has data from a computer.

14. A universal remote control system with data coupling including: a universal remote control, a computer having a memory, instructions for operating said remote control and/or code data for creating appropriate infrared (IR) lamp driver instructions for causing an infrared signal generator to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, stored in said memory of said computer, said universal remote control comprising input means including a set of keys or pushbuttons for inputting commands into said remote control, infrared signal output means including IR lamp driver means for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to said input means and to said signal output means, memory means coupled to said CPU, and data coupling means for periodically coupling said computer to said remote control for

receiving from said computer memory and inputting into said memory means of said remote control (a) said instructions for operating said remote control and/or (b) said code data for creating appropriate IR lamp driver instructions, said code data causing said infrared signal output means to emit infrared signals which will cause specific functions to occur in a specific controlled device when said input means are operated, and said code data operating a variety of devices to be controlled and enabling said remote control to control various devices to be controlled upon the inputting of commands to said keys of said input means.

15. A universal remote control system with data coupling including: a universal remote control, a computer having a memory, instructions for operating said remote control and/or code data for creating appropriate infrared (IR) lamp driver instructions for causing an infrared signal generator to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, stored in said memory of said computer, said universal remote control comprising input means including a set of keys or pushbuttons for inputting commands into said remote control, infrared signal output means including IR lamp driver means for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to said input means and to said signal output means, memory means coupled to said CPU, and data coupling means for periodically coupling said computer to said remote control for receiving from said computer memory and inputting into said memory means of said remote control (a) said instructions for operating said remote control and/or (b) said code data for creating appropriate IR lamp driver instructions for causing said infrared signal output means to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled into said memory means of said remote control to enable said remote control to control various devices to be controlled upon said inputting of commands to said keys of said input means and a data transmission system including said data coupling means for coupling said remote control to said

computer, directly, through a telephone line, through a modem and a telephone line, or through decoding means and a television set which receives a television signal containing said instructions and/or said code data.

16. A universal remote control system with data coupling including: a universal remote control, a computer having a memory, instructions for operating said remote control, stored in said memory of said computer, said universal remote control comprising input means including a set of keys or pushbuttons for inputting commands into said remote control, infrared signal output means including IR lamp driver means for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to said input means and to said signal output means, memory means coupled to said CPU for storing instructions and code data for creating appropriate IR lamp driver instructions, said code data causing said infrared signal output means to emit infrared signals which will cause specific functions to occur in a specific controlled device when said input means are operated, and said code data operating a variety of devices to be controlled and enabling said remote control to control various devices to be controlled upon the inputting of commands to said keys of said input means, and data coupling means for periodically coupling said computer to said remote control for receiving from said computer memory and inputting into said memory means of said remote control said instructions for operating said remote control.

17. A universal remote control system with data coupling including: a universal remote control, a computer having a memory, instructions for operating said remote control, stored in said memory of said computer, said universal remote control comprising input means including a set of keys or pushbuttons for inputting commands into said remote control, infrared signal output means including IR lamp driver means for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to said input means and to said signal output means, memory means coupled to said CPU for storing instructions and code data for creating appropriate IR lamp driver instructions, said code data causing said infrared

signal output means to emit infrared signals which will cause specific functions to occur in a specific controlled device when said input means are operated, and said code data operating a variety of devices to be controlled and enabling said remote control to control various devices to be controlled upon the inputting of commands to said keys of said input means, and data coupling means for periodically coupling said computer to said remote control for receiving from said computer memory and inputting into said memory means of said remote control said instructions for operating said remote control, and a data transmission system including said data coupling means for coupling said remote control to said computer, directly, through a telephone line, through a modem and a telephone line, or through decoding means and a television set which receives a television signal containing said instructions and/or said code data.

IN THE ABSTRACT OF THE DISCLOSURE:

Please delete page 32 containing the Abstract Of The Disclosure in its entirety and substitute in place thereof the following Abstract Of The Disclosure:

ABSTRACT OF THE DISCLOSURE

The universal remote control system includes a universal remote control and a computer having a memory and instructions for operating the remote control and/or code data for creating appropriate IR lamp driver instructions for causing an infrared signal generator to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, stored in the memory of the computer. The universal remote control comprises: input circuitry including a set of keys or pushbuttons for inputting commands into the remote control, infrared signal output circuitry including IR lamp driver circuitry for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to the input circuitry and to the signal output circuitry, a memory coupled to the CPU, and data coupling circuitry and structure for periodically coupling the computer to the remote control for inputting from the computer memory instructions for operating the remote control and/or appropriate IR lamp driver

instructions for causing the infrared signal output circuitry to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled into the memory of the remote control to enable the remote control to control various devices to be controlled upon the inputting of commands to the keys of the input circuitry.

IN THE DRAWINGS:

By separate letter to the Chief Draftsman, applicant is replacing the drawing sheets initially filed in this application containing FIG's. 11-14 and 16-19B with a copy of the drawing sheets containing FIG's. 11-14 and 16-19b as amended and published in U.S. Patent No. 5,228,077 issued on the grandparent application, U.S. Application Serial No. 07/587,326, for: UNIVERSAL REMOTE CONTROL SYSTEM.

REMARKS

Applicant submits that the universal remote control system with data coupling defined in claims 2-17 is patentably distinguished over all of the references to be of record and set forth in the Information Disclosure Statement submitted in the parent application. A copy of PTO form 1449 submitted in the parent application is enclosed herewith and applicant requests that they be made of record. Copies of these prior art references are to be found in the parent application. If the Examiner wishes applicant to submit any of the references cited in this PTO form 1449, applicant will be happy to do so upon receiving a request for same from the Examiner.

Respectfully submitted,

Thomas R. Vigil

Thomas R. Vigil
Reg. No. 24,542

Dated:
October 7, 1993.

836 South Northwest Highway
Barrington, ILLINOIS 60010
(708) 382-6500

TABLE 1

DEVICE BLINK CODES AND SPECIAL FEATURE BUTTONS
TELEVISION SETS

Blink Code	A	B	C	D	E	F	G	H
RRRR RRRR	Display	MTS	Pict +	Pict –	Sleep	TV/Video	Ant	Tone
	25 = Col Up	26 = Col Dn	27 = Brt Up	28 = Brt Dn	29 = Hue Up	30 = Hue Dn	31 = Mtx	32 = Reset
RRRG RRRG	Screen Dn	Sp Phne/ Prnt Ctl	AutoOn/ Data Ent	AutoOff/ Data Clr	Ant	Stereo		
RRRG RGRG	Add	Clear						
RRRG GRRR	A Ch	Hi Fi						
RRRG GRGR	Ant / Aux	Time / Ch	Program	TV / VCR				
RRRG GGGR	Ant / Aux	Time / Ch						
RRRG GGGG	Pwr On	Pwr Off	Display	Ant				
GRRG RRRG	Aux	Last Ch	Timer					
GRRG RRGG	Fine Up	Fine Dn	L Ctl	R Ctl	OBC	Func	Review	BiLing
	25 = Stereo	26 = TimeFa	27 = Timer	28 = TimeS1	29 = TV / AV			
GRRG RGRR	Fine Up	Fine Dn	L Ctl	R Ctl	OBC	Func	Review	BiLing
	25 = Stereo	26 = TimeFa	27 = Timer	28 = TimeS1	29 = TV / AV			
GRRG RGGR	Tint R	Tint L	Color R	Color L	Contr R	Contr L	Timer	Stereo
	24 = SAP 32 = Ext 1	25 = Reset 33 = Ext 2	26 = Q/V 34 = Ant	27 = EXP	28 = Disp	29 = Mono	30 = Lock	31 = TV
GRRG GRRG	TV / Video	Time						
GRRG GRGR	TV / Video	Wide	Lvl Up	Lvl Dn	Memory	Func	MTC	Stereo
	25 = Timer	26 = 100	27 = BiLing					
GRRG GRGG	10	11	12	13				
GRRG GGRR	RF12	Ch Rtn	Str SAP	Mono	Timer	T Set	TV / CATV	TV / Vid
	26 = 100 34 = Pict	27 = Audio 35 = Reset	28 = CCC1	29 = CCC2	30 = CCC3	31 = CCC4	32 = ContDn	33 = ContUp
GRGG RRRR	Sleep	Review						
GRGG RRRG	K	L						
GRGG RRGR	SAP	Sleep	TV / Video					
GRGG RRGG	Program	Q Rev	SAP	Sleep	TV / Video	Add	Delete	
GRGG RGRG	Sleep	St / SAP	TV / Video					
GRGG RGGR	11	12	13	14	15	16		
GRGG RGGG	K	L						
GRGG GRRR	K	L						

TABLE 1 (continued)

VIDEO CASSETTE RECORDERS

Blink Code	A	B	C	D	E	F	G	H
RRRR RRRR	Nse Cncl							
RRGR RRRG	Ant							
RRGR RRGR	Ant							
RRGR RRGG	Frm Adv	Slow	Slow Up	Slow Dn	Srch Fwd	Srch Rev		
RRGR RGRR	A	B	C	D	E	F	Slow	
RRGR GGGR	Slow							
RRGR RGGR	Slow +	Slow –	Eject	CM Skip	Program	Input	Mode	AM / PM
	28 = Shift	29 = Reset	30 = Mem / PS	31 = SR				
RRGR RGGG	Forward	FlshBack	Ant	Vol +	Vol –	Reverse	Sp Phne	PC
RRGR GRRR	Ant / Aux							
RRGR GRRG	11	12	13	14	15	16		
RRGR GRGR	Frm Adv	Memory	Reset	Chg Time				
RRGR GGRR	Pwr On	Pwr Off						
RRGR GGGG	Slow	Slow Up	Slow Dn	Set Up	Set Dn	Timer	Clear	Display
	29 = Frame 37 = Clock	30 = Memory 38 = APS	31 = Prog 39 = 100	32 = Qtr	33 = QtrStr	34 = Quick	35 = Remain	36 = Rst
GGRG RRRR	K	L						
GGRG RRRG	CFM	Slow						
GGRG RRGR	Slow	OSP	Shift L	Shift R	Slow Dn	Slow Up	St +	St –
	28 = Timer							
GGRG RRGG	11	12	13	14	15	16	Slow	
GGRG RGRR	Slow Dn	Slow Up	Slow					

TABLE 1 (continued)

CABLE CONVERTERS

Blink Code	A	B	C	D	E	F	G	H
RRRR RRGR	A / B	Add	Delete	Set	Lock	Last Ch		
RRRR RRGG	A	B	Event (*)	#	Arrow Up	Arrow Dn	AP	Delete
	25 = F	26 = K	27 = Learn	28 = PGM	29 = TCP	30 = Enter		
RRRR RGRR	Skew L	Skew R	Audio	SAT	Ant East	Ant West		
RRRR RGRG	Plus	Minus	Dot	Box	Str	Clear	Time	Auth
	22 = C / R	23 = #						
RRRR RGGR	Prog	Auth						
RRRR RGGG	Auth							
RRRR GRRR	Auth	Prog						
RRRR GRRG	Plus	Minus	Rcp	*	M1	M2	M3	M4
RRRR GRGR	A – B	Dot 1	Dot 2	*	Am	Dm	F	
RRRR GRGG	Arrow Up	Arrow Dn						

COMPACT DISK PLAYERS

Blink Code	A	B	C	D	E	F	G	H
RRRR RRRR	CD Fwd	CD BckUp						
GRRG GRGG	Fwd Indx	Rev Indx	Repeat	Memory				

* For numbered functions, press "DO" then the two-digit number.

08/134086

FORM PTO-1449 (REV. 8-83)

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

ATTY. DOCKET NO.	SERIAL NO.
92348	08/134,086

APPLICANT: Paul V. Darbee

FILING DATE	GROUP
10/8/93	2600

INFORMATION DISCLOSURE CITATION

(Use several sheets if necessary)

U.S. PATENT DOCUMENTS

★EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
WC	AA	3 9 5 6 7 4 5	5/11/76	Ellis	340	337	
	AB	4 0 2 8 4 9 3	6/7/77	Brennemann et al.	~~179~~	~~2 DP~~	
	AC	4 0 3 8 5 3 3	7/26/77	Dummermuth et al.	235	151.11	
	AD	4 2 0 0 8 6 2	4/29/80	Campbell et al.	340	310A	
	AE	4 2 4 5 3 4 2	1/13/81	Entenman	371	8	
	AF	4 3 5 6 5 0 9	10/26/82	Skerlos et al.	358	85	
	AG	4 3 8 6 4 1 2	5/31/83	Ito	364	710	
	AH	4 3 8 6 4 3 6	5/31/83	Kocher et al.	455	151	
	AI	4 4 2 5 6 4 7	1/10/84	Collins et al.	371	70	
	AJ	4 4 8 8 1 7 9	12/11/84	Kruger et al.	358	181	
WC	AK	4 5 0 3 2 8 8	3/5/85	Kessler	~~179~~	~~2 DP~~	

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
	AL							
	AM							
	AN							
	AO							
	AP							

OTHER DOCUMENTS *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	AR	
	AS	
	AT	

EXAMINER	DATE CONSIDERED
W. F. Chan	6/17/94

FORM PTO-1449 (REV. 8-83)

U.S. DEPARTMENT OF COMMERCE
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ATTY. DOCKET NO.	SERIAL NO.
92348	08/134,086
APPLICANT	
Paul V. Darbee	
FILING DATE	**GROUP**
10/8/93	2600

U.S. PATENT DOCUMENTS

★EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
WEC	AA	4 5 0 9 2 1 1	4/2/85	Robbins	455	603	
	AB	4 5 1 7 5 6 4	5/14/85	Morishita et al.	340	825.69	
	AC	4 5 3 5 3 3 3	8/13/85	Twardowski	340	825.69	
	AD	4 5 6 6 0 3 4	1/21/86	Harger et al.	358	194.1	
	AE	4 5 8 0 0 0 9	4/1/86	Darland	~~179~~	~~2C~~	
	AF	4 5 9 9 4 9 1	7/8/86	Serrano	~~179~~	~~2C~~	
	AG	4 6 2 3 8 8 7	11/18/86	Welles, II	340	825.57	
	AH	4 6 2 5 0 8 0	11/25/86	Scott	379	104	
	AI	4 6 2 6 8 4 7	12/2/86	Zato	340	825.56	
↓	AJ	4 6 2 6 8 4 8	12/2/86	Ehlers	340	825.69	
WEC	AK	4 7 0 3 3 5 9	10/27/87	Rumbolt et al.	358	194.1	

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
	AL							
	AM							
	AN							
	AO							
	AP							

OTHER DOCUMENTS *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	AR	
	AS	
	AT	

EXAMINER	DATE CONSIDERED
W. E. Chan	6/17/94

★EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance

FORM PTO-1449 (REV. 8-83)

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

INFORMATION DISCLOSURE CITATION

(Use several sheets if necessary)

ATTY. DOCKET NO.	SERIAL NO.
92348	08/134,086
APPLICANT: Paul V. Darbee	
FILING DATE: 10/8/93	GROUP: 2600

U.S. PATENT DOCUMENTS

★EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
WFC	AA	4 7 1 2 1 0 5	12/8/87	Kohler	340	825.69	
	AB	4 7 1 8 1 1 2	1/5/88	Shinoda	455	151	
	AC	4 7 4 6 9 1 9	5/24/88	Reitmeier	340	825.56	
	AD	4 7 6 9 6 4 3	9/6/88	Sogame	340	825.690	
	AE	4 7 7 1 2 8 3	9/13/88	Imoto	340	825.71	
	AF	4 7 7 4 5 1 1	9/27/88	Rumbolt et al.	340	825.69	
	AG	4 7 9 4 3 7 1	12/27/88	Yamamoto	340	825.64	
	AH	4 8 0 2 1 1 4	1/31/88	Sogame	364	900	
	AI	4 8 0 7 0 5 2	2/21/89	Amano	358	194.1	
	AJ	4 8 2 5 2 0 0	4/25/89	Evans et al.	341	23	
WFC	AK	4 8 4 1 3 6 8	6/20/89	Rumbolt et al.	358	194.1	

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
	AL							
	AM							
	AN							
	AO							
	AP							

OTHER DOCUMENTS *(Including Author, Title, Date, Pertinent Pages, Etc.)*

	AR	
	AS	
	AT	

EXAMINER	DATE CONSIDERED
W.F. Chan	6/17/94

★EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance

FORM PTO-1449 (REV. 8-83) — U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

INFORMATION DISCLOSURE CITATION

(Use several sheets if necessary)

ATTY. DOCKET NO.	SERIAL NO.
92348	08/134,086
APPLICANT: Paul V. Darbee	
FILING DATE: 10/8/93	GROUP: 2600

U.S. PATENT DOCUMENTS

★EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
WFC	AA	4 855 746	8/8/89	Stacy	341	176	
	AB	4 856 081	8/8/89	Smith	455	151	
	AC	4 860 380	8/22/89	Mengel	455	185	
	AD	4 866 434	9/12/89	Keenan	340	825.72	
	AL	4 875 096	10/17/89	Baer et al.	358	143	
	AF	4 885 766	12/5/89	Yasuoka et al.	379	105	
	AG	4 899 370	2/6/90	Kameo et al.	379	104	
	AH	4 918 439	4/17/90	Wozniak et al.	340	825.690	
	AI	4 965 557	10/23/91	Schepers et al.	340	711	
WFC	AJ	5 088 023	2/11/92	Nakamura et al.	395	425	
	AK						

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
WFC	AL	2 053 539	A 2/1981	United Kingdom				
	AM	2 126 000	A 3/1984	United Kingdom				
	AN	2 166 322	A 4/1986	United Kingdom				
	AO	2 136 177	A 9/1984	United Kingdom				
WFC	AP	3 313 493	C2 10/1984	Germany			x	

OTHER DOCUMENTS *(Including Author, Title, Date, Pertinent Pages, Etc.)*

WFC	AR	"IEEE JOURNAL OF SOLID-STATE CIRCUITS", Vol. SC-11, No. 6, December 1976, Casier et al., pages 800-808, "Pulse Position Modulation Transmission System For Remote Control Of A TV Set"
WFC	AS	"IEEE TRANSACTIONS ON CONSUMER ELECTRONICS", Vol. CE-31, No. 1, February 1985, pages 59-69, J. Platte et al. "A new intelligent remote control for consumer electronic devices"
WFC	AT	"IEEE SPECTRUM", March 1983, pages 48-53, I. Dorros, "Telephone nets go digital"

EXAMINER	DATE CONSIDERED
W. F. Chan	6/17/94

★EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance

03BO 12/29

PATENT
USSN 08/134,086
Atty Docket 93173

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

PAUL V. DARBEE

For: UNIVERSAL REMOTE CONTROL SYSTEM

Serial No. 08/134,086

Filed: October 8, 1993

Group Art Unit: Unknown

Examiner: Unknown

LETTER SUBMITTING NON-CITABLE U.S. PATENT REFERENCE TO EXAMINER

TO:
Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

Applicant hereby submits a copy of the Levine U.S. Patent No. 5,123,046.

The Levine patent is just of interest and not art that can be cited against the claims of the subject application because the Levine patent has a filing date after Applicant's priority date under 35 U.S.C. § 120 of September 24, 1990.

Respectfully submitted,

Thomas R. Vigil
Reg. No. 24,542

Dated:
November 24, 1993.

836 South Northwest Highway
Barrington, Illinois 60010
(708) 382-6500

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first-class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, DC 20231 on

Date 11/24/93 Thomas R Vigil

0360
12-1-9
1

PATENT
SN: 08/134,086
Atty Docket: 93173

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Darbee	) Group Art Unit: Unknown
For: UNIVERSAL REMOTE CONTROL SYSTEM	) Examiner: Unknown
Serial No.: 08/134,086	
Filed: October 8, 1993	

INFORMATION DISCLOSURE STATEMENT

TO:
Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

In accordance with Applicant's duty of disclosure under 37 C.F.R. 1.56, Applicant hereby submits (a) a PTO Form 1449 listing the following references, and (b) a copy of the references listed below:

U.S. PATENT NO.	PATENTEE	ISSUE DATE
4,935,870	Burk, Jr. et al.	06/19/90
5,005,118	Lenoski	04/02/91
5,032,983	Fu et al.	07/16/91
5,187,469	Evans et al.	02/16/93

U.K. PUBLICATION NO.	APPLICANT	PUBLICATION DATE
2,215,928	Rank Precision Industries Limited	09/27/89
2,229,022	Creda Limited	09/12/90

E.P. PUBLICATION NO.	APPLICANT	PUBLICATION DATE
0 446 864 A2	Pioneer Electronic Corporation	09/18/91

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first-class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, DC 20231 on

Date 11/30/93 Thomas L. Wood

This Information Disclosure Statement is being filed before the mailing date of a first Office Action, therefore Applicant believes that no fee or certification is necessary for the Examiner to consider the cited references.

However, if a fee is necessary, Applicant authorizes the Commissioner to charge any fee necessary required under 37 CFR § 1.17 to Attorney's Deposit Account No. 22-0355.

It is respectfully requested that the Examiner indicate consideration of the cited references by returning a copy of the enclosed Form PTO 1449 with initials or other appropriate remarks.

Respectfully submitted,

Thomas R. Vigil
Reg. No. 24,542

Dated: November 30, 1993

Thomas R. Vigil
Vigil & Hanrath
836 S. Northwest Highway
Barrington, Illinois 60010
(708) 382-6500

FORM PTO-1449 (REV. 70) U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

INFORMATION DISCLOSURE CITATION

(Use several sheets if necessary)

ATTY. DOCKET NO.	SERIAL NO.
93173	08/134,086
APPLICANT	
Darbee	
FILING DATE	**GROUP**
10/08/93	2600 ~~Unknown~~

#9

U.S. PATENT DOCUMENTS

* EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
WFC	AA	4 9 3 5 8 7 0	06/19/90	Burk, Jr. et al.			
WFC	AB	5 0 0 5 1 1 8	04/02/91	Lenoski			
WFC	AC	5 0 3 2 9 8 3	07/16/91	Fu et al.			
WFC	AD	5 1 8 7 4 6 9	02/16/93	Evans et al.			
	AE						
	AF						
	AG						
	AH						
	AI						
	AJ						
	AK						

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
WFC	AL	0 4 4 6 8 6 4	9/1991	European Patent Office				
WFC	AM	2 2 1 5 9 2 8	9/1989	United Kingdom				
WFC	AN	2 2 2 9 0 2 2	9/1990	United Kingdom				
	AO							
	AP							

OTHER DOCUMENTS *(including Author, Title, Date, Pertinent Pages, Etc.)*

	AR	
	AS	
	AT	

EXAMINER	DATE CONSIDERED
W. F. Chan	6/17/94

*** EXAMINER:** Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

1

2617 A/N. Kyland 5/1/94 #10/1/94 Pending

PATENT
SN: 08/134,086
Atty Docket: 93173

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

2611 3-9-94 020

In re Application of:
Darbee

For:
UNIVERSAL REMOTE CONTROL SYSTEM

Serial No.: 08/134,086

Filed: October 8, 1993

Group Art Unit:
Unknown

Examiner:
Unknown

INFORMATION DISCLOSURE STATEMENT

TO:
Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

In accordance with Applicant's duty of disclosure under 37 C.F.R. § 1.56, Applicant hereby submits (a) a PTO Form 1449 listing the following references and (b) a copy of the references listed below. An explanation of the relevence of each document is set forth below:

U.S. PATENT NO.	PATENTEE	ISSUE DATE
4,779,079	Hauck	10/18/88
E.P. PUBLICATION NO.	**APPLICANT**	**PUBLICATION DATE**
0 309 878	Deutsche Thomson	April 5, 1989
0 354 313	Grundig E.M.V.	Feb. 12, 1990

The non-analogous Hauck U.S. Patent No. 4,770,079 merely discloses a multi-purpose computer utility arrangement including a module in a data transmission path between a selected keyboard and an associated computer system.

The E.P. Published Patent Application No. 0 309 878, published on April 5, 1989, teaches a method for programming tuning data into an audio or video device, in particular, a

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Date 12/10/93 [signature]

VCR. The tuning data, such as channel frequency, etc., needed for receiving television and/or radio programs can be stored in the program memory of the device by allocating a certain program number of identification therewith. The tuning data and their allocated program number are learned from a program memory of an already programmed audio visual device such as a television set.

The E.P. Published Patent Application No. 0 354 313, published on February 12, 1990, teaches the transferring of tuning data from a personal computer to an arrangement, which appears to be a remote control having infrared output, via a cable. The tuning data is related to the channels or stations that a television set is capable of receiving by cable, satellite or air waves. The arrangement or remote control can then supply the tuning data to a memory of a receiving device which can be a television set.

Applicant submits that the macro entry/definition program and macro playback program disclosed and claimed in the subject application are not at all disclosed or suggested by the references cited above.

This Information Disclosure Statement is being filed before the mailing date of a first Office Action, therefore Applicant believes that no fee or certification is necessary for the Examiner to consider the cited references.

However, if a fee is necessary, Applicant authorizes the Commissioner to charge any fee required under 37 CFR § 1.17 to Attorney's Deposit Account No. 22-0355.

It is respectfully requested that the Examiner indicate consideration of the cited references by returning a copy of the enclosed Form PTO 1449 with initials or other appropriate remarks.

Respectfully submitted,

Thomas R. Vigil
Reg. No. 24,542

Dated: December 10, 1993

Thomas R. Vigil
Vigil & Hanrath
836 S. Northwest Highway
Barrington, Illinois 60010
(708) 382-6500

Sheet 1 of 1

FORM PTO-1449 (REV.)

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

INFORMATION DISCLOSURE CITATION

(Use several sheets if necessary)

ATTY. DOCKET NO.	SERIAL NO.
93173	08/134,086
APPLICANT: Darbee	
FILING DATE: October 8, 1993	GROUP: 2600

U.S. PATENT DOCUMENTS

* EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
WFC	AA	4 7 7 9 0 7 9	10/18/88	Hauck			09/06/85
	AB						
	AC						
	AD						
	AE						
	AF						
	AG						
	AH						
	AI						
	AJ						
	AK						

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
WFC	AL	0 3 0 9 8 7 8	04/05/89	EPO			X *	
WFC	AM	0 3 5 4 3 1 3	02/12/90	EPO			X	
	AN							
	AO							
	AP							

OTHER DOCUMENTS (including Author, Title, Date, Pertinent Pages, Etc.)

	AR	* Abstract Only
	AS	
	AT	

EXAMINER	DATE CONSIDERED
W. F. Chan	6/17/94

*** EXAMINER:** Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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Pre Amd&B
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202 GR
2617

PATENT
USSN 08/134,086
Atty Docket 93173

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
PAUL V. DARBEE	)	Group Art Unit:
	)	2617
For: UNIVERSAL REMOTE CONTROL SYSTEM	)	
	)	Examiner:
	)	Unknown
Serial No. 08/134,086	)	
	)	
Filed: October 8, 1993	)	

SECOND PRELIMINARY AMENDMENT BEFORE ACTION

TO:
Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

Applicant requests that the subject application be amended as follows before examination:

IN THE CLAIMS:

Please add new claims 18, 19 and 20 set forth below.

S4b C6

B1 Cont

--18. A universal remote control system with data coupling including: a universal remote control, a computer having a memory, instructions for operating said remote control and/or code data for creating appropriate infrared (IR) lamp driver instructions for causing an infrared signal generator to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, stored in said memory of said computer, said universal remote control comprising input means including a set of keys or pushbuttons for inputting commands

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Date 4/14/94 John D. Bisbikis

into said remote control, infrared signal output means including IR lamp driver means for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to said input means and to said signal output means, memory means coupled to said CPU, and data coupling means including a modem associated with said remote control for periodically coupling said computer to said remote control through a telephone line for receiving from said computer memory and inputting into said memory means of said remote control (a) said instructions for operating said remote control and/or (b) said code data for creating appropriate IR lamp driver instructions, said code data causing said infrared signal output means to emit infrared signals which will cause specific functions to occur in a specific controlled device when said input means are operated, and said code data operating a variety of devices to be controlled and enabling said remote control to control various devices to be controlled upon the inputting of commands to said keys of said input means.

B1 cont

--19. A universal remote control system with data coupling including: a universal remote control, a computer having a memory, instructions for operating said remote control and/or code data for creating appropriate infrared (IR) lamp driver instructions for causing an infrared signal generator to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, stored in said memory of said computer, said universal remote control comprising input means including a set of keys or pushbuttons for inputting commands into said remote control, infrared signal output means including IR lamp driver means for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to said input means and to said signal output means, memory means coupled to said CPU, and data coupling means including a pick up coil associated with said remote control and being positionable adjacent a telephone handset for periodically coupling said computer to said remote control through the telephone handset and a telephone line for receiving from said computer memory and inputting into said memory means of said remote control (a) said instructions for operating said remote

control and/or (b) said code data for creating appropriate IR lamp driver instructions, said code data causing said infrared signal output means to emit infrared signals which will cause specific functions to occur in a specific controlled device when said input means are operated, and said code data operating a variety of devices to be controlled and enabling said remote control to control various devices to be controlled upon the inputting of commands to said keys of said input means.

--20. A method for communicating instructions (a) for enabling an infrared light signal emitting remote control to operate a consumer electronic device or (b) function code data for operating the controlled consumer electronic device, such as a television set, with the remote control, from a computer, through a modem system comprising a modem or a pickup coil associated with a remote control, to a memory of the remote control, said method comprising the steps of:

providing function code data for creating appropriate infrared (IR) lamp driver instructions for causing an infrared signal generator to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, in a digital format of data bytes each comprising a predetermined number of bits;

providing information of the instructions for operating the remote control and/or of the function code data for transmission over a telephone line;

transmitting the information of the instructions and/or function code data over a telephone line;

picking up with the modem or pick up coil the information being transmitted;

retrieving from the information transmitted the instructions for operating the remote control and/or the function code data; and,

storing the function code data in digital format in the memory of the remote control.--

B1 cont'd

REMARKS

Applicant submits that the universal remote control system with data coupling defined in claims 2-20 is patentably

distinguished over all of the references of record set forth in the Information Disclosure Statements submitted in the parent application and the subject application.

A fee calculation sheet is being submitted simultaneously with this Second Preliminary Amendment, along with a check for $111.00 to cover the fee for three extra independent claims. The Examiner is hereby authorized to charge any additional filing fees or credit any overpayment to applicant's attorney's deposit account No. 22-0355.

Respectfully submitted,

John G. Bisbikis

John G. Bisbikis
Reg. No. 37,095

Dated:
April 14, 1994

836 South Northwest Highway
Barrington, ILLINOIS 60010
(708) 382-6500

Due 5/3/94.

OMB NO. 0851-0011

AMENDMENT TRANSMITTAL LETTER	ATTORNEY'S DOCKET NO. 93173

SERIAL NO.	FILING DATE	EXAMINER	GROUP ART UNIT
08/134,086	October 8, 1993		2617

APPLICATION OF: Paul V. Darbee

FOR: UNIVERSAL REMOTE CONTROL SYSTEM

TO THE COMMISSIONER OF PATENTS AND TRADEMARKS:

Transmitted herewith is an amendment in the above-identified application.

☒ Small entity status of this application uner 37 CFR 1.27 has been established by a verified statement previously submitted.

☐ A verified statement to establish small entity status under 37 CFR 1.9 and 1.27 is enclosed.

☐ No additional fee is required.

☒ The fee has been calculated as shown below:

	(1) CLAIMS REMAINING AFTER AMENDMENT		(2) HIGHEST NO. PREVIOUSLY PAID FOR	(3) PRESENT EXTRA	RATE	ADDIT. FEE	OR	RATE	ADDIT. FEE
TOTAL	*	MINUS	**	=	X $11 =			X $22 =	
INDEP.	* 8	MINUS	*** 5	= 3	X $37 =	111.00		X $74 =	
FIRST PRESENTATION OF MULTIPLE DEP. CLAIM					+$115 =			+ $230=	$120
					TOTAL ADDIT. FEE	111.00	OR	TOTAL	$120

* If the entry in Col. 1 is less than the entry in Col. 2, write "0" in Col. 3.

** If the "Highest No. Previously Paid For" IN THIS SPACE is less than 20, enter "20."

*** If the "Highest No. Previously Paid For" IN THIS SPACE is less than 3, enter "3."

The "Highest No. Previously Paid For" (Total or Indep.) is the highest number found in the appropriate box in Col. 1.

☐ Please charge my Deposit Account No. 22-0355 in the amount of $_____. A duplicate copy of this sheet is enclosed.

☒ A check in the amount of $111.00 to cover the fee is enclosed.

☒ The Commissioner is hereby authorized to charge payment of the following fees associated with this communication or credit any overpayment to Deposit Account No. 22-0355. A duplicate copy of this sheet is enclosed.

☒ Any additional filing fees required under 37 CFR 1.16.

☒ Any patent application processing fees under 37 CFR 1.17.

Dated: April 14, 1994

John G. Bisbikis

Reg. No. 37,095 John G. Bisbikis

836 S. Northwest Highway
Barrington, Illinois 60010
(708) 382-6500

080 MH 04/26/94 08134086

1 202 111.00 CK

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to: Commissioner of Patents and Trademarks , Washington, D.C, on:

Date : 4/14/94

John G. Bisbikis

K. Ward
6/5/94
#12 Exam Ext
to patch.

PATENT
SN: 08/134,086
Atty Docket: 93173

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Darbee

For:
UNIVERSAL REMOTE CONTROL SYSTEM

Serial No.: 08/134,086

Filed: October 8, 1993

Group Art Unit:
~~2617~~ V

Examiner:
Unknown

INFORMATION DISCLOSURE STATEMENT

TO:
Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

In accordance with Applicant's duty of disclosure under 37 C.F.R. § 1.56, Applicant hereby submits (a) a PTO Form 1449 listing the following references and (b) a copy of the references listed below.

U.K. PUBLICATION NO.	APPLICANT	PUBLICATION DATE
2,229,023	Creda Limited	09/12/90
2,229,024	Creda Limited	09/12/90

This Information Disclosure Statement is being filed before the mailing date of a first Office Action, therefore Applicant believes that no fee or certification is necessary for the Examiner to consider the cited references.

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first-class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, DC 20231 on

Date 5/3/94 John G. Bisbikis

However, if a fee is necessary, Applicant authorizes the Commissioner to charge any fee required under 37 CFR § 1.17 to Attorney's Deposit Account No. 22-0355.

It is respectfully requested that the Examiner indicate consideration of the cited references by returning a copy of the enclosed Form PTO 1449 with initials or other appropriate remarks.

Respectfully submitted,

John G. Bisbikis

John G. Bisbikis
Reg. No. 37,095

Dated: May 3, 1994

John G. Bisbikis
Vigil & Hanrath
836 S. Northwest Highway
Barrington, Illinois 60010
(708) 382-6500

Sheet 1 of 1

FORM PTO-1449 (REV.) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

INFORMATION DISCLOSURE CITATION

(Use several sheets if necessary)

ATTY. DOCKET NO.	SERIAL NO.
93173	08/134,086
APPLICANT: Darbee	
FILING DATE: 10/8/93	GROUP: ~~2617~~ 2600

U.S. PATENT DOCUMENTS

* EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	AA						#12
	AB						
	AC						
	AD						
	AE						
	AF						
	AG						
	AH						
	AI						
	AJ						
	AK						

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
WFC	AL	2 2 2 9 0 2 3	9/12/90	U.K.				
WFC	AM	2 2 2 9 0 2 4	9/12/90	U.K.				
	AN							
	AO							
	AP							

OTHER DOCUMENTS *(including Author, Title, Date, Pertinent Pages, Etc.)*

	AR	
	AS	
	AT	

EXAMINER	DATE CONSIDERED
W. F. Chan	6/17/94

*** EXAMINER:** Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

Address : COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

08/134086

SERIAL NUMBER	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
08/134,086	10/08/93	DARBEE	P 93173

EXAMINER
CHAN, W

26M1/0627

THOMAS R. VIGIL
VIGIL & HANRATH
836 S. NORTHWEST HIGHWAY
BARRINGTON, IL 60010

ART UNIT	PAPER NUMBER
2608	13

DATE MAILED: 06/27/94

This is a communication from the examiner in charge of your application.
COMMISSIONER OF PATENTS AND TRADEMARKS

☑ This application has been examined ☑ Responsive to communication filed on PRE-AMDTS 10/8/93 & 4/18/94 ☐ This action is made final.

A shortened statutory period for response to this action is set to expire 3 month(s), ~~X~~ days from the date of this letter.
Failure to respond within the period for response will cause the application to become abandoned. 35 U.S.C. 133

Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:

1. ☑ Notice of References Cited by Examiner, PTO-892.
2. ☑ Notice re Patent Drawing, PTO-948.
3. ☑ Notice of Art Cited by Applicant, PTO-1449.
4. ☐ Notice of Informal Patent Application, Form PTO-152.
5. ☐ Information on How to Effect Drawing Changes, PTO-1474.
6. ☐ _____

Part II SUMMARY OF ACTION

1. ☑ Claims 2-20 are pending in the application.

   Of the above, claims _____ are withdrawn from consideration.

2. ☑ Claims 1 has ~~have~~ been cancelled.

3. ☐ Claims _____ are allowed.

4. ☑ Claims 2-20 are rejected.

5. ☐ Claims _____ are objected to.

6. ☐ Claims _____ are subject to restriction or election requirement.

7. ☐ This application has been filed with informal drawings under 37 C.F.R. 1.85 which are acceptable for examination purposes.

8. ☐ Formal drawings are required in response to this Office action.

9. ☐ The corrected or substitute drawings have been received on _____. Under 37 C.F.R. 1.84 these drawings are ☐ acceptable. ☐ not acceptable (see explanation or Notice re Patent Drawing, PTO-948).

10. ☐ The proposed additional or substitute sheet(s) of drawings, filed on _____ has (have) been ☐ approved by the examiner. ☐ disapproved by the examiner (see explanation).

11. ☐ The proposed drawing correction, filed on _____, has been ☐ approved. ☐ disapproved (see explanation).

12. ☐ Acknowledgment is made of the claim for priority under U.S.C. 119. The certified copy has ☐ been received ☐ not been received ☐ been filed in parent application, serial no. _____; filed on _____

13. ☐ Since this application appears to be in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under Ex parte Quayle, 1935 C.D. 11; 453 O.G. 213.

14. ☐ Other

EXAMINER'S ACTION

PTOL-326 (Rev. 9-89)

1. The present application Serial No. 08/134,086 filed 10/8/93 is a continuation (filed under Rule 60) of Serial No. 08/046,105 filed 4/8/93 (now US PAT. 5,255,313). In the present Rule 60 continuation application only claims 2-20 are pending.

2. This Office action is responsive to the preliminary amendments filed 10/8/93 and 4/18/94. As directed by the amendment, claims 2, 3 were amended, claim 1 was canceled, new claims 9-20 were added. Thus, claims 2-20 are presently pending in this application.

3. **Applicant should update the current status of the parent applications on page 1 of the present application. Applicant should also use two line spacing in subsequent response to allow for easier reading and entry of changes.**

4. Claims 16, 17, 20 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As to claims 16, 17, line 4 the comma (,) after "control" should be deleted for clarity, that the instructions are stored in the memory of the computer.

As to claim 20, line 1 "instructions (a)" should be changed to --(a) instructions-- to provide clarity to the claim.

5. The following is a quotation of the first paragraph of 35 U.S.C. § 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The specification is objected to under 35 U.S.C. § 112, first paragraph, as the specification, as originally filed, does not provide support for the claims as is now filed.

The specification, as originally filed, only discloses periodically coupling to a computer to receive "code data for creating appropriate infrared lamp driver instructions for causing an infrared signal generator to emit infrared signals which will cause specific functions to occur in a specific controlled device" and storing these code data into the memory of the remote control device itself. The specification, as originally filed, does not disclose a computer storing instructions for operating the remote control with the "and/or" condition (associated with the code data) as specific in the independent claims presented in the present application. Thus, the specification is non-enabling for the claims as is now filed.

6. Claims 2-20 are rejected under 35 U.S.C. § 112, first paragraph, for the reasons set forth in the objection to the specification.

7. The obviousness-type double patenting rejection is a judicially established doctrine based upon public policy and is primarily intended to prevent prolongation of the patent term by prohibiting claims in a second patent not patentably distinct from claims in a first patent. *In re Vogel*, 164 USPQ 619 (CCPA 1970). A timely filed terminal disclaimer in compliance with 37 C.F.R. § 1.321(b) would overcome an actual or provisional rejection on this ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 C.F.R. § 1.78(d).

8. Claims 2-20 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-13, 20 of U.S. Patent No. 5,255,313 in view of Hashimoto (US PAT. 4,656,655).

The following is a break-down of how the present claims correspond to the patented claims.

Present claims 2-5, 7, 6, 8, 10-13 correspond verbatim to patented claims 3-7, 9, 8, 10-13 respectively.

Present claim 9 is obvious over patented claim 2.

Present claim 14 is obvious over patented claim 20.

Present claims 15, 16-18 are obvious over patented claim 1.

Present claim 19 is obvious over patented claim 6.

Present claim 9 is patterned after patented claim 2 with minor language changes and the addition of "instructions for operating

the remote control, and/or" into the claim. However, to receive instructions for operating the remote control such as for remotely operating the remote control to remotely program a specific controlled device is old and well known in the art, for example see Hashimoto. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to add such a limitation into patented claim 2 perform remote control and programming of a controlled device. Similar comments also apply to present claims 14-19. Broad claims in a continuing application is rejected under the judicially created doctrine of obviousness-type double patenting

In addition to the above discussion, present claims 16, 17 are also obvious over patented claim 1, with the deletion of the infrared signal generator since this generator is inherent in order to generate infrared signals. As to claim 16, although the manner in which coupling is performed (i.e. through the telephone line, etc.) is missing when compared against patented claim 1, since these are the only coupling disclosure it becomes inherent implied that data must be transmitted as disclosed. Broad claims in a continuing application are properly rejected under the judicially created doctrine of obviousness-type double patenting, *In re Vogel*, 164 USPQ 619 (CCPA 1970).

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Examiner W. F. Chan** whose telephone number is (703) 305-4732.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 305-4750.

WING F. CHAN
PRIMARY EXAMINER
ART UNIT 2608

WFC

TO SEPARATE, HOLD TOP AND BOTTOM EDGES, SNAP–APART AND DISCARD CARBON

FORM PTO-892 (REV. 2-92)	U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	SERIAL NO.	GROUP ART UNIT	ATTACHMENT TO PAPER NUMBER
NOTICE OF REFERENCES CITED		08/134086	2608	13
		APPLICANT(S) Darbee		

U.S. PATENT DOCUMENTS

*		DOCUMENT NO.	DATE	NAME	CLASS	SUB-CLASS	FILING DATE IF APPROPRIATE
*	A	5123046	6/1992	Levine			
	B	4656655	4/1987	Hashimoto	379	105	
	C	5255313	10/1993	Darbee	379	102	
	D						
	E						
	F						
	G						
	H						
	I						
	J						
	K						

FOREIGN PATENT DOCUMENTS

*		DOCUMENT NO.	DATE	COUNTRY	NAME	CLASS	SUB-CLASS	PERTINENT SHTS. DWG	PERTINENT PP. SPEC.
	L								
	M								
	N								
	O								
	P								
	Q								

OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, Etc.)

	R	
	S	
	T	
	U	

EXAMINER	DATE	
W. F. Chan	6/17/94	* cited by applicants

* A copy of this reference is not being furnished with this office action.
(See Manual of Patent Examining Procedure, section 707.05 (a).)

Form PTO 948 (Rev. 10-93) U.S. DEPARTMENT OF COMMERCE - Patent and Trademark Office Application No. 134086

NOTICE OF DRAFTSPERSON'S PATENT DRAWING REVIEW

PTO Draftpersons review all originally filed drawings regardless of whether they are designated as formal or informal. Additionally, patent Examiners will review the drawings for compliance with the regulations. Direct telephone inquiries concerning this review to the Drawing Review Branch, 703-305-8404.

The drawings filed (insert date) 10/8/93, are
A. X not objected to by the Draftsperson under 37 CFR 1.84 or 1.152.
B. ____ objected to by the Draftsperson under 37 CFR 1.84 or 1.152 as indicated below. The Examiner will require submission of new, corrected drawings when necessary. Corrected drawings must be submitted according to the instructions on the back of this Notice.

1. DRAWINGS. 37 CFR 1.84(a): Acceptable categories of drawings: Black ink. Color.
   ___ Not black solid lines. Fig(s)____
   ___ Color drawings are not acceptable until petition is granted.

2. PHOTOGRAPHS. 37 CFR 1.84(b)
   ___ Photographs are not acceptable until petition is granted.

3. GRAPHIC FORMS. 37 CFR 1.84 (d)
   ___ Chemical or mathematical formula not labeled as separate figure. Fig(s)____
   ___ Group of waveforms not presented as a single figure, using common vertical axis with time extending along horizontal axis. Fig(s)____
   ___ Individuals waveform not identified with a separate letter designation adjacent to the vertical axis. Fig(s)____

4. TYPE OF PAPER. 37 CFR 1.84(e)
   ___ Paper not flexible, strong, white, smooth, nonshiny, and durable. Sheet(s)____
   ___ Erasures, alterations, overwritings, interlineations, cracks, creases, and folds not allowed. Sheet(s)____

5. SIZE OF PAPER. 37 CFR 1.84(f): Acceptable paper sizes:
   21.6 cm. by 35.6 cm. (8 1/2 by 14 inches)
   21.6 cm. by 33.1 cm. (8 1/2 by 13 inches)
   21.6 cm. by 27.9 cm. (8 1/2 by 11 inches)
   21.0 cm. by 29.7 cm. (DIN size A4)
   ___ All drawing sheets not the same size. Sheet(s)____
   ___ Drawing sheet not an acceptable size. Sheet(s)____

6. MARGINS. 37 CFR 1.84(g): Acceptable margins:

Paper size			
21.6 cm. X 35.6 cm. (8 1/2 X 14 inches)	21.6 cm X 33.1 cm. (8 1/2 X 13 inches)	21 cm. X 27.9 cm. (8 1/2 X 11 inches)	21 cm. X 29.7 cm. (DIN Size A4)
T 5.1 cm. (2")	2.5 cm. (1")	2.5 cm. (1")	2.5cm.
L .64 cm. (1/4")	.64 cm. (1/4")	.64 cm. (1/4")	2.5 cm.
R .64 cm. (1/4")	.64 cm. (1/4")	.64 cm. (1/4")	1.5 cm.
B .64 cm. (1/4")	.64 cm. (1/4")	.64 cm. (1/4")	1.0 cm.

   Margins do not conform to chart above.
   Sheet(s)____
   ____Top (T) ____ Left (L) ____Right (R) ____Bottom (B)

7. VIEWS. 37 CFR 1.84(h)
   REMINDER: Specification may require revision to correspond to drawing changes.
   ___ All views not grouped together. Fig(s)____
   ___ Views connected by projection lines. Fig(s)____
   ___ Views contain center lines. Fig(s)____

Partial views. 37 CFR 1.84(h)(2)
   ___ Separate sheets not linked edge to edge. Fig(s)____
   ___ View and enlarged view not labeled separately. Fig(s)____
   ___ Long view relationship between different parts not clear and unambiguous. 37 CFR 1.84(h)(2)(ii) Fig(s)____

Sectional views. 37 CFR 1.84(h)(3)
   ___ Hatching not indicated for sectional portions of an object. Fig(s)____
   ___ Hatching of regularly spaced oblique parallel lines not spaced sufficiently. Fig(s)____
   ___ Hatching not at substantial angle to surrounding axes or principal lines. Fig(s)____
   ___ Cross section not drawn same as view with parts in cross section with regularly spaced parallel oblique strokes. Fig(s)____
   ___ Hatching of juxtaposed different elements not angled in a different way. Fig(s)____

Alternate position. 37 CFR 1.84(h)(4)
   ___ A separate view required for a moved position. Fig(s)____

Modified forms. 37 CFR 1.84(h)(5)
   ___ Modified forms of construction must be shown in separate views. Fig(s)____

8. ARRANGEMENT OF VIEWS. 37 CFR 1.84(i)
   ___ View placed upon another view or within outline of another. Fig(s)____
   ___ Words do not appear in a horizontal, left-to-right fashion when page is either upright or turned so that the top becomes the right side, except for graphs. Fig(s)____

9. SCALE. 37 CFR 1.84(k)
   ___ Scale not large enough to show mechanism without crowding when drawing is reduced in size to two-thirds in reproduction. Fig(s)____
   ___ Indication such as "actual size" or "scale 1/2" not permitted. Fig(s)____
   ___ Elements of same view not in proportion to each other. Fig(s)____

10. CHARACTER OF LINES, NUMBERS, & LETTERS. 37 CFR 1.84(l)
   ___ Lines, numbers & letters not uniformly thick and well defined, clean, durable, and black (except for color drawings). Fig(s)____

11. SHADING. 37 CFR 1.84(m)
   ___ Shading used for other than shape of spherical, cylindrical, and conical elements of an object, or for flat parts. Fig(s)____
   ___ Solid black shading areas not permitted. Fig(s)____

12. NUMBERS, LETTERS, & REFERENCE CHARACTERS. 37 CFR 1.84(p)
   ___ Numbers and reference characters not plain and legible. 37 CFR 1.84(p)(l) Fig(s)____
   ___ Numbers and reference characters used in conjuction with brackets, inverted commas, or enclosed within outlines. 37 CFR 1.84(p)(l) Fig(s)____
   ___ Numbers and reference characters not oriented in same direction as the view. 37 CFR 1.84(p)(l) Fig(s)____
   ___ English alphabet not used. 37 CFR 1.84(p)(2) Fig(s)____
   ___ Numbers, letters, and reference characters do not measure at least .32 cm. (1/8 inch) in height. 37 CFR(p)(3) Fig(s)____

13. LEAD LINES. 37 CFR 1.84(q)
   ___ Lead lines cross each other. Fig(s)____
   ___ Lead lines missing. Fig(s)____
   ___ Lead lines not as short as possible. Fig(s)____

14. NUMBERING OF SHEETS OF DRAWINGS. 37 CFR 1.84(t)
   ___ Number appears in top margin. Fig(s)____
   ___ Number not larger than reference characters. Fig(s)____
   ___ Sheets not numbered consecutively, and in Arabic numerals, beginning with number 1. Sheet(s)____

15. NUMBER OF VIEWS. 37 CFR 1.84(u)
   ___ Views not numbered consecutively, and in Arabic numerals, beginning with number 1. Fig(s)____
   ___ View numbers not preceded by the abbreviation Fig. Fig(s)____
   ___ Single view contains a view number and the abbreviation Fig.
   ___ Numbers not larger than reference characters. Fig(s)____

16. CORRECTIONS. 37 CFR 1.84(w)
   ___ Corrections not durable and permanent. Fig(s)____

17. DESIGN DRAWING. 37 CFR 1.152
   ___ Surface shading shown not appropriate. Fig(s)____
   ___ Solid black shading not used for color contrast. Fig(s)____

ATTACHMENT TO PAPER NO. 13 REVIEWER A. Doan DATE 2/16/94

PTO Copy

#14/Prior Art
R. Morgan 10/17/94

Sheet 1 of 1

FORM PTO-1449 (REV. 7-64)

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

INFORMATION DISCLOSURE CITATION

(Use several sheets if necessary)

ATTY. DOCKET NO.	SERIAL NO.
93173A	08/134,086
APPLICANT: Paul V. Darbee	
FILING DATE: October 8, 1993	GROUP: 2608

U.S. PATENT DOCUMENTS

* EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
NFC	AA	4 5 4 0 8 5 1	9/10/85	Hashimoto			
	AB						
	AC						
	AD						
	AE						
	AF						
	AG						
	AH						
	AI						
	AJ						
	AK						

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
	AL							
	AM							
	AN							
	AO							
	AP							

OTHER DOCUMENTS *(including Author, Title, Date, Pertinent Pages, Etc.)*

NFC	AR	Ronald G. Gordon, "An Interactive Video Information Terminal" IEEE TRANSACTIONS ON COMMUNICATIONS, February, 1983, Volume COM-31, Number 2, pp. 245-250.
	~~AS~~	
	AT	

EXAMINER	DATE CONSIDERED
W. F. Chan	12/5/94

* **EXAMINER:** Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

#15/ Arndt C
R. Morgan
10/17/94

PATENT
USSN 08/134,086
Atty Docket 93173

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

R. Loyer
10/19/94

In re Application of:

PAUL V. DARBEE

For: REMOTE CONTROL SYSTEM

Group Art Unit: 2608

Examiner: W. Chan

Serial No. 08/134,086

Filed: October 8, 1993

AMENDMENT A UNDER RULE 111

TO:
Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

In response to the Examiner's Action (Paper No. 13) mailed on June 26,1994, applicant requests that the subject application be amended as follows:

ON THE TITLE PAGE:

Please change the title to read:

--REMOTE CONTROL SYSTEM--

Please change the CROSS-REFERENCE TO RELATED APPLICATIONS to read:

This Application is a Continuation Application of U.S. Application Serial No. 08/046,105 filed April 8, 1993, now U.S. Patent No. 5,255,313, which is a

C 1
contd

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first-class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, DC 20231 on

Date 9/15/94 [signature]

35

C1 Cont

Continuation Application of U.S. Application Serial No. 07/587,326 filed September 24, 1990, now U.S. Patent No. 5,228,077, which is a Continuation-In-Part Application of Application Serial No. 07/127,999 filed 12-2-87, now U.S. Patent No. 4,959,810, which is a Continuation-In-Part of Application Serial No. 07/109,336 filed 10/14/87, now abandoned.

IN THE SPECIFICATION:

Page 2, lines 19 through 33, containing the Summary Of The Invention, delete in their entirety and substitute in place thereof the following new Summary Of The Invention:

SUMMARY OF THE INVENTION

C2 Cont'd

According to the present invention there is provided a remote control system with data coupling including: a remote control, a computer having a memory, at least one of instruction codes or code data for creating appropriate infrared (IR) lamp driver instructions for causing an infrared signal generator to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, stored in the memory of the computer, the remote control comprising input circuitry including a set of keys or pushbuttons for inputting commands into the remote control, infrared signal output circuitry including IR lamp driver circuitry for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to the input circuitry and to the signal output circuitry, a memory coupled to the CPU, and data coupling circuitry and structure for periodically coupling the computer to the remote control for receiving from the computer memory and inputting into the memory of the remote control at least one of (a) the instruction codes or (b) the code data for

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creating appropriate IR lamp driver instructions, the code data causing the infrared signal output circuitry to emit infrared signals which will cause specific functions to occur in a specific controlled device when the input circuitry are operated, and the code data operating a variety of devices to be controlled and enabling the remote control to control various devices to be controlled upon the inputting of commands to the keys of the input circuitry.

Further according to the invention there is provided a remote control system with data coupling including: a remote control, a computer having a memory, at least one of instruction codes or code data for creating appropriate infrared (IR) lamp driver instructions for causing an infrared signal generator to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, stored in the memory of the computer, a remote control comprising input circuitry including a set of keys or pushbuttons for inputting commands into the remote control, infrared signal output circuitry including IR lamp driver circuitry for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to the input circuitry and to the signal output circuitry, a memory coupled to the CPU, and data coupling circuitry and structure for periodically coupling the computer to the remote control for receiving from the computer memory and inputting into the memory of the remote control at least one of (a) the instruction codes or (b) code data for creating appropriate IR lamp driver instructions for causing the infrared signal output circuitry to emit infrared signals which will cause specific functions to occur in a specific

C2 cont'd

A1

controlled device, for operating a variety of devices to be controlled into the memory of the remote control to enable the remote control to control various devices to be controlled upon the inputting of commands to the keys of the input circuitry and a data transmission system including the data coupling circuitry and structure for coupling the remote control to the computer, directly, through a telephone line, through a modem and a telephone line, or through decoding circuitry and a television set which receives a television signal containing at least one of the instruction codes or the code data.

C2 (contd

Still further according to the present invention there is provided a remote control system with data coupling including a remote control comprising input circuitry including a set of keys or pushbuttons for inputting commands into the remote control, infrared signal output circuitry including IR lamp driver circuitry for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to the input circuitry and to the signal output circuitry, a memory coupled to the CPU and data coupling circuitry and structure including terminal structure comprising a receiving port coupled to the CPU for enabling at least one of (a) instruction codes or (b) the code data for creating appropriate IR lamp driver instructions for causing the infrared signal output circuitry to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, to be supplied from outside the remote control through the receiving port of the terminal structure directly to the CPU for direct entry to the memory to enable the remote control to control various devices to be controlled upon the inputting of commands

A2

C2 cont'd

to the keys of the input circuitry and a data transmission system including coupling circuitry for coupling the terminal structure to a computer, directly, through a telephone line, through a modem and a telephone line, or through decoding circuitry and a television set which receives a television signal containing at least one of the instruction codes or the code data.

C3

Page 11, line ~~33~~ 32, after "serially", insert --from data supply means, such as from the memory of a personal computer--.

C4

Page 12, ~~line~~ 39, after "computer", insert --"(having instruction codes and code data stored in a memory of the computer)--.

IN THE CLAIMS:

Please amend claims 9 and 12-20 in the manner set forth below:

C5 cont'd

~~9~~ 1. (Amended) A [universal] remote control system with data coupling including: a [universal] remote control comprising input means including a set of keys or pushbuttons for inputting commands into the remote control, infrared signal output means including IR lamp driver means for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to the input means and to the signal output means, memory means coupled to the CPU and data coupling means including [terminal structure comprising a] receiving [port] means coupled to the CPU for enabling at least one of (a) [instructions for operating the remote control] instruction codes [and/]or (b) code data for creating appropriate IR lamp driver instructions for causing the infrared signal output means to emit infrared signals which will cause specific functions to occur in a specific controlled device, for

A3

operating a variety of devices to be controlled, to be supplied from outside the remote control through the receiving [port of the terminal structure] <u>means</u> directly to the CPU for direct entry to the memory to enable the remote control to control various devices to be controlled upon the inputting of commands to the keys of the input means and a data transmission system including coupling means for coupling the [terminal structure] <u>receiving means</u> to a computer, directly, through a telephone line, through a modem and a telephone line, or through decoding means and a television set which receives a television signal containing <u>at least one of</u> the [instructions] <u>instruction codes</u> [and/]or the code data.

12. (Amended) The universal remote control system of claim ~~9~~ 1 wherein said <u>receiving means include</u> terminal means [comprise] <u>comprising</u> three serial ports coupled to said CPU, one port being coupled to the ground for the CPU, one port, forming [said] <u>a</u> receiving port, being coupled to an input of said CPU and one port, forming a sending port, being coupled to an output of said CPU.

~~13.~~ 9 (Amended) The universal remote control system of claim ~~9~~ 1 wherein said coupling means includes a cable, first connector means at one end of said cable for connection to said [terminal means] <u>receiving means</u>, and interface connector means at the other end of said cable for connecting to a computer, directly, through a telephone line, through a modem and a telephone line, or through decoding means, a television set, and a television signal which is picked up by the television set and which has data from a computer.

14. (Amended) A [universal] remote control system with data coupling including: a [universal] remote control, a

computer having a memory, [instructions for operating said remote control] at least one of instruction codes [and/]or code data for creating appropriate infrared (IR) lamp driver instructions for causing an infrared signal generator to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, stored in said memory of said computer, said remote control comprising input means including a set of keys or pushbuttons for inputting commands into said [universal] remote control, infrared signal output means including IR lamp driver means for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to said input means and to said signal output means, memory means coupled to said CPU, and data coupling means for periodically coupling said computer to said remote control for receiving from said computer memory and inputting into said memory means of said remote control at least one of (a) said [instructions for operating said remote control] instruction codes [and/]or (b) said code data for creating appropriate IR lamp driver instructions, said code data causing said infrared signal output means to emit infrared signals which will cause specific functions to occur in a specific controlled device when said input means are operated, and said code data operating a variety of devices to be controlled and enabling said remote control to control various devices to be controlled upon the inputting of commands to said keys of said input means.

Cb cont'd

15. (Amended) A [universal] remote control system with data coupling including: a [universal] remote control, a computer having a memory, [instructions for operating said

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remote control] at least one of instruction codes [and/]or code data for creating appropriate infrared (IR) lamp driver instructions for causing an infrared signal generator to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, stored in said memory of said computer, said [universal] remote control comprising input means including a set of keys or pushbuttons for inputting commands into said remote control, infrared signal output means including IR lamp driver means for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to said input means and to said signal output means, memory means coupled to said CPU, and data coupling means for periodically coupling said computer to said remote control for receiving from said computer memory and inputting into said memory means of said remote control at least one of (a) said [instructions for operating said remote control] instruction codes [and/]or (b) said code data for creating appropriate IR lamp driver instructions for causing said infrared signal output means to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled into said memory means of said remote control to enable said remote control to control various devices to be controlled upon said inputting of commands to said keys of said input means and a data transmission system including said data coupling means for coupling said remote control to said computer, directly, through a telephone line, through a modem and a telephone line, or through decoding means and a television set which receives a television signal containing at least one of said

cb contd

Ab

[instructions] instruction codes [and/]or said code data.

16. (Amended) A [universal] remote control system with data coupling including: a [universal] remote control, a computer having a memory, [instructions for operating said remote control,] instruction codes stored in said memory of said computer, said [universal] remote control comprising input means including a set of keys or pushbuttons for inputting commands into said remote control, infrared signal output means including IR lamp driver means for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to said input means and to said signal output means, memory means coupled to said CPU for storing [instructions] instruction codes and code data for creating appropriate IR lamp driver instructions, said code data causing said infrared signal output means to emit infrared signals which will cause specific functions to occur in a specific controlled device when said input means are operated, and said code data operating a variety of devices to be controlled and enabling said remote control to control various devices to be controlled upon the inputting of commands to said keys of said input means, and data coupling means for periodically coupling said computer to said remote control for receiving from said computer memory and inputting into said memory means of said remote control said [instructions for operating said remote control] instruction codes.

C6 contd

17. (Amended) A [universal] remote control system with data coupling including: a [universal] remote control, a computer having a memory, [instructions for operating said remote control,] instruction codes stored in said memory of said computer, said [universal] remote control comprising input

A7

means including a set of keys or pushbuttons for inputting commands into said remote control, infrared signal output means including IR lamp driver means for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to said input means and to said signal output means, memory means coupled to said CPU for storing [instructions] instruction codes and code data for creating appropriate IR lamp driver instructions, said code data causing said infrared signal output means to emit infrared signals which will cause specific functions to occur in a specific controlled device when said input means are operated, and said code data operating a variety of devices to be controlled and enabling said remote control to control various devices to be controlled upon the inputting of commands to said keys of said input means, and data coupling means for periodically coupling said computer to said remote control for receiving from said computer memory and inputting into said memory means of said remote control said [instructions for operating said remote control] instruction codes, and a data transmission system including said data coupling means for coupling said remote control to said computer, directly, through a telephone line, through a modem and a telephone line, or through decoding means and a television set which receives a television signal containing at least one of said [instructions] instruction codes [and/]or said code data.

C6 cont'd

18. (Amended) A [universal] remote control system with data coupling including: a [universal] remote control, a computer having a memory, [instructions for operating said remote control] at least one of instruction codes [and/]or code data for creating appropriate infrared (IR) lamp driver

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instructions for causing an infrared signal generator to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, stored in said memory of said computer, said [universal] remote control comprising input means including a set of keys or pushbuttons for inputting commands into said remote control, infrared signal output means including IR lamp driver means for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to said input means and to said signal output means, memory means coupled to said CPU, and data coupling means including a modem associated with said remote control for periodically coupling said computer to said remote control through a telephone line for receiving from said computer memory and inputting into said memory means of said remote control <u>at least one of</u> (a) said [instructions for operating said remote control] <u>instruction codes</u> [and/]or (b) said code data for creating appropriate IR lamp driver instructions, said code data causing said infrared signal output means to emit infrared signals which will cause specific functions to occur in a specific controlled device when said input means are operated, and said code data operating a variety of devices to be controlled and enabling said remote control to control various devices to be controlled upon the inputting of commands to said keys of said input means.

C/b cont'd

19. (Amended) A [universal] remote control system with data coupling including: a [universal] remote control, a computer having a memory, [instructions for operating said remote control] <u>at least one of instruction codes</u> [and/]or code data for creating appropriate infrared (IR) lamp driver

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instructions for causing an infrared signal generator to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, stored in said memory of said computer, said [universal] remote control comprising input means including a set of keys or pushbuttons for inputting commands into said remote control, infrared signal output means including IR lamp driver means for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to said input means and to said signal output means, memory means coupled to said CPU, and data coupling means including a pick up coil associated with said remote control and being positionable adjacent a telephone handset for periodically coupling said computer to said remote control through the telephone handset and a telephone line for receiving from said computer memory and inputting into said memory means of said remote control at least one of (a) said [instructions for operating said remote control] instruction codes [and/]or (b) said code data for creating appropriate IR lamp driver instructions, said code data causing said infrared signal output means to emit infrared signals which will cause specific functions to occur in a specific controlled device when said input means are operated, and said code data operating a variety of devices to be controlled and enabling said remote control to control various devices to be controlled upon the inputting of commands to said keys of said input means.

Cl cont'd

13
~~20.~~ (Amended) A method for communicating [instructions] at least one of (a) instruction codes [for enabling an infrared light signal emitting remote control to operate a consumer electronic device] or (b) function code data for operating

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[the] a controlled consumer electronic device, such as a television set, with the remote control, from a computer, through a modem system comprising a modem or a pickup coil associated with a remote control, to a memory of the remote control, said method comprising the steps of:

providing function code data for creating appropriate infrared (IR) lamp driver instructions for causing an infrared signal generator to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, in a digital format of data bytes each comprising a predetermined number of bits for transmission over a telephone line;

providing [information of the instructions for operating the remote control and/or of the function code data] instruction codes for transmission over a telephone line;

transmitting the information of the [instructions] at least one of the instruction codes or the [and/or] function code data over a telephone line;

picking up with the modem or pick up coil the information being transmitted;

retrieving from the information transmitted at least one of the [instructions for operating the remote control] instruction codes [and/]or the function code data; and,

storing the at least one of the instruction codes or the function code data in digital format in the memory of the remote control.

IN THE ABSTRACT OF THE DISCLOSURE:

Please delete page 32 containing the Abstract Of The Disclosure in its entirety and substitute in place thereof the following Abstract Of The Disclosure:

ABSTRACT OF THE DISCLOSURE

The remote control system includes a remote control and a computer having a memory and at least one of instruction codes or code data for creating appropriate IR lamp driver instructions for causing an infrared signal generator to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled, stored in the memory of the computer. The remote control comprises: input circuitry including a set of keys or pushbuttons for inputting commands into the remote control, infrared signal output circuitry including IR lamp driver circuitry for supplying an infrared signal to a controlled device, a central processing unit (CPU) coupled to the input circuitry and to the signal output circuitry, a memory coupled to the CPU, and data coupling circuitry and structure for periodically coupling the computer to the remote control for inputting from the computer memory at least one of instruction codes or appropriate IR lamp driver instructions for causing the infrared signal output circuitry to emit infrared signals which will cause specific functions to occur in a specific controlled device, for operating a variety of devices to be controlled into the memory of the remote control to enable the remote control to control various devices to be controlled upon the inputting of commands to the keys of the input circuitry.

C1

REMARKS

Applicant has carefully studied the Examiner's objections to the application and rejection of the claims under 35 U.S.C. §112 and has amended the claims along the lines suggested by the Examiner.

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Also, applicant has carefully reviewed the specification and finds that there is support for the language used by applicant in the claims. However, to make certain that there is clear correspondence between the claims and the specification, applicant has amended the claims to call for --instruction codes-- rather than "instructions for operating said remote control".

Looking at the specification, and particularly page 11, it is stated at lines 32 and 33 that

> "Incoming data is received serially at serial port 3...".

To render this statement more clear and consistent with the language on the bottom of page 12, applicant is amending the phrase to read

> --Incoming data is received serially from data supply means, such as a personal computer, at serial port 3...--

On page 12, lines 35-39 there is clear support for the language used in the claims. In this respect, the first part of the sentence beginning at line 35 reads as follows:

> "Later, after the device 10 has been in use for some time and the RAM 54 needs to be updated with the instruction codes and data relative to the new equipment on the market, the control device can be simply and easily updated as a service outlet having an ordinary personal computer with a serial port...".(Emphasis Added)

Clearly, this language supports a remote control system with data coupling including a remote control and a computer having a memory, at least one of instruction codes or code data... stored in the memory of the computer for transmission to the remote control.... To make this more clear and since it is inherent that a personal computer has a memory, applicant is

amending line 39 on page 12 to call for:

--...an ordinary personal computer (having instruction codes and code data stored in the memory thereof) with a serial port...--

Further, to overcome the Examiner's objection that the specification does not provide support for: "instruction codes and/or code data..." (Emphasis Added), applicant has amended the application, and particularly the claims to call for: --at least one of instruction codes or code data...-- (Emphasis Added).

The Examiner's rejection of claims 2-20 under the judicially created doctrine of obviousness-type double patenting for being unpatentable over claims 1-13 and 20 of the Darbee U.S. Patent No. 5,255,313 in view of the Hashimoto U.S. Patent No. 4,656,655, as this rejection may be attempted to be applied to the amended claims, is respectfully traversed.

First of all in support of this traverse, applicant is submitting herewith a Terminal Disclaimer signed by the President of applicant's Assignee, together with a check in the amount of $55.00, the fee required under 37 CFR 1.17.

Further in support of this traverse, all that Hashimoto teaches is a remote control adapter 6 into which a remote control 4 is inserted so that signals coming from a distant telephone 1 to a local telephone 2 connected to the adapter 6 can supply codes which enable transistors 5 in the adapter 6 to control the pushbutton switches on the remote control. Applicant does not utilize an adapter and does not control pushbutton switches. Rather, applicant claims a remote control having data coupling means which are adapted to receive at least one of instructions codes or code data, as defined now

even more clearly in the amended claims.

Accordingly, for the reason that applicant is submitting a Terminal Disclaimer, and for the reason that Hashimoto does not teach applicant's remote control having coupling means, at least one of instruction codes or code data, applicant submits that claims 2-20 are clear of the art and are patentably distinguished over the prior art.

To complete the citation of background art in this application, applicant is making this disclosure statement and is submitting a PTO form 1449 and a copy of Hashimoto U.S. Patent No. 4,540,851 and a copy of "An Interactive Video Information Terminal" published in IEEE TRANSACTIONS ON COMMUNICATIONS, Vol. COM-31, No. 2, Feb. 1983, pp. 245-250.

Note that the Hashimoto U.S. Patent No. 4,656,655 is identical to the Hashimoto GB Patent No. 2,166,322 A, cited by applicant and already of record herein. Also the IEEE article and the Hashimoto U.S. Patent No. 4,540,851 are merely cumulative with the Hashimoto U.S. Patent No. 4,656,655 cited by the Examiner.

The IEEE article and the earlier Hashimoto Patent were cited in the Hashimoto U.S. Patent No. 4,656,655 cited in the Examiner's Action dated June 27,1994 and the undersigned attorney hereby certifies that no item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application or, to the knowledge of the person signing this certification after making reasonable inquiry, was known to any individual designated in § 1.56(c) more than three months prior to the filing of the statement.

In summary, applicant submits that the application is in condition for allowance and an early and favorable action to that end is requested.

Respectfully submitted,

Thomas R. Vigil
Reg. No. 24,542

Dated:
September 15, 1994.

836 South Northwest Highway
Barrington, ILLINOIS 60010
(708) 382-6500

55-248 GP268

PTO/SB/ 26 (10-92) #16

TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A PRIOR PATENT

Docket Number (optional): 93173

In re Application of: Paul V. Darbee
Application No. 08/134,086
Filed: October 8, 1993
For: UNIVERSAL REMOTE CONTROL SYSTEM

Petitioner, ..., is the owner of ..100%.. percent interest in the instant application. Petitioner hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application, which would extend beyond the expiration date of the full statutory term defined in 35 U.S.C. 154 to 156 annd 173, as presently shortened by any terminal disclaimer, of prior Patent No. ..5,228,077.. ,Petitioner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, petitioner does not disclaim the terminal part of any patent granted on the instant application that would extend to the expiration date of the full statutory term as defined in U.S.C. 154 to 156 and 173 of the prior patent, as presently shortened by any terminal disclaimer, in the event that it later: expires for failure to pay a maintenance fee, is held unenforceable, is found invalid by the court of competent jurisdiction, is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321, has all claims cancelled by a reexamination certificate, is reissued, or is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

For submissions on behalf of an organization (e.g., corporation, partnership, university, government agency, etc.), the undersigned (whose title is supplied below) is empowered to act on behalf of the organization.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

050 RP 10/04/94 08134086 1 248 55.00 CK

August 18, 1994.
Date

UNIVERSAL ELECTRONICS INC.
By:
Signature
Thomas C. Tyler, President
Typed or printed name and title if applicable

[X] Terminal disclaimer fee under 37 CFR 1.20(d) included
[ ] PTO suggested wording for terminal disclaimer was

[ ] unchanged, [ ] changed (if changed, an explanation should be supplied).

Atty Docket 93173

CERTIFICATE UNDER 37 CFR 3.73(b)

Applicant: Paul V. Darbee

Application No: 08/134,086 Filed: October 8, 1993

Entitled: UNIVERSAL REMOTE CONTROL SYSTEM

Universal Electronics Inc., a Delaware corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

certifies that it is the assignee of the entire right, title and interest in the patent application identified above by virtue of either:

A. [ ] An assignment from the inventor(s) of the patent application identified above. The assignment was recorded in the Patent and Trademark Office at Reel _____ , Frame _____ , or for which a copy thereof is attached.

OR

B. [X] A chain of title from the inventor(s), of the patent application identified above, to the current assignee as shown below:

1. From: Darbee & Grossman To: Universal Electronics Inc.
   The assignment was recorded in the Patent and Trademark Office at
   Reel 4860 , Frame 0654 , or for which a copy thereof is attached.

2. From: Darbee,Ellis,Jansky & Grossman to: Universal Electronics Inc.
   The assignment was recorded in the Patent and Trademark Office at
   Reel 5253 , Frame 0410 , or for which a copy thereof is attached.

3. From: Darbee To: Universal Electronics Inc.
   The assignment was recorded in the Patent and Trademark Office at
   Reel 5611 , Frame 0998 , or for which a copy thereof is attached.

** [x] Additional documents in the chain of title are listed ~~on a supplemental sheet~~. below.

[ ] Copies of assignments or other documents in the chain of title are attached.

The undersigned has reviewed all the documents in the chain of title of the patent application identified above and, to the best of the undersigned's knowledge and belief, title is in the assignee identified above.

The undersigned (whose title is supplied below) is empowered to act on behalf of the assignee.

I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further, that these statements are made with the knowledge that willful false statements, and the like so made, are punishable by fine or imprisonment, or both, under Section 1001, Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

**
4. From: Darbee to: Universal Electronics Inc.
The assignment was recorded in the Patent and Trademark Office at
Reel 5611, Frame 0998.

August 18 , 1994
Date

UNIVERSAL ELECTRONICS INC.
By: _____
Signature

Thomas C. Tyler
Typed or printed name

President
Title

PTO/SB/ 26 (10-92)
Rev. 15, May 1993

Patent and Trademark Office, U.S. DEPARTMENT OF COMMERCE

200-126

Brief Art W/Refes

PATENT
SN: 08/134,086
Atty Docket: 93173

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Paul V. Darbee	Group Art Unit: 2617
For: REMOTE CONTROL SYSTEM	Examiner: Unknown
Serial No.: 08/134,086	
Filed: October 8, 1993	

INFORMATION DISCLOSURE STATEMENT FILED UNDER 37 C.F.R. §1.97(C)

TO:
Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Dear Sir:

In accordance with Applicant's duty of disclosure under 37 C.F.R. § 1.56, Applicant hereby submits (a) a PTO Form 1449 listing the following references and (b) a copy of the references listed below.

U.S. Patent No.	Patentee	Issue Date
4,121,198	Tsuboi et al.	10/17/78
4,177,453	Collins	12/04/79
4,231,031	Crowther et al.	10/28/80
4,246,611	Davies	01/20/81
4,251,812	Okada et al.	02/17/81
4,318,130	Heuer	03/02/82
4,338,632	Falater	07/06/82
4,425,647	Collins et al.	01/10/84
4,426,662	Skerlos et al.	01/17/84
4,482,947	Zato et al.	11/13/84

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first-class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, DC 20231 on

Date 9/20/94 John G. Bathis

040 FT 10/07/94 08134086 1 126 200.00 CK

Foreign Publications:

Country	Publication Number	Applicant	Date
United Kingdom	1 487 784	Crowther et al.	10/05/77

REMARKS

These references are being cited as background art showing the construction of bits from bursts of IR pulses and bytes formed from the bits. The bytes are coded IR signals for causing different functions to occur in a controlled device that receives the bytes (IR signals).

This Information Disclosure Statement is being filed after the time period set forth in 37 C.F.R. §1.97(b) but before the mailing date of a final action under 37 C.F.R. §1.113 and before the mailing date of a notice of allowance under 37 C.F.R. §1.311, therefore Applicant is submitting a check for $200.00 to cover the fee required under 37 CFR § 1.17(p).

If any additional fee is necessary for consideration of the references cited in this Information Disclosure Statement, the Examiner is authorized to charge the same, or to credit any overpayment, to Attorney's Deposit Account No. 22-0355.

It is respectfully requested that the Examiner indicate consideration of the cited references by returning a copy of the enclosed Form PTO 1449 with initials or other appropriate remarks.

Respectfully submitted,

John G. Bisbikis

John G. Bisbikis
Reg. No. 37,095

Dated: September 20, 1994

John G. Bisbikis
Vigil & Hanrath
836 S. Northwest Highway
Barrington, Illinois 60010
(708) 382-6500

Sheet 1 of 1

FORM PTO-1449 (REV.)

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

INFORMATION DISCLOSURE CITATION

(use several sheets if necessary)

ATTY. DOCKET NO.	SERIAL NO.
93173	08/134,086
APPLICANT	#17
DARBEE	
FILING DATE	**GROUP**
OCTOBER 8, 1993	~~2617~~ 2608

U.S. PATENT DOCUMENTS

* EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
KC	AA	4 1 2 1 1 9 8	10/17/78	TSUBOI ET AL.			
	AB	4 1 7 7 4 5 3	12/04/79	COLLINS			
	AC	4 2 3 1 0 3 1	10/28/80	CROWTHER ET AL.			
	AD	4 2 4 6 6 1 1	01/20/81	DAVIES			
	AE	4 2 5 1 8 1 2	02/17/81	OKADA ET AL.			
	AF	4 3 1 8 1 3 0	03/02/82	HEUER			
	AG	4 3 3 8 6 3 2	07/06/82	FALATER			
	AH	4 4 2 5 6 4 7	01/10/84	COLLINS ET AL.			
	AI	4 4 2 6 6 6 2	01/17/84	SKERLOS ET AL.			
KC	AJ	4 4 8 2 9 4 7	11/13/84	ZATO ET AL.			
	AK						

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	TRANSLATION NO
KC	AL	1 4 8 7 7 8 4	10/05/77	UNITED KINGDOM				
	AM							
	AN							
	AO							
	AP							

OTHER DOCUMENTS *(including Author, Title, Date, Pertinent Pages, Etc.)*

	AR	
	AS	
	AT	

EXAMINER	DATE CONSIDERED
W. F. Chan	12/5/94

* **EXAMINER:** Initial if reference considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

08/134,086

SERIAL NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO.
08/134,086	10/08/93	DARBEE	P 93173

EXAMINER
CHAN, W

26M1/1213

THOMAS R. VIGIL
VIGIL & HANRATH
836 S. NORTHWEST HIGHWAY
BARRINGTON, IL 60010

ART UNIT	PAPER NUMBER
2608	18

DATE MAILED: 12/13/94

NOTICE OF ALLOWABILITY

PART I.

1. ☑ This communication is responsive to amendment & Terminal Disclaimer filed 9/19/94.
2. ☑ All the claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice Of Allowance And Issue Fee Due or other appropriate communication will be sent in due course.
3. ☑ The allowed claims are 2-20.
4. ☑ The drawings filed on 10/8/93 are acceptable.
5. ☐ Acknowledgment is made of the claim for priority under 35 U.S.C. 119. The certified copy has [_] been received. [_] not been received. [_] been filed in parent application Serial No. _____, filed on _____.
6. ☐ Note the attached Examiner's Amendment.
7. ☐ Note the attached Examiner Interview Summary Record, PTOL-413.
8. ☐ Note the attached Examiner's Statement of Reasons for Allowance.
9. ☐ Note the attached NOTICE OF REFERENCES CITED, PTO-892.
10. ☑ Note the attached INFORMATION DISCLOSURE CITATION, PTO-1449.

PART II.

A SHORTENED STATUTORY PERIOD FOR RESPONSE to comply with the requirements noted below is set to EXPIRE THREE MONTHS FROM THE "DATE MAILED" indicated on this form. Failure to timely comply will result in the ABANDONMENT of this application. Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

1. ☐ Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL APPLICATION, PTO-152, which discloses that the oath or declaration is deficient. A SUBSTITUTE OATH OR DECLARATION IS REQUIRED.
2. ☐ APPLICANT MUST MAKE THE DRAWING CHANGES INDICATED BELOW IN THE MANNER SET FORTH ON THE REVERSE SIDE OF THIS PAPER.
   a. ☐ Drawing informalities are indicated on the NOTICE RE PATENT DRAWINGS, PTO-948, attached hereto or to Paper No. _____. CORRECTION IS REQUIRED.
   b. ☐ The proposed drawing correction filed on _____ has been approved by the examiner. CORRECTION IS REQUIRED.
   c. ☐ Approved drawing corrections are described by the examiner in the attached EXAMINER'S AMENDMENT. CORRECTION IS REQUIRED.
   d. ☐ Formal drawings are now REQUIRED.

Any response to this letter should include in the upper right hand corner, the following information from the NOTICE OF ALLOWANCE AND ISSUE FEE DUE: ISSUE BATCH NUMBER, DATE OF THE NOTICE OF ALLOWANCE, AND SERIAL NUMBER.

Attachments:

- _ Examiner's Amendment
- _ Examiner Interview Summary Record, PTOL-413
- _ Reasons for Allowance
- _ Notice of References Cited, PTO-892
- ✓ Information Disclosure Citation, PTO-1449
- _ Notice of Informal Application, PTO-152
- _ Notice re Patent Drawings, PTO-948
- _ Listing of Bonded Draftsmen
- _ Other

Wing F. Chan

WING F. CHAN
PRIMARY EXAMINER
GROUP 2600

PTOL-37 (REV. 4-89) ★

USCOMM-DC 89-3789

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

Address: Box ISSUE FEE
COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

28M1/1213

THOMAS P. VIOTL
VIOTL & HANRATH
636 S. NORTHWEST HIGHWAY
BARRINGTON, IL 60010

NOTICE OF ALLOWANCE AND ISSUE FEE DUE

☐ Note attached communication from the Examiner
☐ This notice is issued in view of applicant's communication filed _____

SERIES CODE/SERIAL NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT	DATE MAILED
08/134,086	10/08/93	019	CHIN, W	2700 12/13/94

First Named Applicant: BAREIS PAUL V

TITLE OF INVENTION: REMOTE CONTROL SYSTEM (AS AMENDED)

	ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
2	93173	379-102.000	1005	UTILITY	YES	$605.00	03/13/95

THE APPLICATION IDENTIFIES ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED.

THE ISSUE FEE MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED.

HOW TO RESPOND TO THIS NOTICE:

I. Review the SMALL ENTITY Status shown above.
If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is changed, pay twice the amount of the FEE DUE shown above and notify the patent and Trademark Office of the change in status, or
B. If the Status is the same, pay the FEE DUE shown above.

If the SMALL ENTITY is shown as NO:
A. Pay FEE DUE shown above, or
B. File verified statement of Small Entity Status before, or with, pay of 1/2 the FEE DUE shown above.

II. Part B of this notice should be completed and returned to the Patent and Trademark Office (PTO) with your ISSUE FEE. Even if the ISSUE FEE has already been paid by charge to deposit account, Part B should be completed and returned. If you are charging the ISSUE FEE to your deposit account, Part C of this notice should also be completed and returned.

III. All communications regarding this application must give series code (or filing date), serial number and batch number. Please direct all communication prior to issuance to Box ISSUE FEE unless advised to contrary.

IMPORTANT REMINDER: Patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PTOL-85 (REV. 12-93) (0651-0033) PATENT AND TRADEMARK OFFICE COPY

EB

#605 242
30 561

B

PART B—ISSUE FEE TRANSMITTAL

MAILING INSTRUCTIONS: **This form should be used for transmitting the ISSUE FEE. Blocks 2 through 6 should be completed where appropriate. All further correspondence including the Issue Fee Receipt, the Patent, advance orders and notification of maintenance fees will be mailed to addressee entered in Block 1, unless you direct otherwise, by: (a) specifying a new correspondence address in Block 3 below; or (b) providing the PTO with a separate "FEE ADDRESS" for maintenance fee notifications with the payment of Issue Fee or thereafter. See reverse for Certificate of Mailing.**

25

1. CORRESPONDENCE ADDRESS	2. INVENTOR(S) ADDRESS CHANGE (Complete only if there is a change)
26M1/1213 THOMAS R. VIGIL VIGIL & HANRATH 836 S. NORTHWEST HIGHWAY BARRINGTON, IL 60010	INVENTOR'S NAME Street Address City, State and ZIP Code CO-INVENTOR'S NAME Street Address City, State and ZIP Code ☐ Check if additional changes are on reverse side

E

SERIES CODE/SERIAL NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT	DATE MAILED
08/134,086	10/08/93	019	CHAN, W 2600	12/13/94
First Named Applicant DARBEE,	PAUL V.			

TITLE OF INVENTION MUTE CONTROL SYSTEM (AS AMENDED)

	ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
2	93173	379-102.000	1105	UTILITY	YES	$605.00	03/13/95

040 CH 01/05/95 08138917 ~~1 242 605.00 CK~~
1 561 30.00 CK

3. Correspondence address change (Complete only if there is a change)	4. For printing on the patent front page, list the names of not more than 3 registered patent attorneys or agents OR, alternatively, the name of a firm having as a member a registered attorney or agent. If no name is listed, no name will be printed.
VIGIL & HANRATH 836 S. Northwest Highway Barrington, IL 60010 ~~120 EK 01/11/95 08134086~~	1 Thomas R. Vigil 2 3 1 242 605.00 CK

DO NOT USE THIS SPACE

120 EK 01/11/95 08134086 1 561 30.00 CK
040 CH 01/05/95 ~~08138917~~

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(2) ADDRESS: (CITY & STATE OR COUNTRY) 1864 Enterprise Parkway, Twinsburg, OHIO 44087

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December 19, 1994
(Date)

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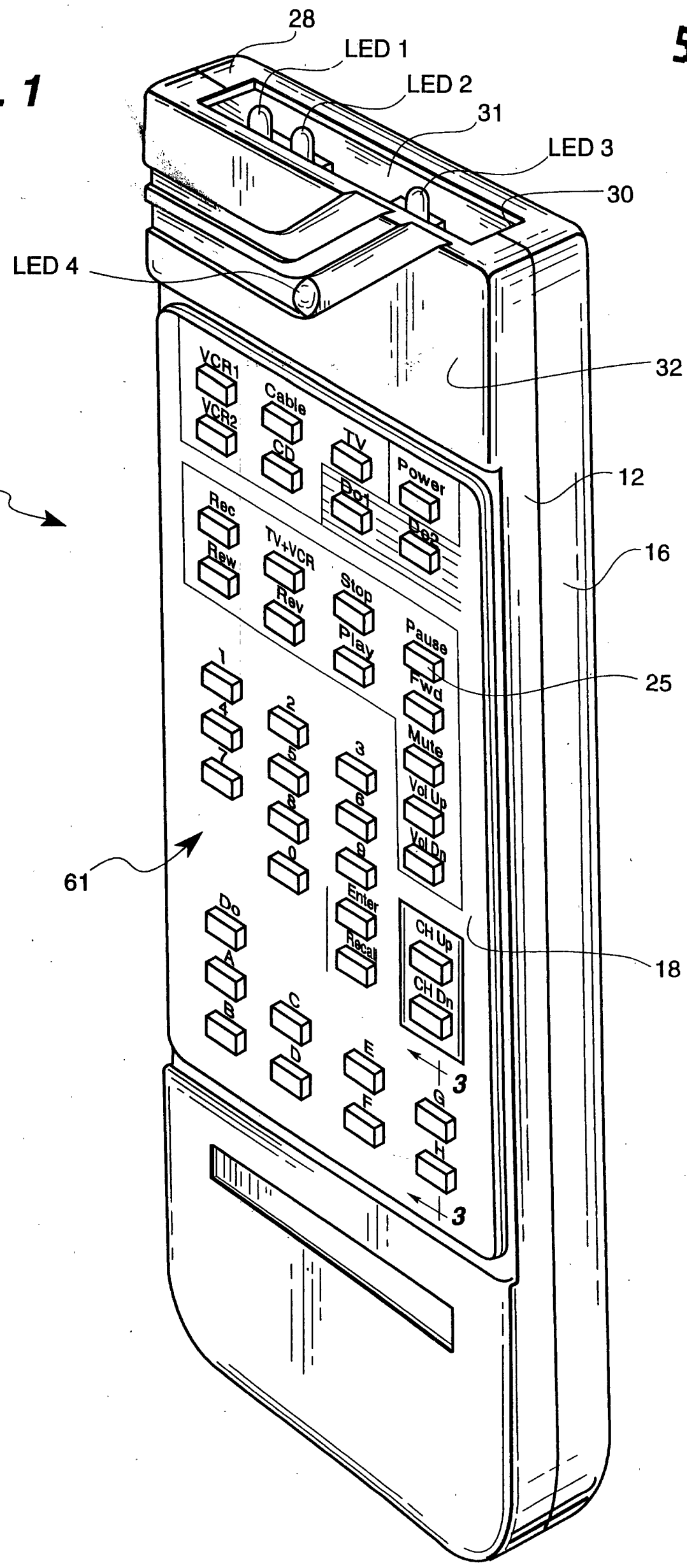
FIG. 1



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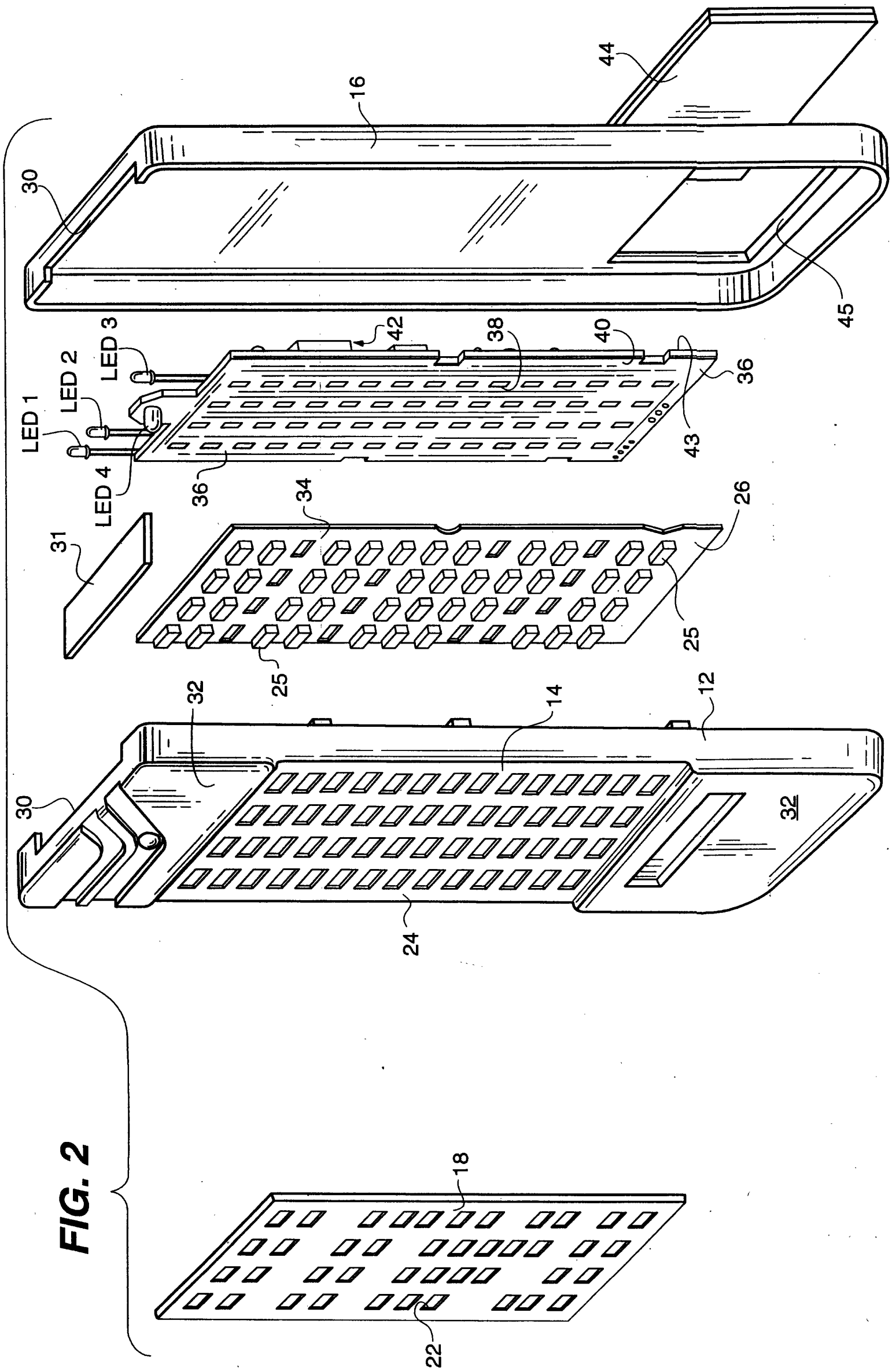

FIG. 2

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FIG. 3

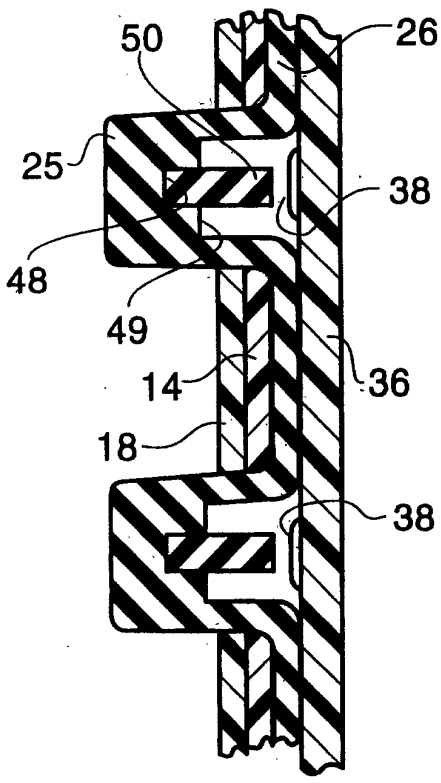

FIG. 4

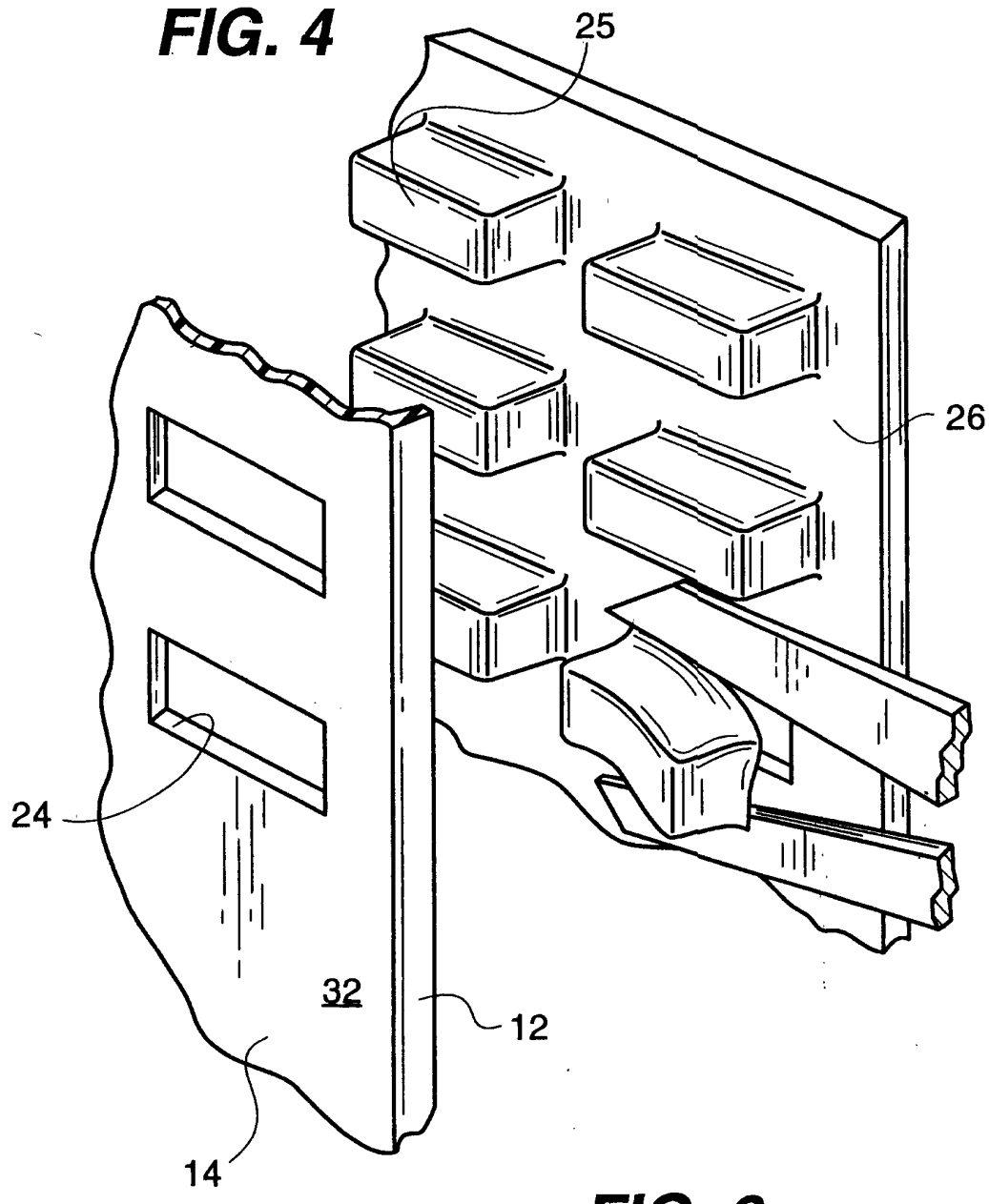

FIG. 5

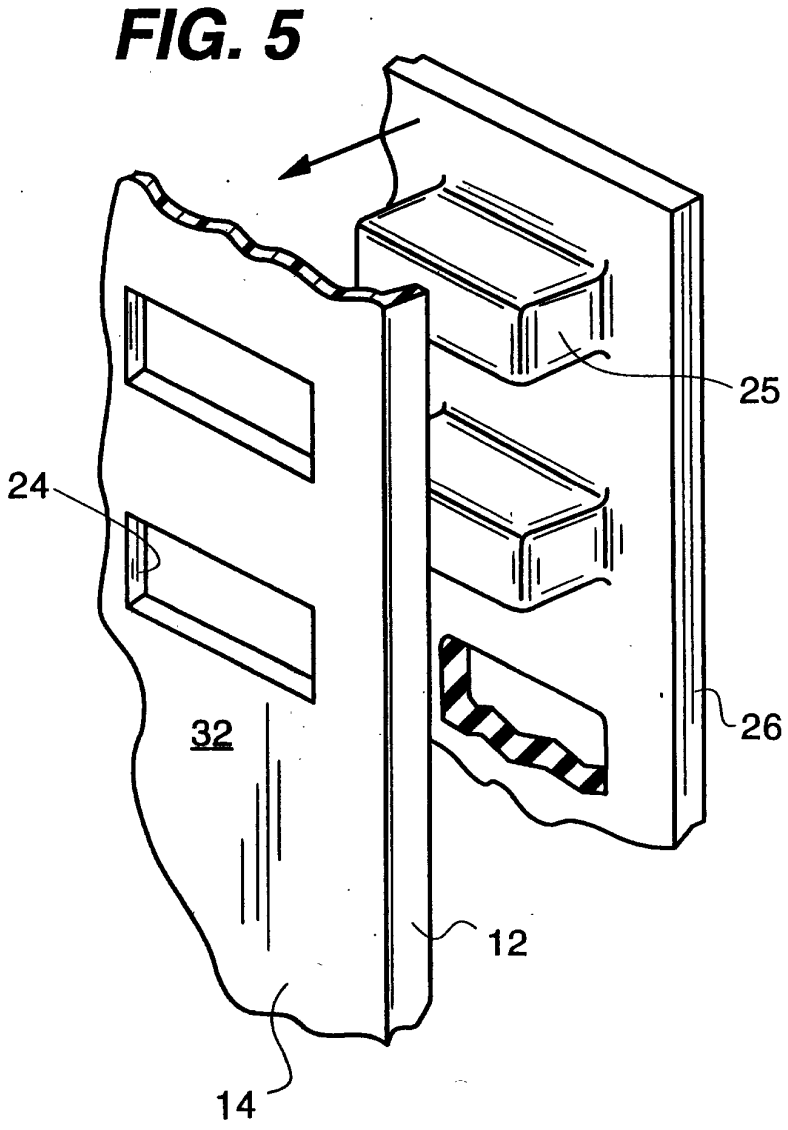

FIG. 6

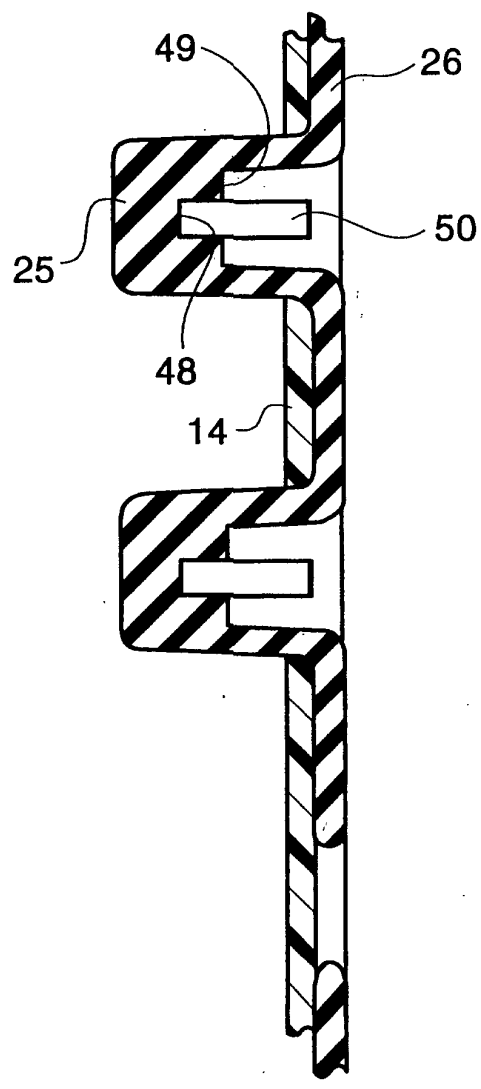

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FIG. 7

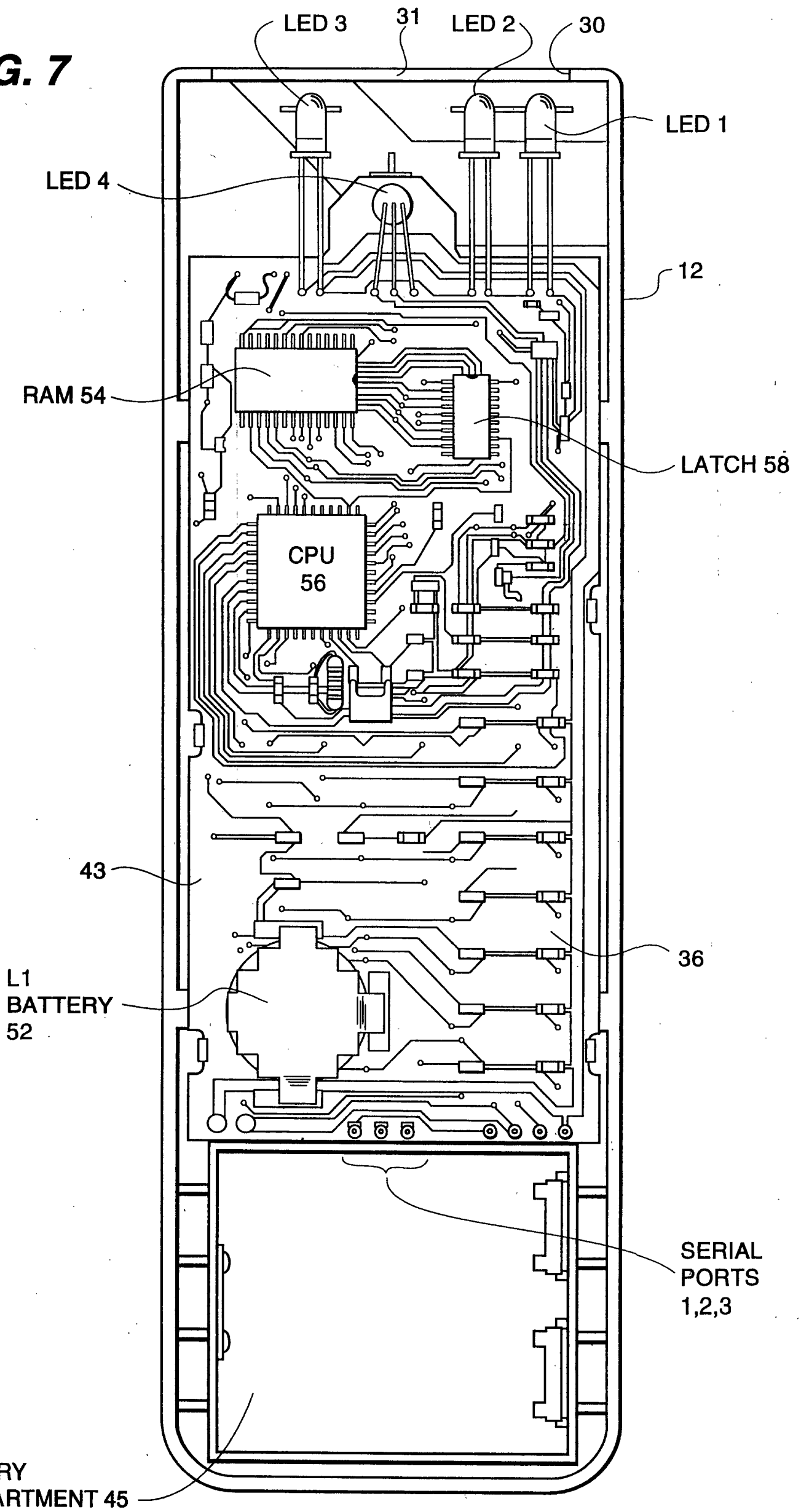

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FIG. 8

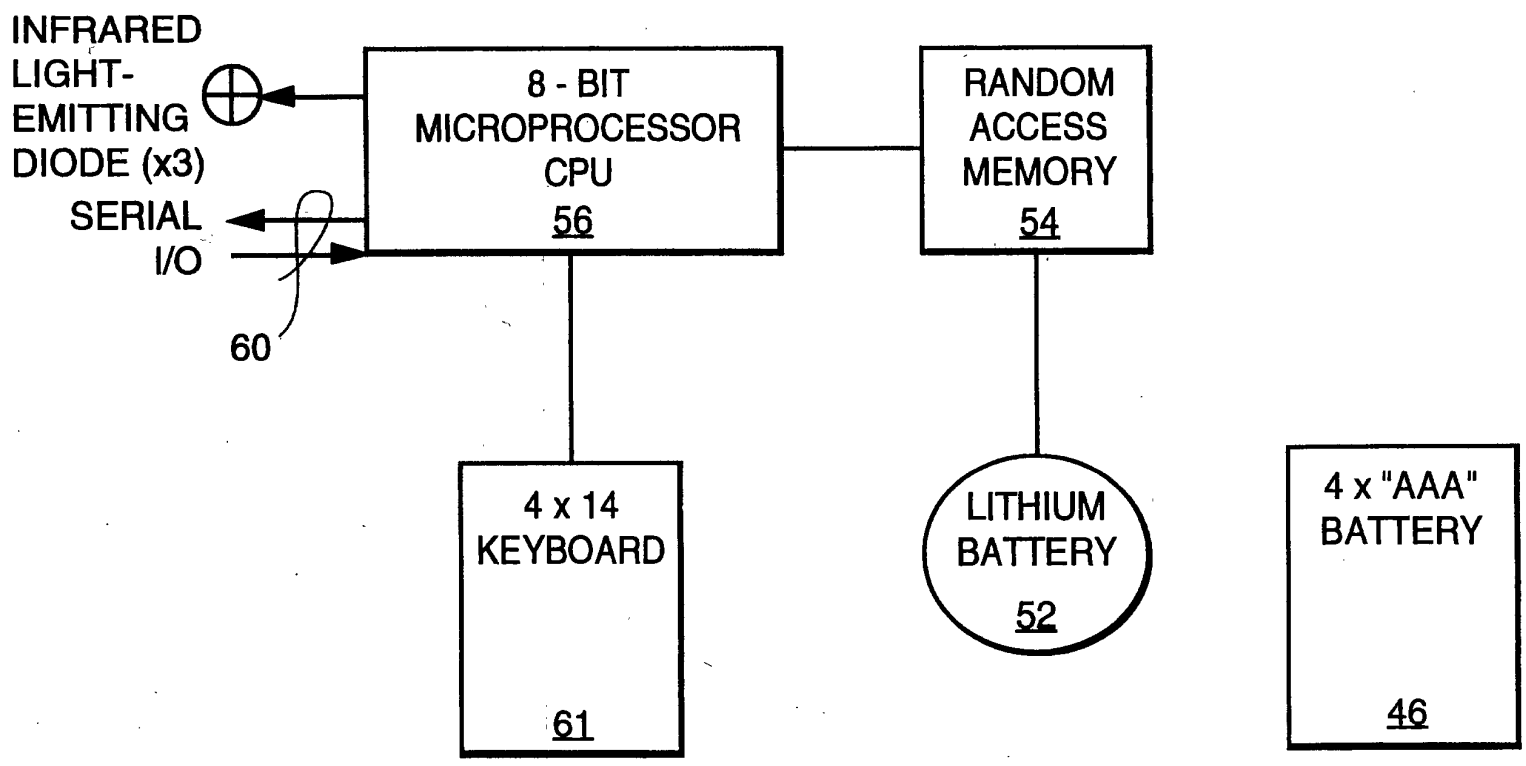
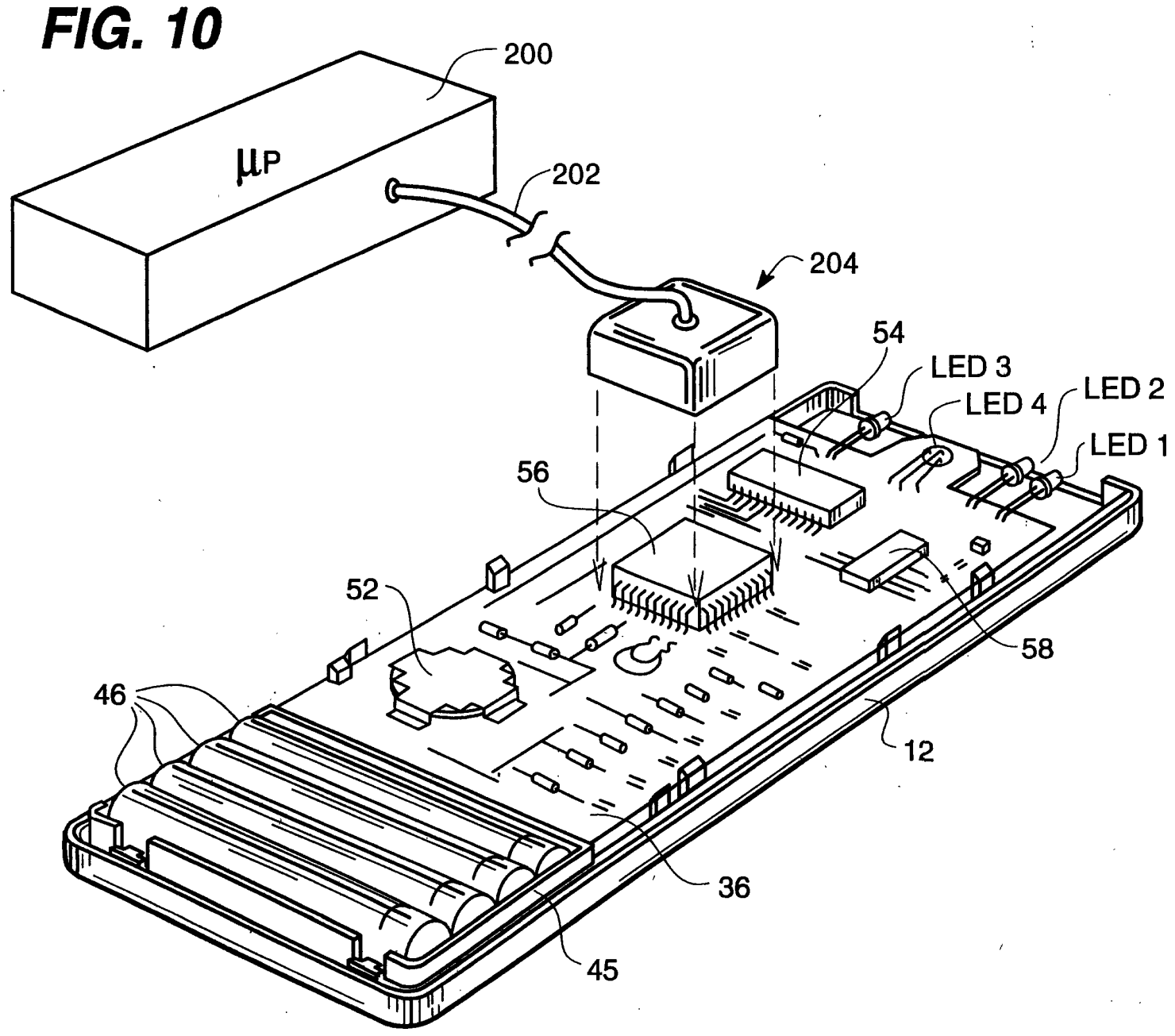


FIG. 10



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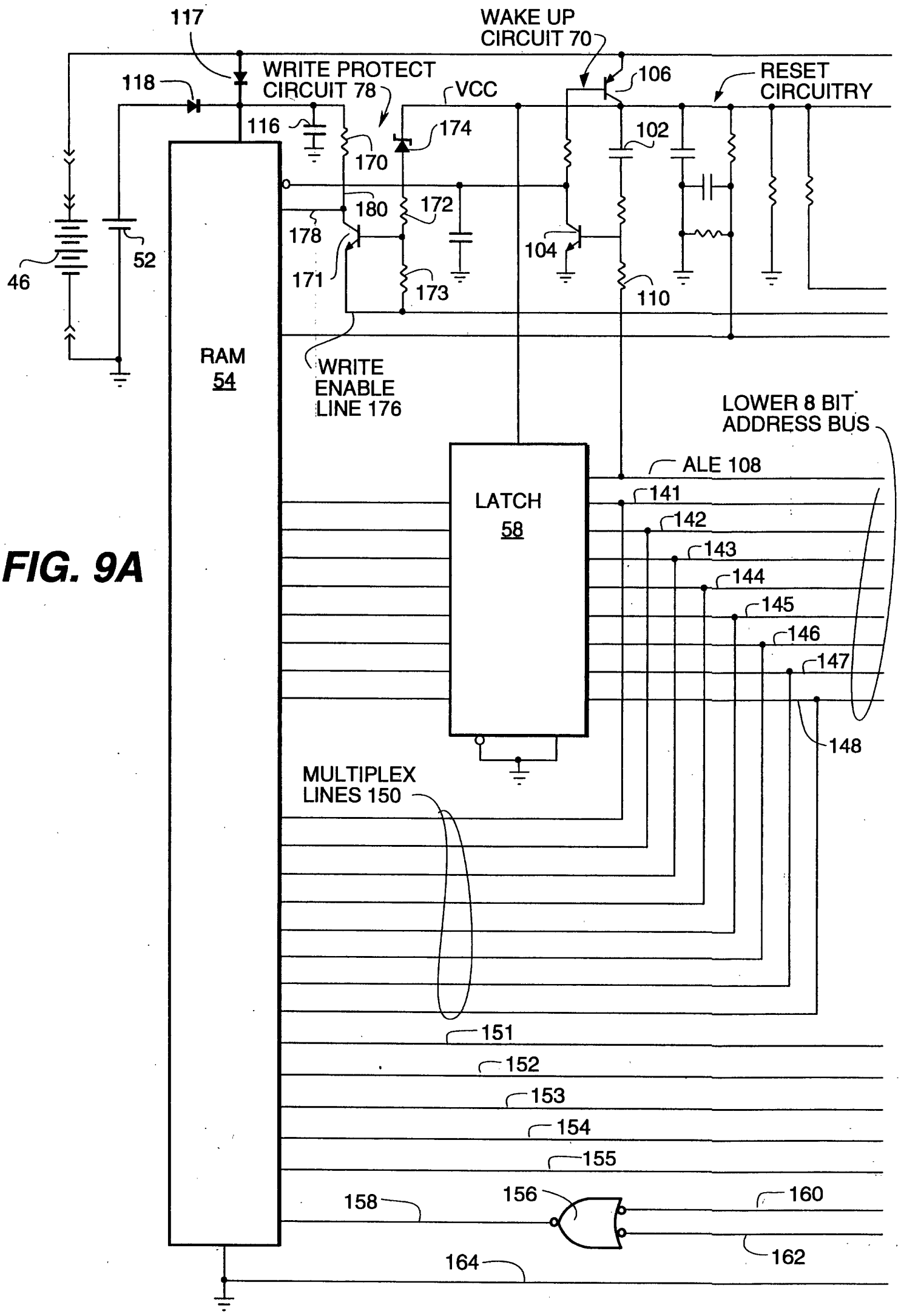

FIG. 9A

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FIG. 9B

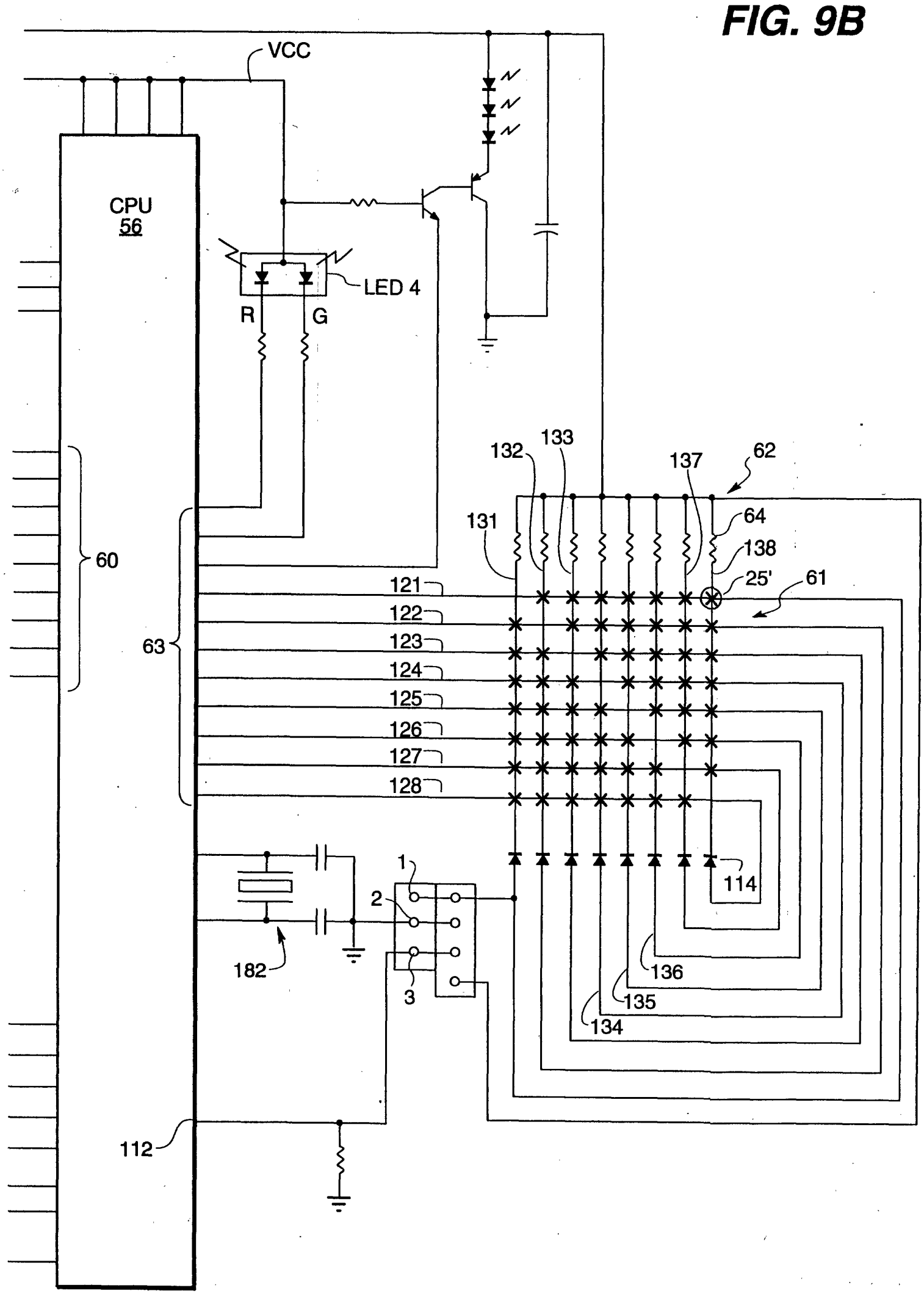

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FIG. 11

MODULATION SCHEMES

FIG. 11a — FIXED BIT TIME, FULL WIDTH BURST

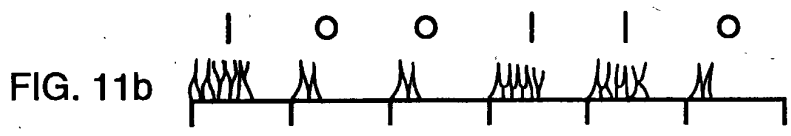

FIG. 11b — FIXED BIT TIME, BURST WIDTH MODULATED

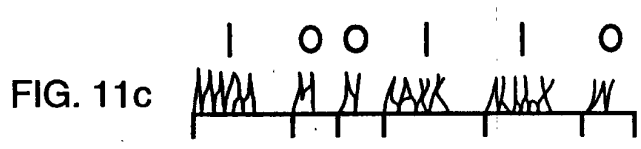

FIG. 11c — FIXED OFF TIME, BURST WIDTH MODULATED

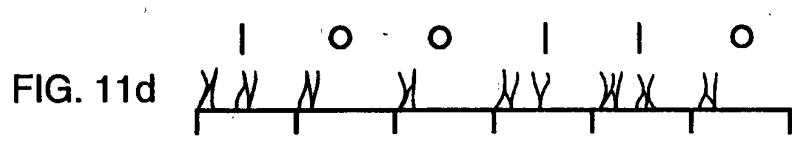

FIG. 11d — FIXED BIT TIME, SINGLE / DOUBLE BURST

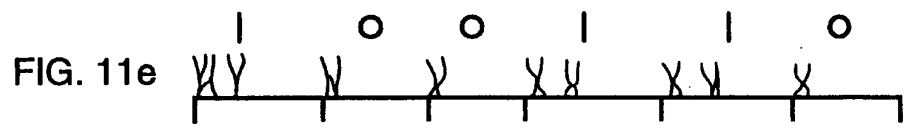

FIG. 11e — FIXED OFF TIME, SINGLE / DOUBLE BURST

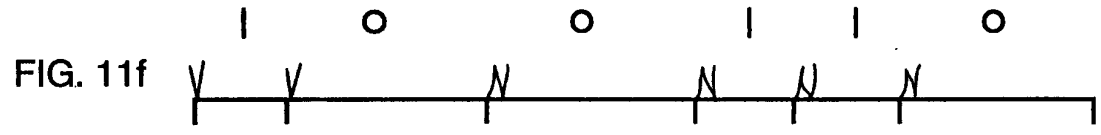

FIG. 11f — FIXED BURST TIME, OFF TIME MODULATED

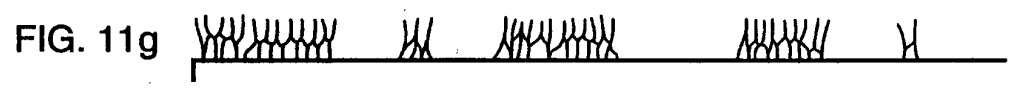

FIG. 11g — RANDOM

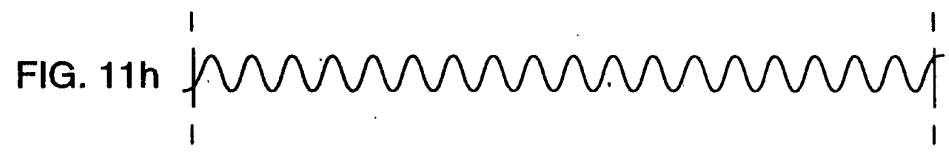

FIG. 11h — ONE FREQUENCY FOR EACH KEY

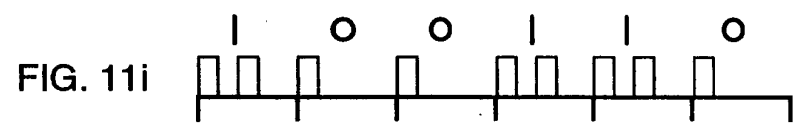

FIG. 11i — SINGLE / DOUBLE PULSE, FIXED BIT TIME

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FIG. 12A

CAPTURING IR CODE

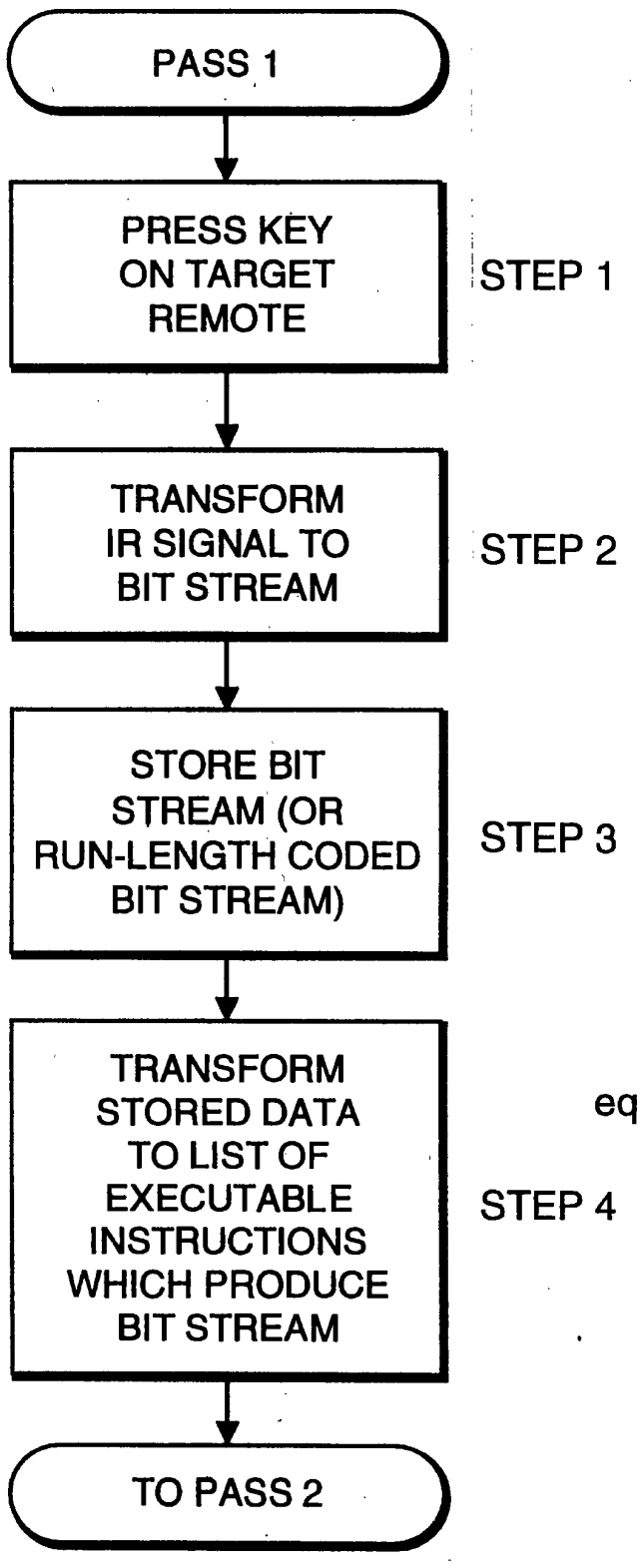

FIG. 12B

eq.

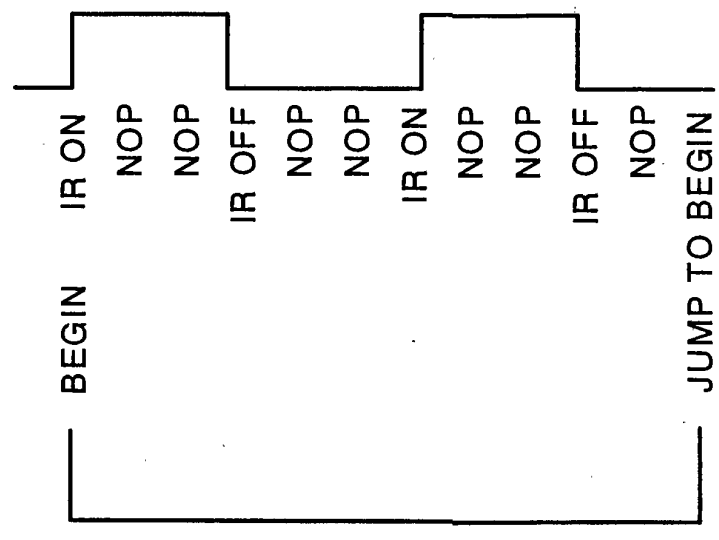

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FIG. 13A

CAPTURING IR CODE

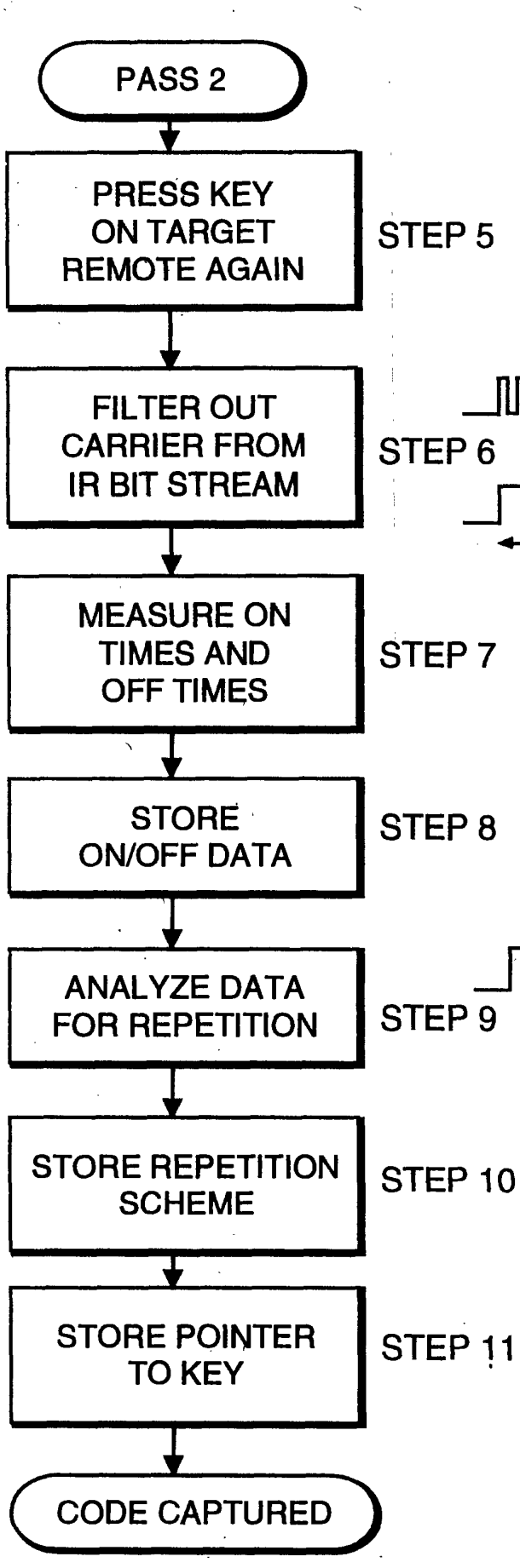


FIG. 13B

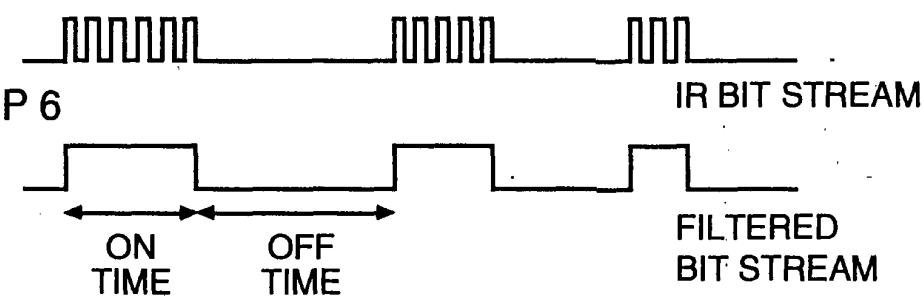
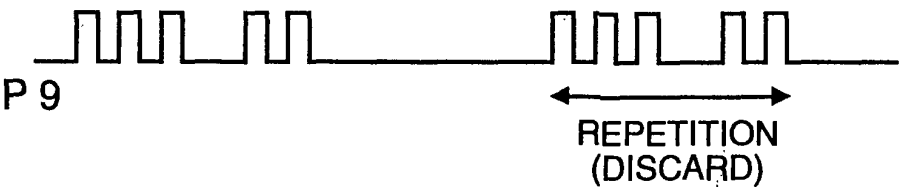


FIG. 13C



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ART UNIT 237 O.G. FIG. 23
BY CLASS 379 SUBCLASS 102
DRAFTSMAN

FIG. 14

GENERATING IR CODE

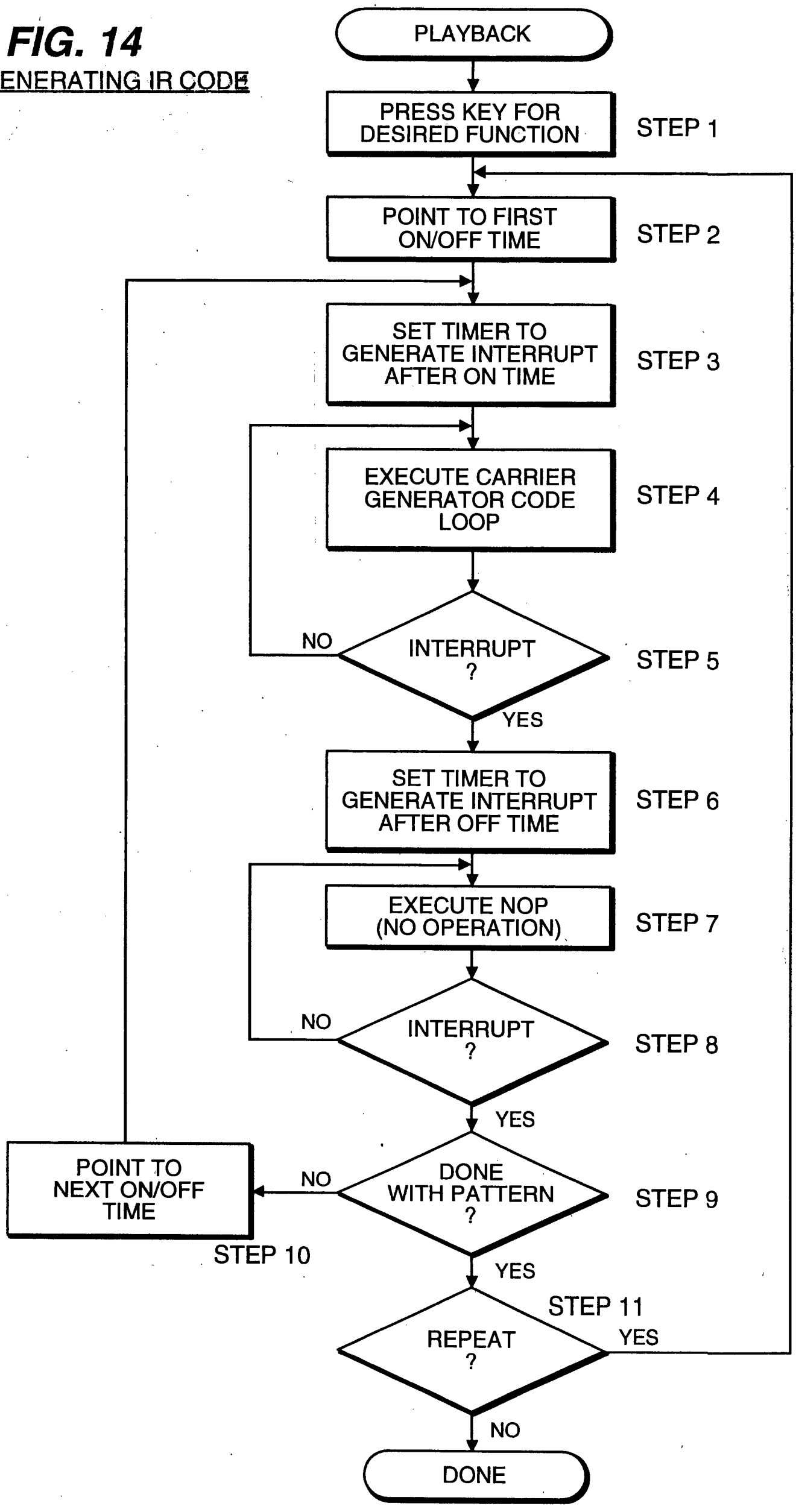

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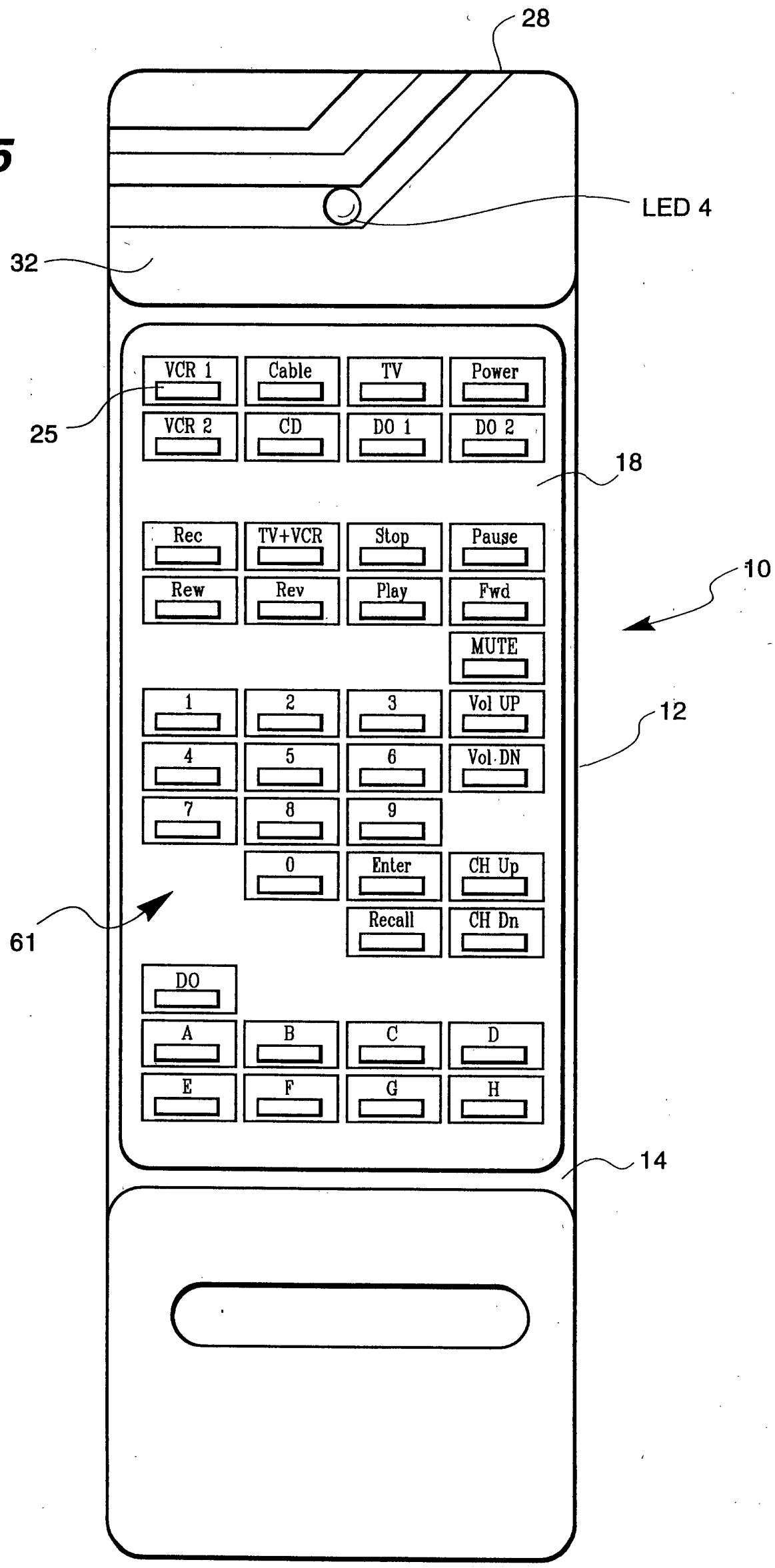
FIG. 15



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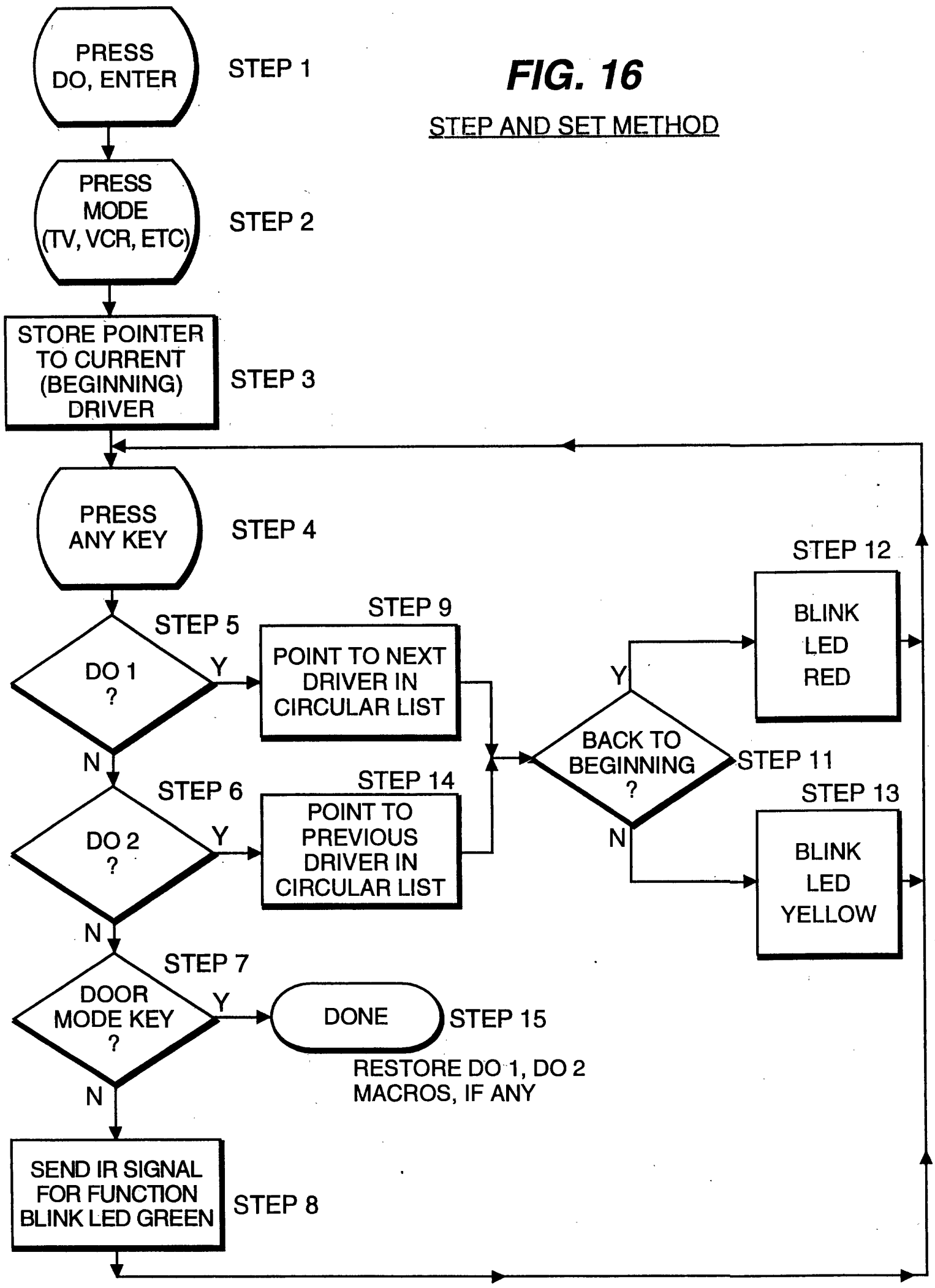

FIG. 16

STEP AND SET METHOD

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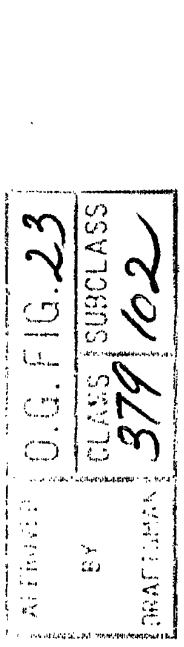
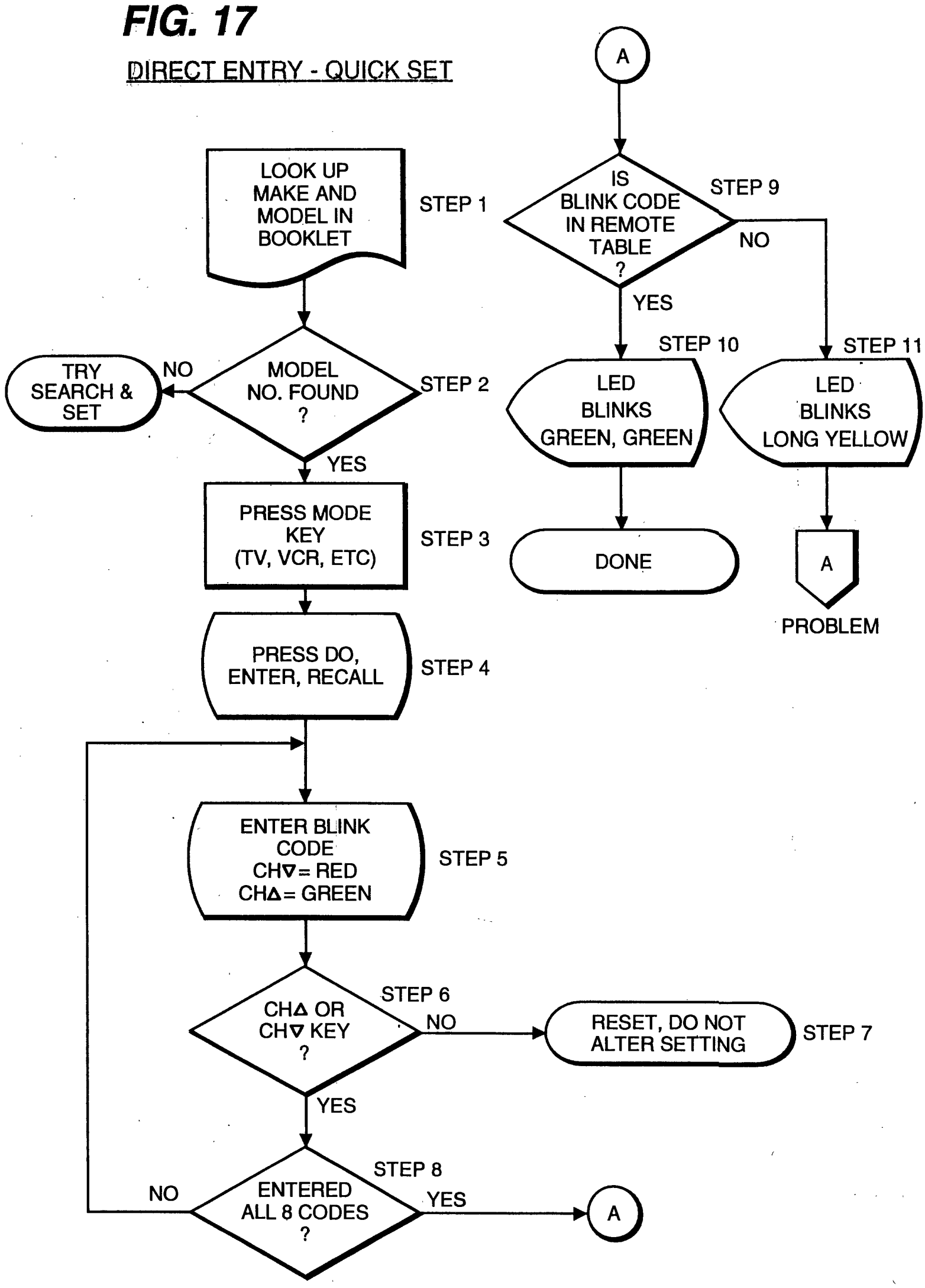
FIG. 17

DIRECT ENTRY - QUICK SET





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Iversal Remote Control System
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FIG. 18A

SETTING A "DO" COMMAND MACRO

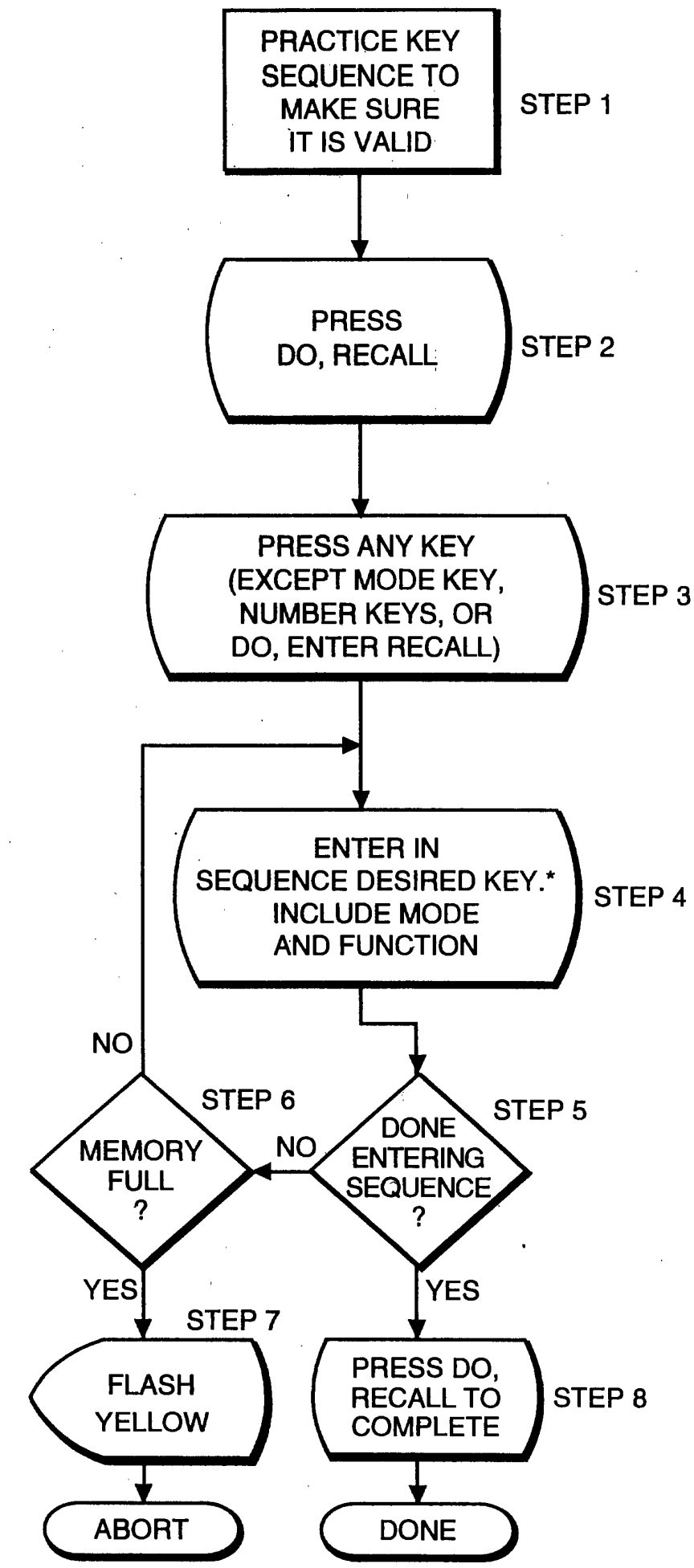
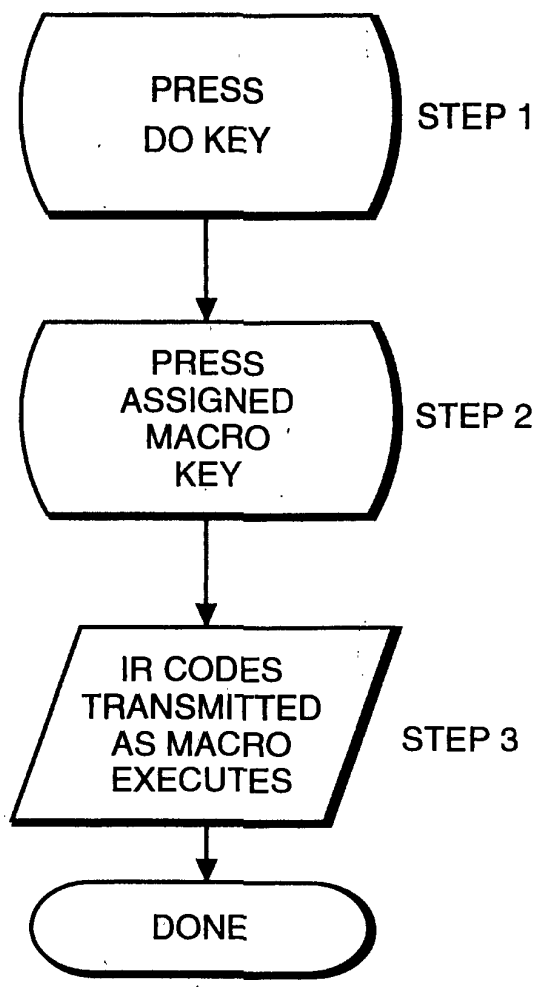


FIG. 18B

EXECUTING A MACRO "DO" COMMAND



* eg. TV, POWER, VCR 1, POWER, PLAY, TV, 3, ENTER

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FIG. 19A

TO IDENTIFY WHAT DEVICE REMOTE IS SET FOR - BLINK CODE

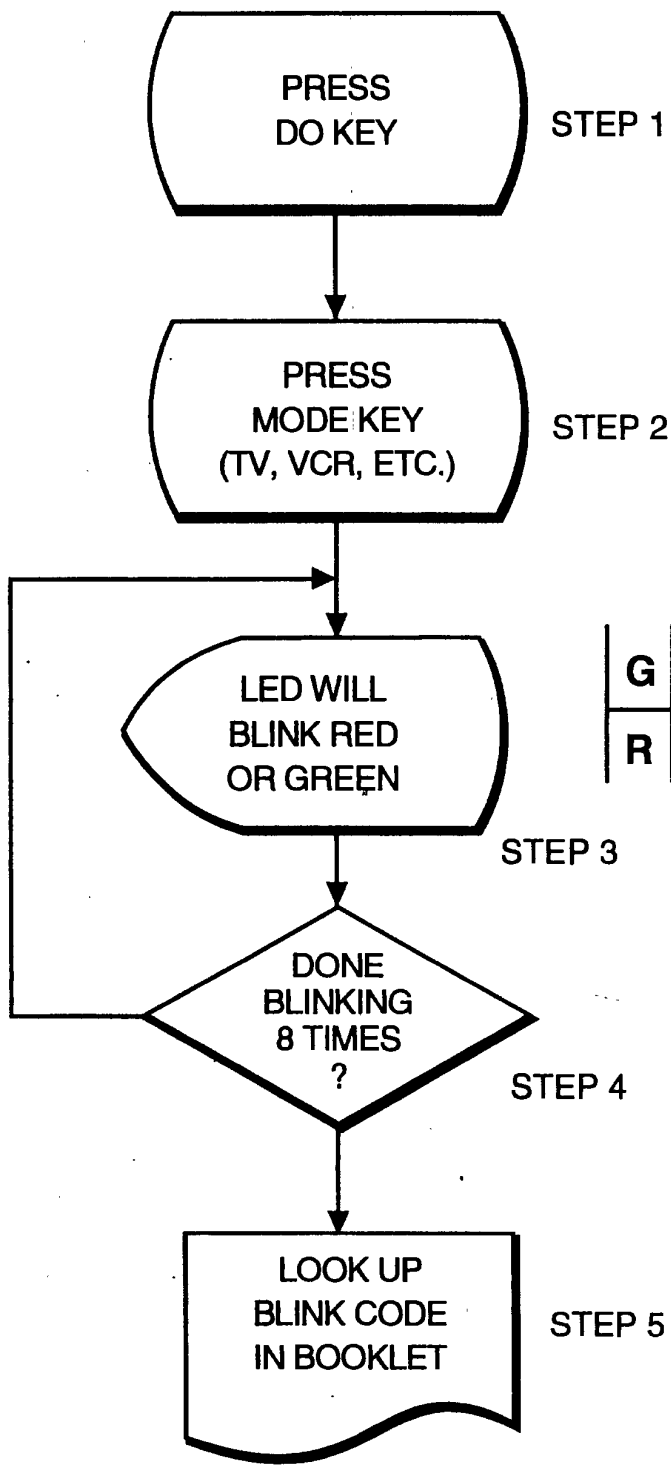

FIG. 19B

G	G	G	G	G	G	G	G
R	R	R	R	R	R	R	R

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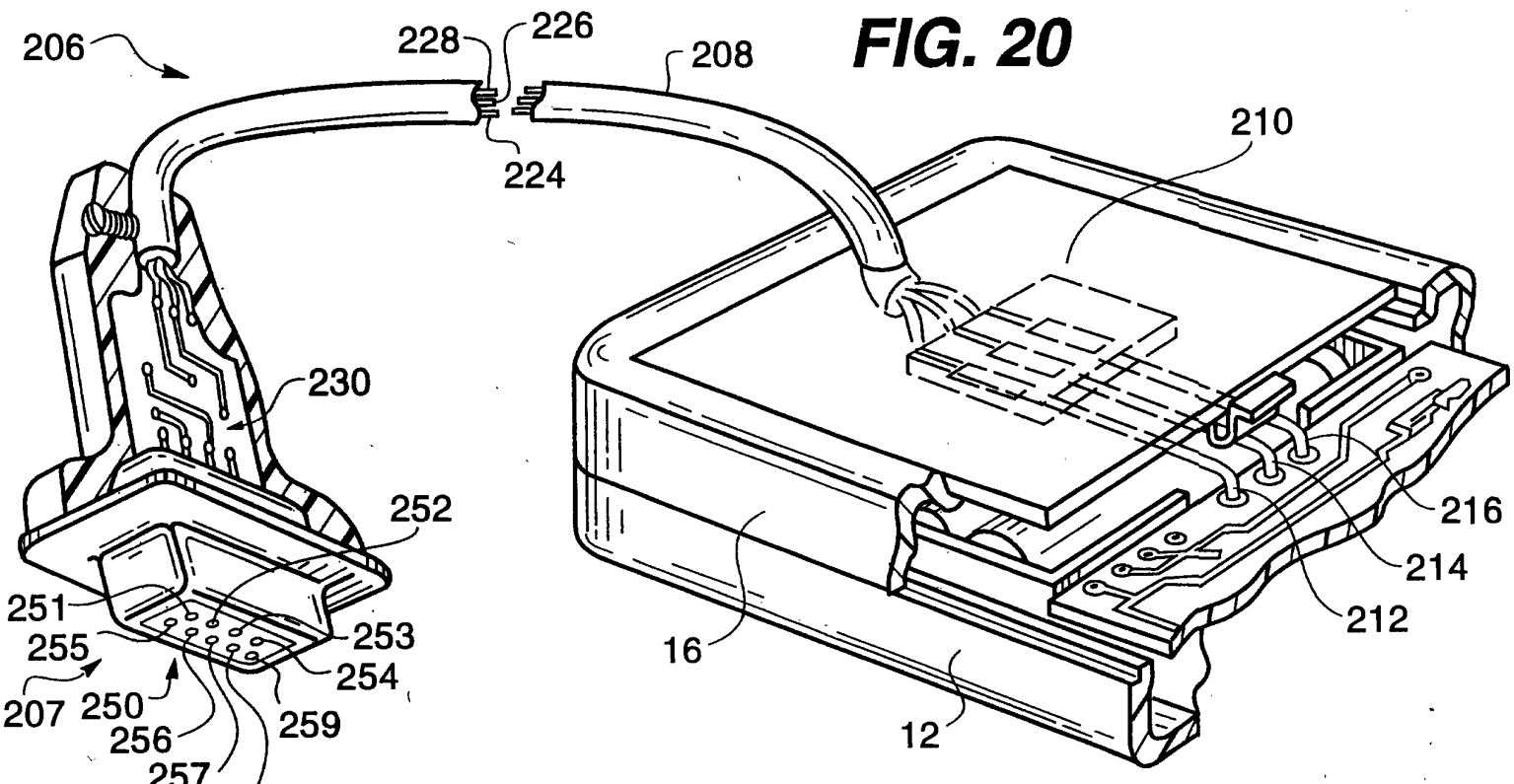


FIG. 20

FIG. 21

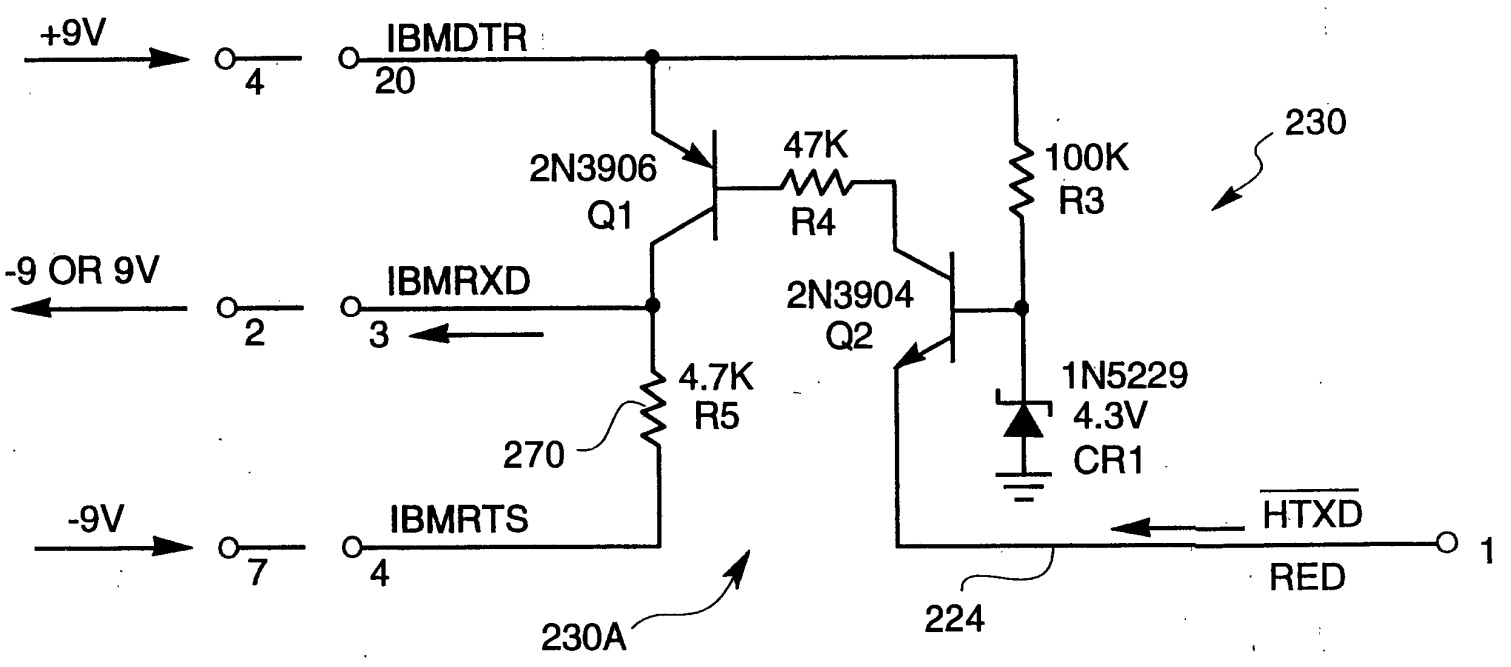
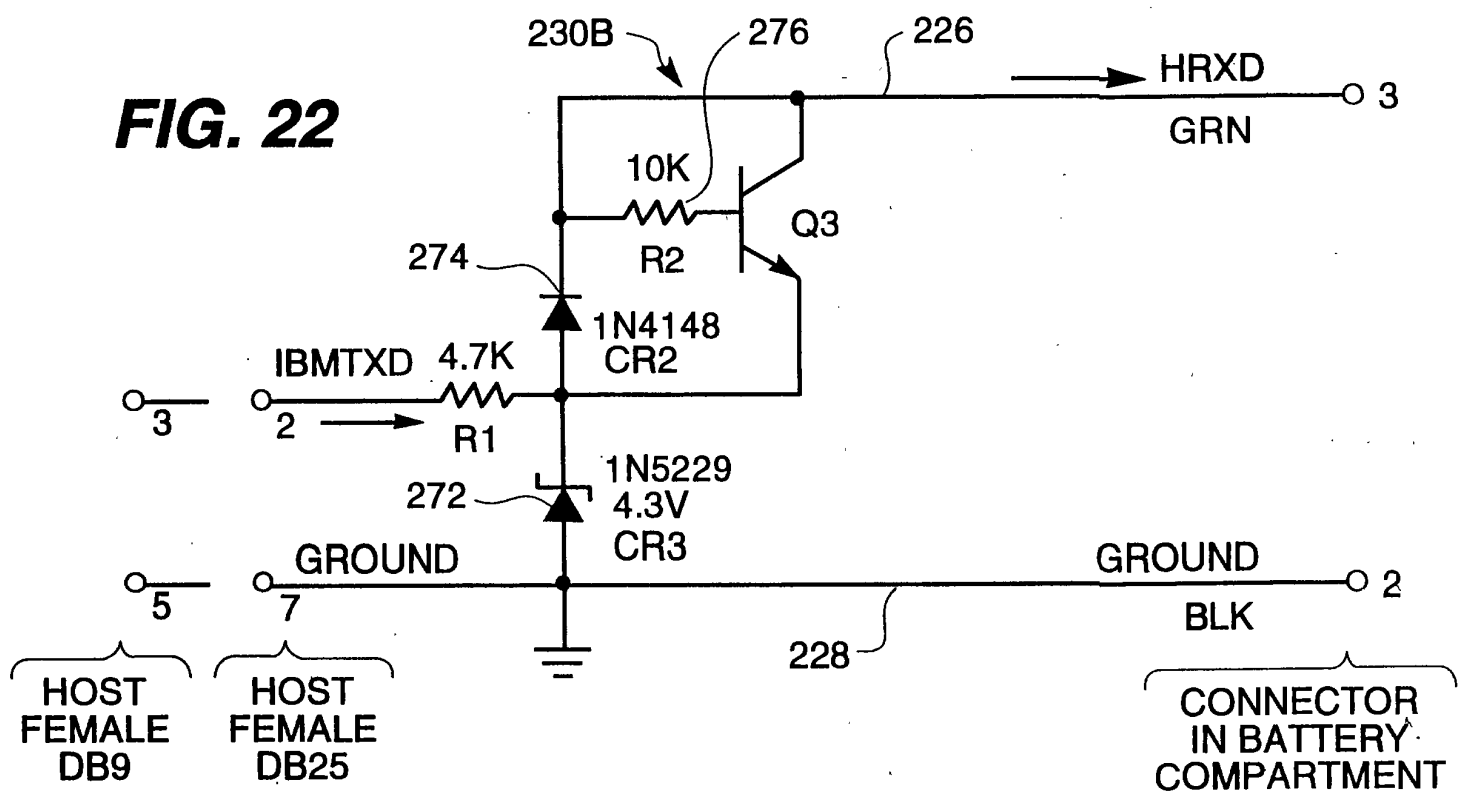


FIG. 22



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Atty: Tom Vigil (#9373)

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FIG. 23

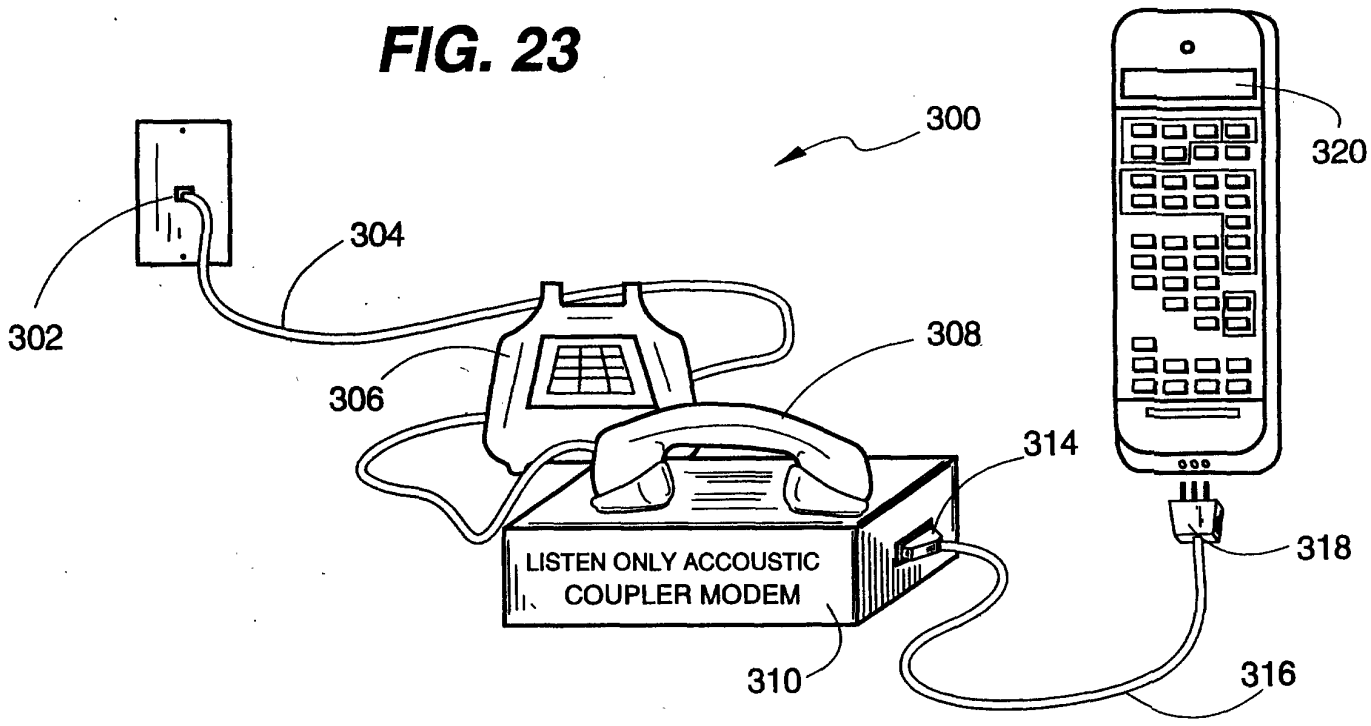


FIG. 24

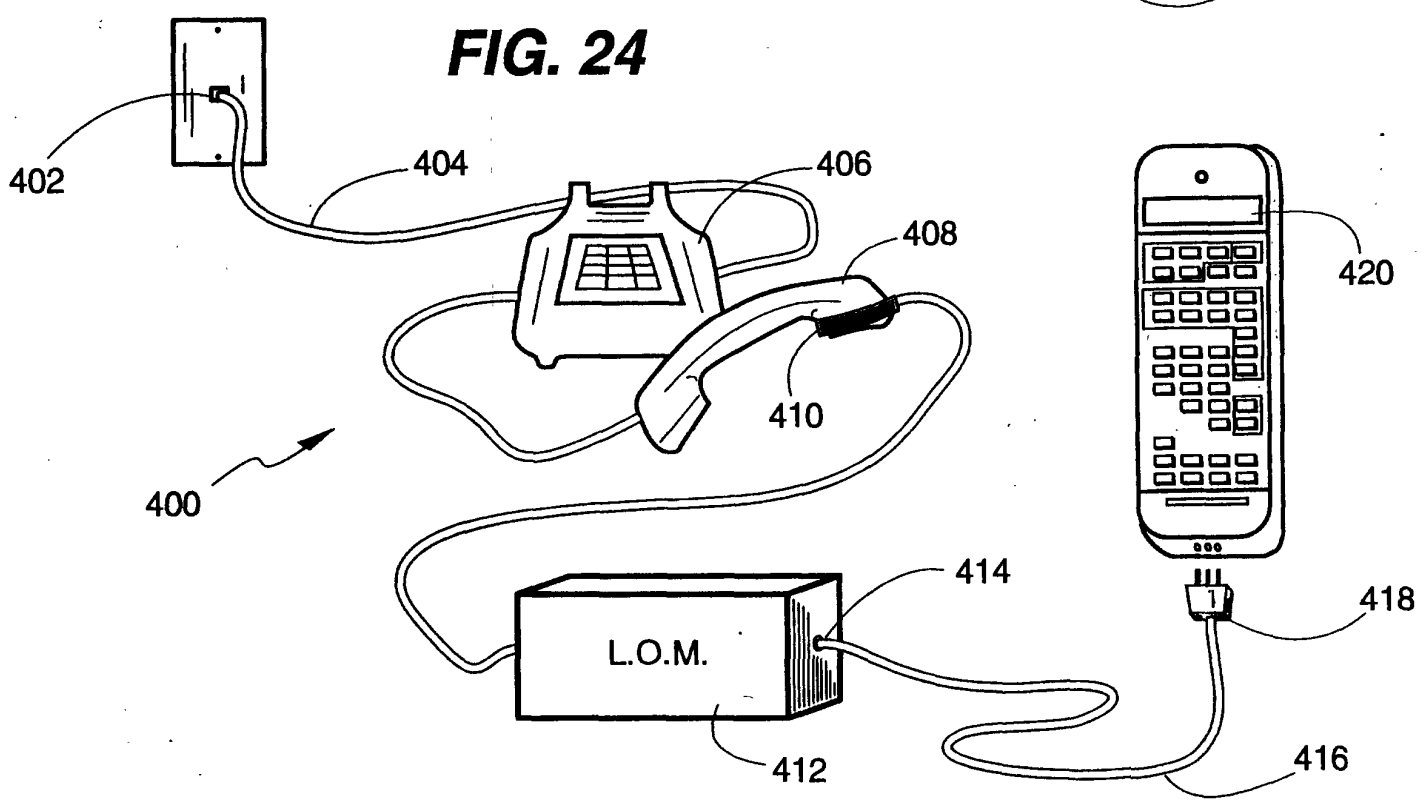


FIG. 25

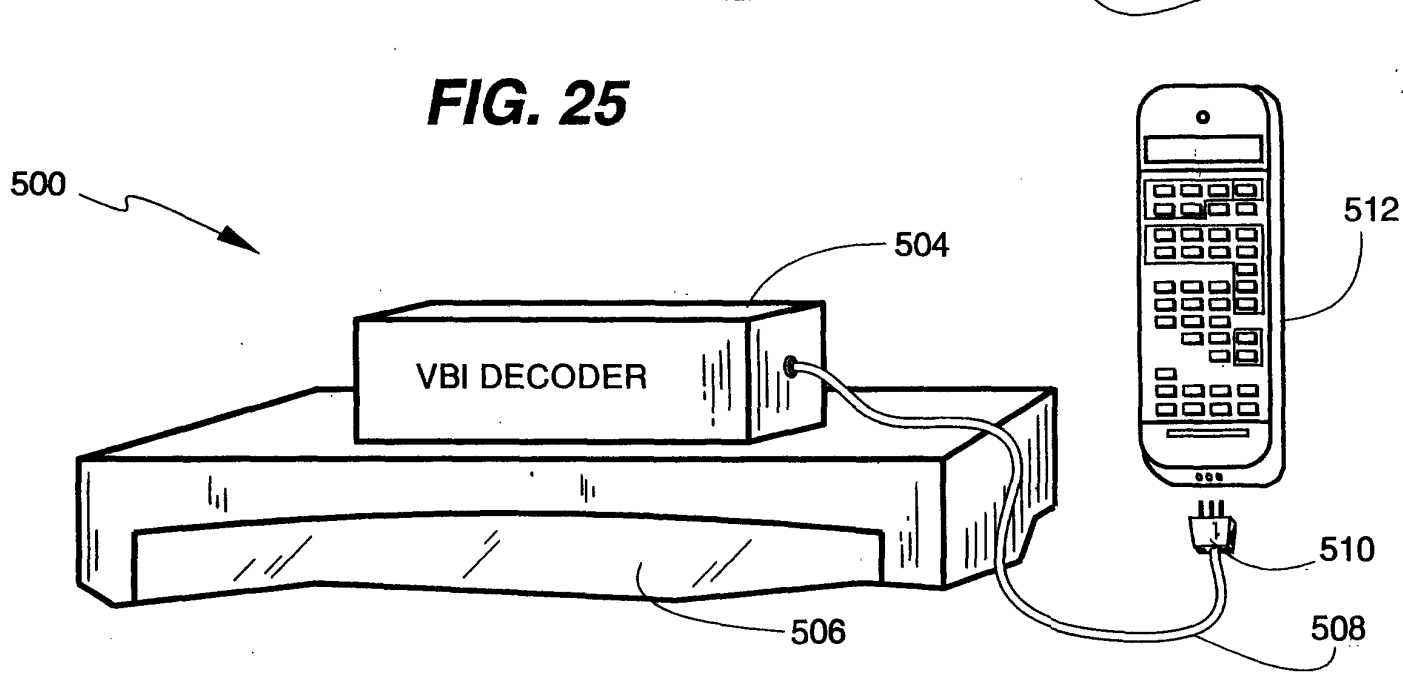
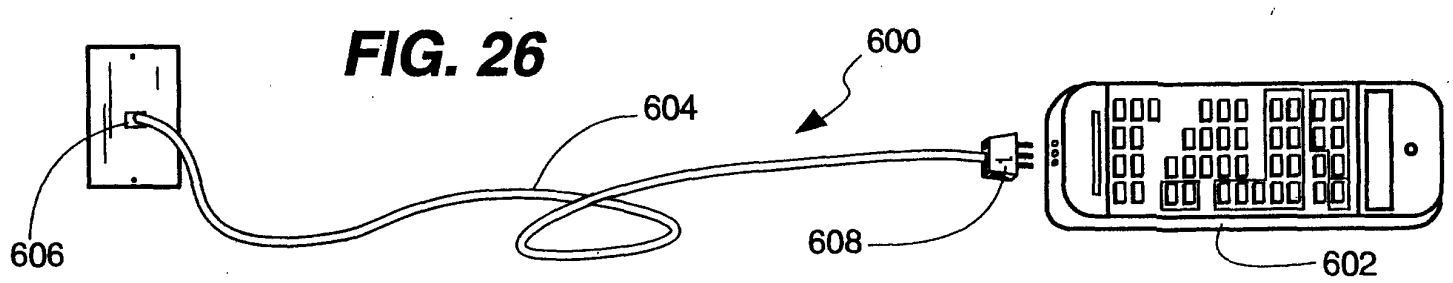


FIG. 26



PTO UTILITY GRANT

Paper Number 19

The United States of America

The Commissioner of Patents and Trademarks

Has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, this

United States Patent

Grants to the person or persons having title to this patent the right to exclude others from making, using or selling the invention throughout the United States of America for the term of seventeen years from the date of this patent, subject to the payment of maintenance fees as provided by law.

Bruce Lehman

Commissioner of Patents and Trademarks

Karna Y. Cooper

Attest

PTO-1584

(RIGHT INSIDE)

FPI-LOM

PATENT APPLICATION FEE DETERMINATION RECORD

Effective October 1, 1992

Application or Docket Number: 08/134,086

CLAIMS AS FILED - PART I

	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE	SMALL ENTITY FEE	OR	OTHER THAN SMALL ENTITY RATE	OTHER THAN SMALL ENTITY FEE
FOR							
BASIC FEE				$355.00	OR		$710.00
TOTAL CLAIMS	16 minus 20 =	* —	x$11=		OR	x$22=	
INDEPENDENT CLAIMS	15 minus 3 =	* 2	x 37=	74	OR	x 74=	
MULTIPLE DEPENDENT CLAIM PRESENT			+115=		OR	+230=	
			TOTAL	429	OR	TOTAL	

* If the difference in column 1 is less then zero, enter "0" in column 2

CLAIMS AS AMENDED - PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE	SMALL ENTITY ADDITIONAL FEE	OR	OTHER THAN SMALL ENTITY RATE	OTHER THAN SMALL ENTITY ADDITIONAL FEE
Total	* 19	Minus	** 20	=	x$11=		OR	x$22=	
Independent	* 8	Minus	*** 5	= 3	x 37=	$111.00	OR	x 74=	
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					+ 115=		OR	+230=	
					TOTAL ADDIT. FEE	Paid	OR	TOTAL ADDIT. FEE	

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE	SMALL ENTITY ADDITIONAL FEE	OR	OTHER THAN SMALL ENTITY RATE	OTHER THAN SMALL ENTITY ADDITIONAL FEE
Total	*	Minus	**	=	x$11=		OR	x$22=	
Independent	*	Minus	***	=	x 37=		OR	x 74=	
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					+ 115=		OR	+ 230=	
					TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT C

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE	SMALL ENTITY ADDITIONAL FEE	OR	OTHER THAN SMALL ENTITY RATE	OTHER THAN SMALL ENTITY ADDITIONAL FEE
Total	*	Minus	**	=	x$11=		OR	x$22=	
Independent	*	Minus	***	=	x 37=		OR	x 74=	
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					+115=		OR	+230=	
					TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

FORM PTO-875
(Rev.10-92)

Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

PTO 1130 (REV 11/91)

U.S. DEPARTMENT OF COMMERCE– PATENT & TRADEMARK OFFICE

PACE DATA ENTRY CODING SHEET

1ST EXAMINER: Ramirez — DATE: 10/27/93

2ND EXAMINER: D Wyrozumski — DATE: 2/7/94

APPLICATION NUMBER	TYPE APPL	FILING DATE MONTH	DAY	YEAR	SPECIAL HANDLING	GROUP ART UNIT	CLASS	SHEETS OF DRAWING
08/134086	1	10	08	93	2	2617	340	18

TOTAL CLAIMS	INDEPENDENT CLAIMS	SMALL ENTITY?	FILING FEE	FOREIGN LICENSE	ATTORNEY DOCKET NUMBER
7 ~~20~~	~~1~~ 1	2	494	Y	93173

CONTINUITY DATA

CONTINUITY CODE	STATUS CODE	PARENT APPPLICATION SERIAL NUMBER	PARENT PATENT NUMBER	PARENT FILING DATE MONTH	DAY	YEAR
02	2	08/046,105		04	08	93
12	1	07/587,326	5,228,077	09	24	90
13	1	07/127,999	4,959,810	12	02	87
13	3	07/109,336		10	14	87

PCT/FOREIGN APPLICATION DATA

FOREIGN PRIORITY CLAIMED	COUNTRY CODE	PCT/FOREIGN APPLICATION SERIAL NUMBER	FOREIGN FILING DATE MONTH	DAY	YEAR

EP 0446864
SEP 1991

PIOE ★ W05 91-275500/38 ★EP -446-864-A

Remote controller with learning function - stores external and key assigned remote control signals and outputs external signal on key-press or receiving key assigned control signal

PIONEER ELECTRONIC CORP 13.03.90-JP-062046

(18.09.91) G08c-19/28

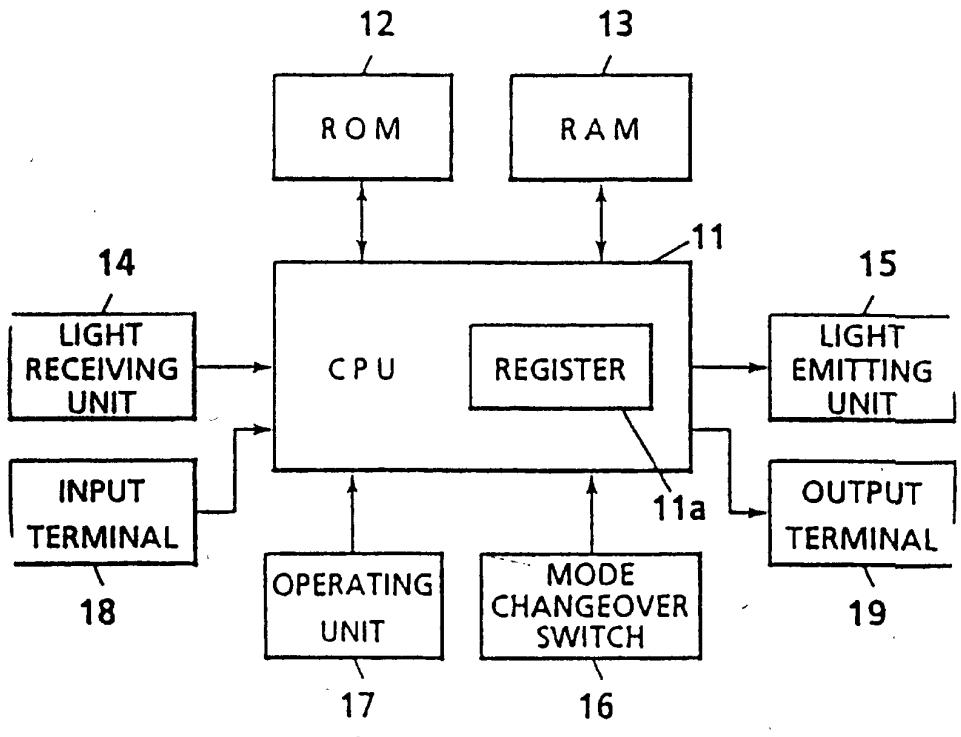
12.03.91 as 103746 (2062DM) (E) No-SR.Pub R(DE FR GB)

The controller comprises a keypad (17), first and second memories (12, 13) and a number of inputs (14, 18) and outputs (15, 19). Each operating key is assigned to a region in the first memory (12) holding a previously stored remote control signal.

During the learning mode, operating a key allows an externally received remote control signal to be stored in the second memory (13) with that assinged to the operated key. During the transmit mode, pressing the respective key or inputting its assigned remote control signal allows the external signal stored int he second memory to be output.

ADVANTAGE - Flexible. Can be extended to allow learning without keys being pressed, and to carryo out more remote control functions than number of incorporated keys. (28pp Dwg.No.3/22)

N91-210453 **W5-D4**



Publication Number: 0 354 313 A2

Applicant: Grundig E.M.V. ...

Priority Date: August 11, 1988

Publishing Date: February 12, 1990

Title: Arrangement for transferring tuning data into receiving devices

A known arrangement for transferring tuning data into receiving devices comprises a non volatile memory for tuning data, from which the tuning data are transferred into the memory for tuning data of the receiving devices. The entering takes place laboriously by using a certain key of the keyboard of the known arrangement. The entering of the tuning data will be simplified with the new arrangement.

This will be achieved by providing an outlet to the arrangement for transferring tuning data into receiving devices, by which the tuning data to be stored in the non volatile memory for tuning data will be entered.

Receiving devices of the entertainment electronics ...

Arrangement for transferring tuning data into receiving devices

The present invent ion relates to an arrangement for transferring tuning data into receiving devices according to the features of the preamble of claim 1.

Such an arrangement is known to applicant from DE-OS 36 42 365. This known arrangement is based on the cognition that, because of the increasing number of channels, especially by cable or satellite, the tuning process of receiving devices at their initiation is becoming more and more expensive and time consuming. To simplify and fasten the tuning process, the known arrangement comprises a non volatile memory for the tuning data, in which the tuning data are entered by a keyboard. Using this arrangement with its non volatile memory for the tuning data, the authorized dealer can transfer the tuning data into the memory for the tuning data of the receiving device during the set up or initiation.

A similar arrangement is known from DE-OS 36 40 437.

Furthermore, it is known from applicants not pre published Patent Application P 37 13 235.0 to use a magnetic tape as a non volatile memory for the tuning data, on which the tuning data are stored in a suitable manner.

The problem of the intention is to find a suitable way, based on an arrangement according to the preamble of claim 1, to make the entering of tuning data into the non volatile memory for the tuning data easier.

For an arrangement according to the preamble of claim 1 this problem is solved by the features of the body of claim 1.

Advantageous embodiments of the claimed invention are described in the dependent claims.

The advantages of the invention are described in the description of the (only) figure.

The figure shows a receiving device E to be programmed having a memory for tuning data S, an arrangement G for transferring tuning data into receiving devices and a personal computer PC including a screen B and a keyboard T. The arrangement G includes a display D, keys T1, T2,..., Tn, a load key L, an outlet A and a (not shown) non volatile memory for tuning data. A disk DK is loadable into the personal computer PC, on which a program is stored, which is given by the manufacturer of the device E to be programmed and will be used to generate the tuning data. The arrangement is connected to the personal computer PC by a cable K.

Entering Of the tuning data into arrangement G takes place as set forth below:

After operating load key L of arrangement G a start signal is generated and thereby the communication interface for communicating with the personal computer PC is generated. Therewith the arrangement G is ready to take over data.

After inserting a disk DK in the personal computer PC a program stored on the disk will be invocated. The program lists tuning data or data for channels, special channels, station findings, a. s. o., respectively, on the screen B using tables. These data are either stored on the disk DK or they are read from a non volatile memory for tuning data of arrangement G and transferred to the personal computer PC or its screen B, respectively, using a connecting cable K. The tuning data can be modified by using the keyboard T. If the desired tuning data are entered by a keyboard, the take over key U of the keyboard T of the personal computer PC is to be operated. In response of operating this key, the tuning data are transferred from the personal computer PC into the non volatile memory for tuning data of arrangement G via the (not shown) printer interface of the personal computer PC and the connecting cable K.

During the initial setting up the tuning data can be loaded from there into the memory for tuning data S of a device E. This last mentioned data transmission can be done without wires, for example by using an infrared transmission, or by using a connecting cable.

CLAIMS:

1. Arrangement for transferring tuning data into receiving devices having a non volatile memory for the tuning data from which the tuning data are to be transferred into the memory for the tuning data of the receiving device,

characterized in that,

the arrangement comprises an outlet (A), through which the tuning data to be stored in the non volatile memory for the tuning data can be entered.

2. Arrangement according to claim 1, characterized in that the tuning data entered through the outlet (A) are generated in a personal computer (PC).

3. Arrangement according to claim 2, characterized in that the tuning data generated in the personal computer (PC) are output by the printer interface of the personal computer (PC) and transferred to the outlet (A) of the arrangement (C) using a connecting cable (K).

4. Arrangement according to claim 3, characterized in that the arrangement comprises a load key (L) and operating the load key (L)
- prepares the arrangement (G) for taking over tuning data,
- invocates a program stored on a disk (DK), which lists tuning data on a screen (B) of the personal computer (PC), whereby the tuning data listed on the screen (B) are modifiable by the keyboard (T) of the personal (PC).

5. Arrangement according to claim 4, characterized in that the tuning data listed on the screen of the personal computer (PC) are stored on a disk (DK)

6. Arrangement according to claim 4, characterized in that the tuning data listed on the screen (B) of the personal computer (PC) are read from the non volatile memory of the arrangement (G).

Controlling Remote Electrical Appliances Via The Mains Supply

This invention relates to remote control of electrical appliances via the mains supply, and especially to a handset for communicating with a terminal for causing a mains borne data packet to be transmitted to control the electrical appliance.

It is known to control electric lights via terminals which receive mains borne signals, wherein a user has a handset which can communicate with a terminal via an infra-red link.

In the applicant's co-pending patent application nos. 89 05082.7 and 89 05083.5 (P/8086/CRE and P/8087/CRE), a controller terminal transmits mains borne data packets and a plurality of remote terminals control the electrical appliances in response to receipt of such data packets. One or more handsets are able to commence transmission of data packets at respective defined times after the end of a message. The controller is driven by a micro-computer, into which messages can be fed from a

touch-sensitive display. It would in principle be possible to communicate with the micro-computer via a modem and a telephone link. This could be done using a further handset, which would need to have a modem to communicate with the telephone system.

The applicants have realised that certain components for such a handset would duplicate those for the infra-red handset for signalling to the terminals in the household having the electrical appliances.

Accordingly, the invention provides a handset for communicating with a terminal for causing a mains borne data packet to be transmitted to another terminal to control an electrical appliance remotely, comprising a display, a key pad, a micro-processor, a modem for communicating with a terminal via electro-magnetic or acoustic waves, and a modem for communicating with a terminal via a telephone link.

Such a handset can be used for communicating with the terminals via an electro-magnetic or acoustic link or via a telephone link. The modem for communicating via a electro-magnetic or acoustic waves could include an ultra-sonic link but preferably includes an infra-red link. The modem for communicating via the telephone link may have a plug or socket for communicating with telephone wires directly, or it may incorporate an acoustic coupler which can be connected to a telephone handset.

The invention also provides a system for the remote control of electrical appliances via the mains supply, comprising a controller terminal for transmitting and receiving mains borne data packets and a plurality of remote terminals for controlling the electrical appliances in response to receipt of data packets from the controller, and a handset for communicating via an electro-magnetic or acoustic link with a terminal to cause transmission of a mains borne data packet to control an appliance, the handset also being capable of communicating with the controller terminal via a telephone system.

The invention will now be described in detail with reference to the accompanying drawings, in which:

Figure 1 is a block diagram of apparatus for controlling remote electrical appliances via the mains supply; and

Figure 2 is a block diagram of the main components of the handsets shown in Figure 1.

Referring to Figure 1, a number of electrical appliances such as a lamp 1, a temperature sensor 2, a lamp 3, and a heater 4 are connected to the mains supply via respective terminals 6 to 9. Two of the terminals 6, 8 are provided with infra-red transmitter-receivers (not shown) to communicate with handsets IR1, IR2 also provided with transmitter-receivers. The terminals each include micro-processors which control the electrical appliances in accordance with data packets received from a bus (mains) controller terminal 10 which also includes a micro-processor, and which is in turn controlled by a micro-computer 11, which incorporates a display 12. The handsets IR1, IR2 also incorporate micro-processors, and terminals 6, 8 each include two

micro-processors each, one for processing the infra-red signals communicated between the terminals and the handsets, and the other for receiving signals from and transmitting signals onto the mains. Frequency shift keying (FSK) is used for the mains signalling frequencies being 130 or 134 kHz, and data can be transmitted and received at a rate of up to 2400 bits per second.

In a condition of high bus activity, messages will be transmitted by the controller terminal to respective remote terminals and, after predetermined delays, responses will be sent out by the respective remote terminals, The messages will be queued in the micro-computer 11 and fed to an internal queue in the controller 10 in turn at appropriate intervals. Thus, message 1 could be an instruction to turn lamp 1 on and message 2 could be an instruction to read temperature. In each case, the message duration is 15 bytes (8 bits to a byte) although the message could be up to 43 bytes long. A message specifies where the message is being sent from, the destination to which it is being sent, and the data content representing the operation to be performed. After the message 1 is transmitted by the controller, each terminal receives it and start

decoding it to ascertain if it is intended for that terminal. As soon as its terminal has decoded the signal sufficiently to ascertain that it is not intended for that terminal, it discards the remainder of that message.

When the terminal for which the message is intended confirms that the message is intended for itself, and after the message has itself ended, that terminal transmits, after a delay of 22 bytes from the end of the message, a response to the controller to confirm the message has been received. The response is in the same format as the message i.e. address of originating terminal, address of destination terminal and data content, and also lasts for a duration of 15 bytes (but could be up to 43 bytes long).

The other terminals will also receive the response, and will discard them when they have read its destination address, so that only the controller will make use of the data in it. After a delay of 22 bytes from the end of the response, the next message is sent out, and this could be for example an instruction to read temperature sensor 2.

The regular transmission of messages and receipt of responses only applies of course in a period of high bus activity eg. when the micro-computer 11 and the controller 10 are holding a stack of messages to be sent out. In a situation of low bus activity dummy messages of length 16 bytes are sent out at regular intervals, this time spaced by the longer interval of 87 bytes. The messages preserve the structure of the normal messages but do not result in any operation being performed on any appliance. The purpose of these dummy messages is to maintain synchronisation of the terminals, each of which has its own clock capable of being re-synchronised to incoming messages.

In either case of high or low bus activity, it will be noted that a delay follows each message or dummy message. This is made use of in the following way. Various given times in the delay are allocated to various functions to enable the controller to receive messages in the delay period. Further details of the use of such time slots is given in our co-pending application No. 89 05082.7 (P/8086/CRE). Further details of the synchronisation of the messages with each other is given in our co-pending application No. 89 05083.5 (P/8087/CRE).

Particular time slots are allocated to the various handsets IR1, IR2, and these can communicate with any terminal with infra-red transmitter receiver, and the message will be held in that terminal until the next time that slot appears after the end of a message on the mains.

Referring to Figure 2, the handset comprises a key pad 16 and a display 17 which are controlled by a micro-processor 18. The micro-processor is also connected to an infra-red modem 19 and a telecommunications modem 20.

When the handset is in the vicinity of the terminals 6 to 9, for example, when the handset is in a household, messages can be entered on the key pad and will transmitted to the terminals via the infra-red modem 19 and the infra-red link to the respective terminals.

When the user is out of the household and desires to communicate with the system in the household, the handset is coupled to a telephone handset since the handset has a built-in acoustic coupler, and messages

entered into the key pad 16 are transmitted via the telecom modem 20 which communicates via the telephone system with modem 21 connected to the micro-computer 11.

Thus, it is possible to control electrical appliances in the household from within the household using the infra-red link and from outside the household using the telephone link, and in each case the same handset is used. In practice, a number of handsets would be used in a household eg. IR1, IR2, and one of these would also have the telephone modem enabling it to be used outside in conjunction with a telephone. Apart from the convenience of having one handset instead of two, only one display, key pad and micro-processor are needed instead of two of each of these components if a separate handset was used for infra-red communication and for telephone communication.

CLAIMS

1. A handset for communicating with a terminal for causing a mains borne data packet to be transmitted to another terminal to control an electrical appliance remotely, comprising a display, a key pad, a micro-processor, a modem for communicating with a terminal via electro-magnetic or acoustic waves, and a modem for communicating with a terminal via a telephone link.

2. A handset as claimed in claim 1, in which the modem is arranged to communicate with the terminal via infra-red radiation.

3. A handset as claimed in claim 1 or claim 2, including an acoustic coupler for connection to a telephone handset.

4. A handset substantially as herein described with reference to the accompanying drawings.

5. A system for the remote control of electrical

appliances via the mains supply, comprising a controller terminal for transmitting and receiving mains borne data packets and a plurality of remote terminals for controlling the electrical appliances in response to receipt of data packets from the controller, and a handset for communicating via an electro-magnetic or acoustic link with a terminal to cause transmission of a mains borne data packet to control an appliance, the handset also being capable of communicating with the controller terminal via a telephone system.

6. A system for the remote control of electrical appliances via the mains supply substantially as herein described with reference to the accompanying drawings.

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An Interactive Video Information Terminal

RONALD D. GORDON

Abstract—**The development of computer-controlled laser video disc players provides computer systems with access to thousands of high-resolution video images. Roughly 50 000 individual pictures or nearly 30 minutes of full motion video can be randomly retrieved in a matter of seconds. Coupled with a touch sensitive display, a very exciting information retrieval system results.**

This paper documents a prototype video information terminal built using a laser video disc, an infrared touch sensing device, and a speaker phone, all controlled by a minicomputer. Our initial experience with this sytem is described.

I. AN OVERVIEW OF THE SYSTEM

An interactive video information terminal has been built at Bell Laboratories which is intended for use by the general public to retrieve pictorial, textual, and audio information. As shown in Fig. 1, the prototype terminal consists of a color TV monitor which has been fitted with touch sensing device. A hidden speaker and microphone provide audio information and are used to support a speaker phone interface to the telephone network.

Video information retrieved by the user is displayed on a 19 inch color television monitor. Full-resolution "TV quality" pictures are viewed, unlike the low-resolution computer-generated graphics used by many contemporary teleterminal systems such as Prestel [1].

At the heart of this system is a random access laser video disc player. The video disc player is controlled by an external minicomputer which directs it to retrieve the specific video and audio material requested by the terminal user. Roughly 50 000 individual images or almost 30 minutes of full motion video is available on-line. Typically, retrieval is accomplished in 1-3 seconds.

Full-resolution video with full motion capability provides a display which has the ability to attract and maintain interest. Images of places and people which can be clearly recognized significantly improve the perception and understanding of the user.

Information is organized and made available to the user in a hierarchical, tree-like fashion. Menus are used to select from initially broad classifications of information available: Transportation, Lodging, Food, etc. Each subsequent menu further refines the subject matter desired until a specific video image (perhaps a detailed map or a short video sequence) is obtained.

This type of hierarchical organization has been used successfully in many teleterminal applications [2]. The video information terminal, however, improves upon this access mechanism by eliminating the need for users to interact with either

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The author is with Bell Laboratories, Murray Hill, NJ 07974.

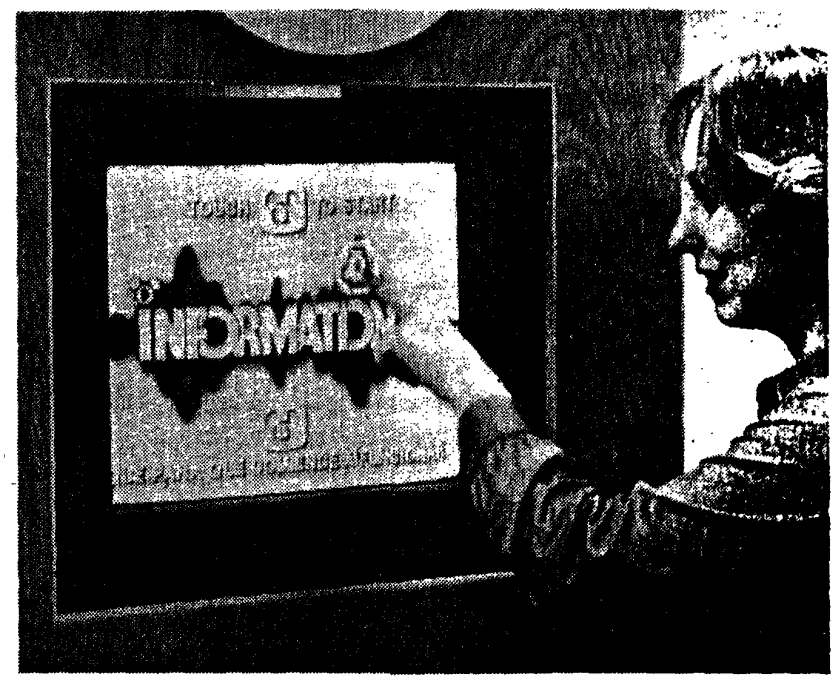

Fig. 1. The video information terminal prototype.

buttons, numeric key pads, or alphanumeric keyboards. This terminal uses an infrared beam touch-sensing device. Users simply point at the screen to the information desired! The system, upon sensing the user's touch, retrieves the associated information.

Some information available to the user is updated often. Transportation schedules, the availability of reservations, and prices are some examples. Unfortunately, the laser video disc is manufactured by an outside organization. Manufacturing is expensive and turnaround time is typically 4-6 weeks. Once manufactured, the video disc can not be changed.

To overcome this shortcoming, a graphics overlay device has been built. This peripheral circuit accepts the composite video signal from the video disc player and, using a programmable character generator, superimposes text and simple graphics on the picture. Up-to-date information can be presented in a very attractive format by overlaying text on top of an appropriate full-resolution video image.

The system also includes a speaker phone arrangement. The speaker phone is activated by pointing to the screen. It is used to obtain further information about an event or activity after some preliminary information has been obtained using the terminal. Making a telephone reservation is a typical application.

When activated, the minicomputer automatically dials the appropriate telephone number. The user of the system merely indicates that a phone call to the identified establishment is desired. The user need not know the specific phone number, nor is the number manually dialed.

II. A DETAILED DESCRIPTION OF THE SYSTEM HARDWARE

The major elements of the video information terminal system as implemented are shown in Fig. 2. Notice that as installed, the color monitor, touch sensing appliqué, and audio microphone and speaker are located roughly 1500 feet from the video disc player and the minicomputer with its associ-

0090-6778/83/0200-0245$01.00

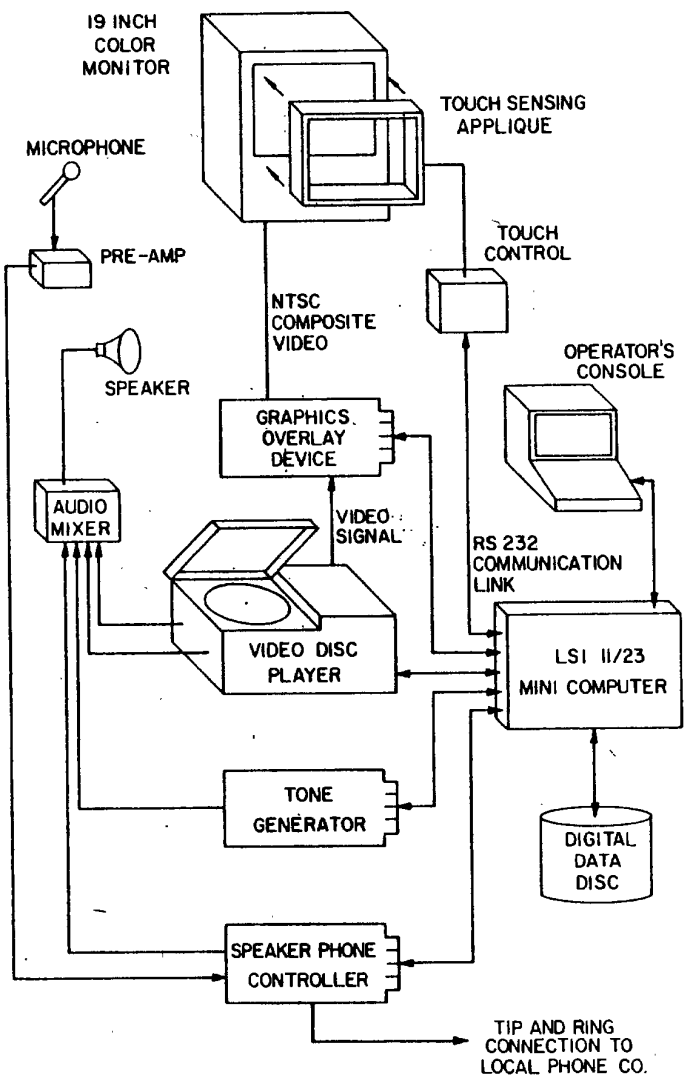

Fig. 2. Hardware block diagram of the system.

ated peripherals. Space at the terminal location was limited and environmentally much less suited for the computer equipment used to control the operation of the terminal.

The primary source of video material is the laser video disc player. An industrial version of the player is used which permits control and status information to be exchanged with an external computer. This version is also built to handle nearly continuous random repositioning of the reading mechanism which occurs in this application. Consumer versions of the laser video disc player, by contrast, do not provide as complete a control and status exchange and are intended primarily for the viewing of largely sequential video, typically movies.

The laser video disc player permits random access to each of the frames recorded on the disc. Approximately 50 000 full-resolution video images may be recorded. Because the disc is read using a low-power laser, no disc wear occurs regardless of how many times an image is accessed or how long it is viewed.

It is still not possible to manufacture a video disc which contains several thousand images, each of which can be individually accessed. Although this manufacturing process will continue to be improved, approximately one frame out of every few thousand cannot be individually accessed due to imperfections on the disc.

Rather than attempting to create a video disc in which each individual frame can be reliably accessed, each still frame image was recorded on the disc three times. This reduces the overall capacity of the disc, but makes the disc much easier to produce and therefore much less costly.

Many other access modes are available in addition to still frame retrieval. Full motion sequences may be retrieved. In this mode, 30 frames per second are read from the disc and displayed on the color monitor. This rate corresponds to the rate normally used to display images on a television set and results in an illusion of full motion. At that rate, the capacity of the video disc provides nearly 30 minutes of material.

Typically, video discs used in this application contain a mixture of both still and motion video sequences. Several thousand still images and perhaps as many as 60 full motion sequences, each a few seconds to a few minutes in length, may be recorded on a disc.

When presenting a full motion video sequence, the video disc player also makes available two high fidelity audio channels. In our system these are used to record background music and sounds as well as a voice explanation. On one channel an English explanation is given while the alternate channel provides a Spanish explanation. Other applications might use the two audio tracks to provide an initial and a more detailed explanation, or to simply permit a paraphrased explanation to be retrieved.

Unfortunately, the process of manufacturing the video disc is both costly and time consuming. At the present, once manufactured, the information recorded on the laser disc is permanent. Although this improves the reliability of the recorded signal, it stands in the way of presenting up-to-date information to the user. To accomplish this, a color graphics overlay peripheral is used.

The graphics overlay peripheral is built around the Texas Instruments TMS9918 video display processor MOS LSI device. It is interfaced to 16 kbytes of random access memory which stores the display information for the text and graphics to be generated.

Two modes of operation are supported: an overlay mode in which the characters and graphics generated overlay portions of the video image, and an independent mode in which the entire video image is constructed by the display processor itself. In both modes, the text and graphics contributed by the display processor are low-resolution images produced using a character (i.e., mosaic) mapping technique. A total of 24 lines, each composed of 32 character or pattern positions, are visible. Each pattern is defined using an 8 by 8 bit matrix.

The overlay mode is most useful in preparing attractive information pages which contain volatile information. The video disc is used to retrieve an appropriate background image. Text or graphics are then added to provide up-to-date information for schedules, prices, reservations, etc. The resulting image has a much more pleasing appearance than computer generated graphics alone. Fig. 3 is an example of such an information page.

Another useful application of the overlay capability is to provide a form of visual feedback to the user in response to touching the screen. A symbol may be positioned on the screen with high coordinate resolution and is placed by the minicomputer at the spot touched by the user. This symbol may also be simply animated to provide a dazzling effect.

When no image is available from the video disc player a low-resolution color image may be generated by the graphics display processor. This mode is used when the system is seeking a new video image on the video disc. During this 1–5 second period no video signal is available from the video disc player. The graphics generator is used to display a simple page of text and graphics to indicate that the requested information is being retrieved.

This independent generation mode is also used to correct for inadvertent omissions of material from the video disc, or to compensate for defects on the disc which make it impos-

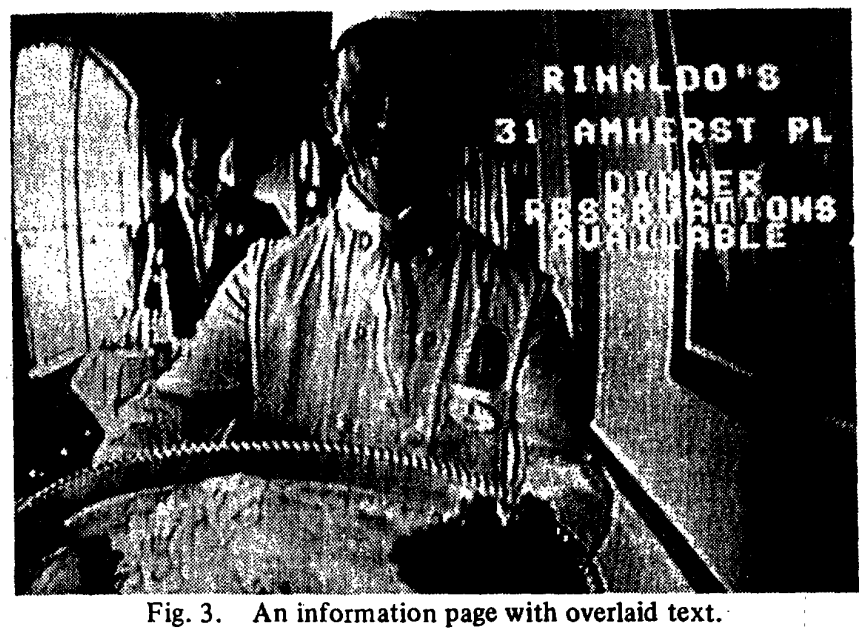

Fig. 3. An information page with overlaid text.

sible to retrieve specific frames. In general, however, all generated text is artistically enhanced by utilizing the overlay capability.

This system is made surprisingly more appealing to naivé users by combining the use of full-resolution video images with an easy-to-use touch-sensing device. A series of infrared photo diodes are placed along the bottom and left edge of the screen. A corresponding series of photo detectors are placed along the top and right edge of the screen. As each photo diode is individually activated, an increase in light is detected by the opposite photo detector if the user's finger does not block the path. This technique eliminates the need to focus the beams and minimizes the alignment which is required between diodes and detectors.

When one's finger touches the screen, some of the beams of light are interrupted and the finger position can be accurately determined. The photo detectors and diodes are spaced on 1/4 inch centers. A microprocessor-based controller sequentially strobes each beam position and computes the center point when contiguous beams are interrupted. The resulting X–Y coordinate is forwarded to the minicomputer. A resolution of about 1/8 inch is achieved.

Using such a device, the user points to images on the screen instead of buttons. This simplifies access since the user does not need to look away from the screen to find and activate a corresponding button. At the same time, the need to indicate to the user the correspondence between an item of interest and a button label (a letter or digit for example) is eliminated. Thus, the user is relieved of an otherwise distracting mental task.

Buttons and keyboards are less desirable for several additional reasons. They are more difficult to maintain than is the sealed touch system when used with the public. Very few people (some estimate fewer than 10 percent of the population) are adept at using the QWERTY keyboard. Many simply view the pushing of buttons as a demeaning task!

The images pointed to by the user may be words describing the information desired. In this system, however, the availability of full-resolution video makes it possible to permit the user to point at pictures which represent the information in a language-independent way.

Button-shaped images using minature pictures facilitate information retrieval by helping to overcome the language barrier. Pictures are also more quickly recognized and, if carefully prepared, can more easily convey the idea intended. Using small pictures which look like the tops of buttons encourages the user to push the appropriate image to obtain the desired information. People, we have observed, do not instinctively "push" words!

The infrared beams of light are invisible to the human eye. The photo diodes and detectors are protected from the environment by a hard plastic bezel which is transparent only in the infrared portion of the spectrum. As a result, the electronics and light beams are not seen and the system appears to operate as if by magic!

This illusion, coupled with the high quality of video images provided by the video disc, results in a system which users do not perceive as a "computer system." This overall reaction is important because the fears and inhibitions which are often associated with using computer systems are avoided.

A sound synthesis circuit is used to provide audio feedback when the screen is touched. Several musical schemes were tried before a satisfactory feedback technique was obtained.

Initially, an upbeat sequence was played when an image was touched which corresponded to an information retrieval function. Touching the screen elswhere yielded a sour note! Although entertaining and somewhat instructional, it soon became tiring to a serious user. Only a single *sweet* note is now produced when a valid touch is sensed.

A speaker phone arrangement is also incorporated in the information terminal. It permits users to phone to a particular location after some preliminary information has been obtained. Phoning for a reservation, or to ask a detailed question, are typical uses for the speaker phone.

The telephone is activated by pointing to the screen. Often a stylized image of a telephone is included on the screen as part of the information picture provided for a particular item. When touched, the minicomputer activates the speaker phone and dials the appropriate telephone number.

A new mode of voice-activated switching is used to control the operation of speaker phone in this application. A speaker phone operates with either the microphone or speaker switched into the circuit at any one time. This is done to prevent undesirable feedback. One technique often used to determine when the microphone or speaker is to be in the circuit is called "receive-idle." This method places the speaker into the circuit only when very little sound is sensed by the microphone. Special circuitry is used to prevent the speaker phone from switching the microphone into the circuit simply because sound from the speaker is sensed.

This works well in a quiet environment and when the person using the speaker phone is aware of the unusual equipment. The person using the speaker phone learns that if he wishes to hear the other party, he must be quiet! Hence the name, *receive-idle*.

In this application the terminal would be placed in an outside location and subject to a significant amount of noise. In such an environment, a method referred to as "transmit-idle" performs better. Such a scheme monitors the signal being received from the remote party. Normally, the speaker phone microphone is switched into the circuit. Whenever the remote party (the person not using a speaker phone) begins to talk, the speaker is quickly switched into the circuit. A quiet remote location is assumed and in our application this is typically the case.

III. THE SYSTEM CONTROL SOFTWARE

The operation of this terminal is controlled by a 16 bit minicomputer. The minicomputer has access to 256 kbytes of

random access memory and a 10 Mbyte hard disc drive. The UNIX™ operating system was used [3]. Although such a configuration is more than is needed to support this application, it was used to speed the prototyping of the system.

Control of the system is accomplished using a special command language. A script is developed in this language to specify the operation of the terminal in response to the touch input provided by the user. An example of the use of the command language is given in Fig. 4. Table I provides a summary of the major statement types which are provided.

Scripts written in the command language are composed of small collections of statements called decision nodes. Each node has a unique name and usually begins by specifying which video material is to be displayed. Text to be overlaid on top of the video picture from the video disc may also be specified using the overlay command.

The script writer may make use of variables to record the activity and usage of the system. Variables are identified by an initial "$" symbol which begins their name. Normally, the script writer will store a value into a variable so that at a later point in the script, a decision may be made which depends upon which path had been taken earlier by the user.

The system waits for touch input from the user when a touch statement is encountered. Once a valid touch input is obtained, the special variable $pick is updated to reflect the area of the screen which was touched, and execution of the script continues.

A provision is made for the case in which no input is obtained after a reasonable amount of time has elapsed. If no touch input is obtained within the number of seconds specified in the command, the variable $pick is asssigned to value 0 and execution of the script continues. This is useful in preparing scripts which take into account the possibility of a person walking away at some point during a session and permits the system to recycle back to the initial state. In our first script, it was useful to display a message which asked if additional time was required. Upon receiving a response, the system would return to the current node. Otherwise, the system would reset to the initial state.

Case statements permit the script author to indicate multiway branching. Branching is often based upon the value of the variable $pick, set by the execution of a touch command. It may also be performed based upon the current date or time, or the value of other variables defined by the script author.

Specific video material is identified within the script by name. Thus, the script writer does not need to know the exact frame address of the video material on the video disc. That frame information is contained in a separate data file, the video dictionary. This dictionary is created when the video tape which will be used to master the video disc is assembled.

Compilation may be performed before the video dictionary is available, long before the video disc has been produced. The video commands, when executed, display the name of the node and the name of the video sequence called for. This mode of execution is useful in verifying the operation of script logic before the disc is available.

IV. OUR EXPERIENCE WITH THE SYSTEM

The terminal has been installed and available for use by the public for a few months. To date, experience with the terminal has been encouraging.

™UNIX is a trademark of Bell Laboratories.

```
restaurant {
        video restaurant_types;
        touch 60;
        case $pick
                1 { goto near_by_restaurants; }
                2 { goto ethnic_selector; }
                3 { goto breakfast_lunch_snacks; }
                4 { goto dinner_restaurants; }
                0 { goto no_response; }
        endcase;
}

near_by_restaurant {
        set $map_to_use = $date < 810823;       /* new freeway opens 8/23/81 */
        case $map_to_use
                0 { video new_map; }
                1 { video old_map; }
        endcase;
        touch 60;
        case $pick
                1 { goto MacDonalds; }
                2 { goto Home_Run_Inn_Pizza; }
                3 { goto Coffee_Shop; }
                4 { dial 992-9745; call telephone_handling; }       /* local suggestions */
        endcase;
        goto main_menu;
}
```

Fig. 4. An example of the script language.

TABLE I
COMMAND LANGUAGE STATEMENTS

STATEMENT	DESCRIPTION
video	Present named video sequence from video disc.
audio	Select audio channel 1 or 2.
set	Arithmetic assignment statement.
overlay	Superimpose text on the video image.
goto	Transfer control to named node.
call	Invoke named node as a subroutine.
backup	Restart the previously executed node.
return	Return to point after previous call statement.
case	Select subsequent statements based on variable value.
touch	Await touch input from user.
font	Specifies current font type and color.
dial	Dials number given.

When idle, the terminal displays a moving video sequence from the video disc. A "video palindrome" was created which could be played both forward and then in reverse until the system was touched. The palindrome identified two areas of the screen: one labeled "TOUCH TO START," the other "TOQUE PARA QUE COMIENCE A FUNCIONAR." When the latter area was touched, the system presented all subsequent information in Spanish.

Although the button images on this first video segment were only about 2 inches square, the area of the screen which would actually respond to touch covered the entire screen. In this way, people who touched the screen but failed to actually touch the button image would at least get started!

The palindrome successfully attracted attention and motivated people to touch the screen. Almost immediately people learned to touch the screen to obtain information. Subsequent frames contained button images whose active sensitive area was actually smaller than the button image itself. This improved the reliability of accepted touch input.

Menus created for this first trial made use of lists of words which categorized the information which could be obtained. A picture of a button appeared to the left of each category.

These menus proved to be more difficult to use than had been anticipated. In a few situations, the major subdivisions proved to be inadequate, for what was perceived as an "Entertainment" for one person was an "Accommodation" for another. Unfortunately, information for a particular establishment was available under only one heading.

The further refinement of information categories was perhaps the most bothersome. For example, there are several

ways one might further decompose the category of Food: by location, time of meal, ethnic style, price range, etc. For simplicity only one hiearchy was provided. First, location was selected, then time of day (breakfast, lunch, snack, dinner), and finally, specific eating establishments were listed by name.

For those who approached the terminal with a question which could be presented in an order which matched the implemented hierachy, an answer was obtained in a simple fashion. The question, "Where can I go for a steak dinner," however, cannot be made to fit into that hierarchy!

Unfortunately, it does not appear possible to develop a single partitioning and connecting hierarchy which will closely match the expectations of a broad class of people [4]. On the other hand, systems which permit users to reorganize the hierarchy on a personal terminal are successful since they permit the user to build an access hierarchy which matches their own mental organization [5].

Several methods are now being developed to improve the access hierarchy. First, selection menus which provide at once several different opportunities to refine an inquiry are being composed. While one universal system cannot be built, it may be possible to provide several hierarchies simultaneously in hopes that one will be found to be useful by the individual. For example, a simplified map may be shown and to the side might appear symbolics representing time of day, pricing, and type of food. The map may be used to define a desired area or any of the symbolics employed to indicate suitable subcategories.

The use of aerial maps and simplified or stylized maps appears very attractive. Touching an area of such a map causes a more detailed view of the area to be shown. As the scope of the map is reduced and the scale gets larger, more details are added. Eventually, small storefronts are visible. When touched, the user is shown the interior, text is added to provide appropriate information, and the telephone may be activated to call the establishment.

Still frames, of course, must be recorded on the disc three times to guarantee that a copy of the required image can be retrieved. Although this significantly reduces the total capacity of the disc, the three-frame requirement can be used to provide a more interesting display for simple information pages. This is done by recording three slightly different frames. When all three frames are accessible, the system steps through the frames in the order 1-2-3-2-1-2-3- and so on, thus providing a form of limited three-frame animation. Text overlays the video image and remains stationary as the edges of the image show trees swaying or cartoon characters jumping about! If the three frames cannot be accessed, any one frame is used and is not animated.

The ability to browse through the video database was also identified as a useful facility during the trial. People often wanted to just scan through the video material quickly, just to get a feel for what was available. Unfortunately, presently available video disc players do not support this access mode well.[1] Nonetheless, such a facility is being developed using a modified player. Users could ultimately scan through the material, stop, back up, locate an interesting item, and reenter the hierarchy to retrieve the available video, audio, and textual information.

Support for the use of multiple disc players has also been developed. Not only does a multiple video disc player configuration provide more video storage, but pools of players may be efficiently used by several information terminals. Enough players are provided to permit each terminal to allocate one. These are loaded with a video disc containing the most often referenced material. One or two players are also provided with this disc and serve as spares. In addition, a few players are provided which are loaded with alternate video discs containing less used information.

Both reliability and capacity are improved. Furthermore, a simple allocation policy may be used to reduce the seek time to a requested frame by allocating the video disc player which is idle and whose read head is closest to the desired frame.

Most users were surprised once they had activated the speaker phone. Although in each case a button carrying a label such as "Touch Here To Call For Reservations" was activated, most people failed to realize that a phone call was being placed. The users could hear the tones which were used to dial the number, the line would be heard to ring, a person would answer, and the user would stand speechless or might even walk away! When questioned, it became clear that these people had never used a phone which had not required the use of a traditional handset. In many cases, the user simply wanted to see what might happen, but because they hadn't picked up a handset, or dialed a number, they did not expect a real phone call to be made!

Perhaps the speaker phone idea was a mistake. If people failed to understand what was being accomplished, a useful service was not being provided (even if it was technically a success!). A handset mounted next to the screen may be more easily understood and used by the general public. To call an establishment seen on the screen, the handset would be picked up from its cradle. Privacy would be improved, as would the audio quality of the connection. The supporting circuitry would be greatly simplified. Most importantly, the system would provide a more easily understood method for telephoning while still eliminating the need for the ubiquitous telephone number.

Some difficulty was experienced by users which can be attributed to the operation of the touch sensing device. The infrared beams of light are placed away from the screen so they are not interrupted by the curvature of the glass picture tube. As a result, the beams of light are interrupted by the user's finger even before the screen is touched. This caused some problems, since as a person approached the screen to touch a target, the beams were interrupted and input accepted before the user had properly positioned his finger over the desired target. This effect was most pronounced near the edge of the screen, where the beams were roughly 1.5 inches from the glass picture tube.

This difficulty could be reduced by designing menus in which the target areas were displayed along the horizontal, rather than stacked vertically. This is so since people typically raised their arm from their side to reach an item on the screen. Usually, they would interrupt the beams initially below their intended target as they moved to the desired location on the screen.

A new design is being developed which will further minimize this problem. The cylindrical geometry of the color tube being used makes it possible to place the vertically oriented

[1] A high-speed scan mode is available which permits rapid viewing of the video information. However, it is not easy to prevent users from scanning beyond either edge of the disc! The present system attempts to stop the scanning operation a few hundred frames before the end of the recorded material is encountered.

beams immediately adjacent to the glass. Since touch information is obtained only when both X and Y coordinate beams are interrupted, this new configuration will respond only when the user's finger is within 1/8 inch of the screen.

A new touch sensing algorithm has also been developed which will produce coordinate data only after the user's finger has become nearly stationary. Both of these improvements to the touch sensing device should greatly help to reduce the number of false system activations.

Interestingly, dirt and finger marks on the screen did not appear to be a problem. Some tolerable level of smudges did accumulate. Over the long run, however, those with dirty fingers left a little dirt behind, while those with clean fingers took some dirt away.

People using the present system reacted very enthusiastically to the high-resolution images which could be retrieved. Often, the pictures were so entertaining themselves that accompanying text was ignored! Many users even failed to notice the 1 or 2 second pause between images as the system moved to a new frame. That was most surprising since it is generally felt that computer response times in excess of 0.5 seconds are annoying. Perhaps the attractiveness of the images retrieved and the simple touch access to the information accounts for some of this effect. Surely, however, the novelty of the system also played a part.

Perhaps the best compliment that has been received has come from the naive users of the system. When interviewed, they did not associate this system with a *computer* system. Instead, they described the system as "magic television" or "inteligent TV." The fears and apprehensions which these people might have otherwise associated with computer systems was absent. The warm, friendly familiarity of TV-quality video made interactive provided a remarkably comfortable information retrieval service.

As our experience with the terminal increases, better techniques for simply organizing and retrieving information will continue to be developed. The composition of video pages with the use of overlay graphics provides the potential for many new and novel techniques facilitating the clear dissemination of information to the public. Already our early attempts have been largely successful.

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Evaluation of the Undetected Error Probability of Single Parity-Check Product Codes

CYRIL LEUNG

Abstract—**In this paper, an expression for the undetected error probability $P(\epsilon)$ of single parity-check product (SPCP) codes used for error detection over a binary symmetric channel is derived. It is shown that square SPCP codes need not obey a certain commonly used bound. Approximate expressions for the maximum $P(\epsilon)$ and the corresponding maximizing ϵ are given.**

I. INTRODUCTION

In a number of recent papers [1]–[3], the probability of undetected block error $P(\epsilon)$ for an (n, k) block code, used solely for error detection on a binary symmetric channel (BSC) with crossover probability $\epsilon, \epsilon \leqslant 1/2$, has been examined. It has been pointed out that caution must be exercised when using a commonly assumed upperbound on $P(\epsilon)$, namely, that $P(\epsilon) \leqslant 2^{-p}$, where $p = n - k$ is the number of parity-check bits. The following "justification" for the 2^{-p} bound is often given. Assume that the (n, k) code is used over a totally noisy BSC with $\epsilon = \frac{1}{2}$. Then all 2^n possible received sequences are equally likely, and of these only $2^k - 1$ are codewords other than the one actually sent. The resulting undetected error probability is

$$P(\tfrac{1}{2}) = \frac{2^k - 1}{2^n} < \frac{2^k}{2^n} = 2^{-p}.$$

It is then incorrectly argued that for ϵ less than $\frac{1}{2}$, the undetected error probability should be even smaller and, hence, $P(\epsilon) < 2^{-p}$ for $\epsilon \leqslant \frac{1}{2}$. Following [2] we will refer to a code for which $P(\epsilon)$ is monotonically increasing in ϵ, $\epsilon \leqslant \frac{1}{2}$, as a *proper* code. Since as shown above $P(\frac{1}{2}) < 2^{-p}$ for any (n, k) code, it follows that a proper code always obeys the 2^{-p} bound.

It turns out [1], [2] that some codes such as single parity-check, Hamming, and double-error correcting BCH codes obey the 2^{-p} bound but others do not. In this paper we consider single parity-check product (SPCP) codes which are used in certain systems [4], [5]. The codeword for a general SPCP

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(54) Programmierverfahren und/oder -Einrichtung für Audio- oder Videogeräte.

(57) Die Erfindung betrifft ein Verfahren und/oder eine Einrichtung zum Programmieren eines Audio- oder Videogerätes, insbesondere eines Videorecorders, mit zum Empfang von Fernseh-und/oder Hör-Rundfunksendern benötigten Abstimm-Daten (Kanal, Frequenz o. dgl.), wobei die einen Sender betreffenden Abstimm-Daten unter Zuordnung zu einer Programmnummer oder -Kennzeichnung in einen Programmspeicher des Audio-oder Videogerätes eingebbar sind. Die Abstimm-Daten und deren Zuordnung zu einer Programmnummer oder -Kennzeichnung werden automatisch einem Programmspeicher eines bereits programmierten Audio- oder Videogerätes, insbesondere eines Fernsehempfangsgerätes, entnommen. Zusätzlich kann vorgesehen sein, auch die aktuelle Uhrzeit zu übernehmen. Dadurch wird ein für den Benutzer einfaches Programmieren von Audio- oder Videogeräten mit zum Empfang von Fernseh-und/oder Hör-Rundfunksendern benötigten Abstimmdaten und/oder der aktuellen Uhrzeit ermöglicht.

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Programmierverfahren und/oder -Einrichtung für Audio- oder Videogeräte

Die Erfindung betrifft ein Verfahren und/oder eine Einrichtung zum Programmieren eines Audio- oder Videogerätes nach dem Oberbegriff des Anspruchs 1.

Verfahren der eingangs genannten Art sind insbesondere bei Videorecordern bekannt. Dabei werden - meist beim erstmaligen Anschließen des Recorders an eine bestehende Videoanlage - einzelnen sogenannten Programmnummern oder Programmplätzen des Recorders jeweils eine Frequenz oder ein Kanal örtlich empfangbarer Rundfunksender zugeordnet und in einem sogenannten Programmspeicher gespeichert. Der Recorder wird also mit einem bestimmten "Grundwissen" gefüllt oder "programmiert". Soll der Tuner des Recorders dann auf einen auf einen gewünschten Sender abgestimmt werden, so braucht der Benutzer nicht mehr die betreffende Sendefrequenz oder Kanalnummer einzugeben, die er häufig gar nicht auswendig weiß; es genügt vielmehr, daß er die zugeordnete Programmnummer eingibt. Über den Programmspeicher ermittelt der Recorder dann die dem gewünschten Programm zugehörige Sendefrequenz oder Kanalnummer und stimmt den Tuner entsprechend ab.

Bei dem bekannten Verfahren ist es jedoch von Nachteil, daß das Eingeben der Frequenzen und deren Zuordnen zu einzelnen Programmnummern zeitraubend und fehleranfällig ist.

Eine Quelle zusätzlicher Fehlbedienungen kann außerdem noch dann auftreten, wenn die einzelnen Komponenten einer Audio-oder Videoanlage - beispielsweise Hörfunk- oder Fernsehempfangsgerät und Videorecorder - unterschiedliche Zuordnungen von Frequenzen oder Kanälen zu Programmnummern aufweisen.

Der Erfindung liegt die Aufgabe zugrunde, ein für den Benutzer einfaches Programmieren von Audio- oder Videogeräten mit zum Empfang von Fernseh- und/oder Hör-Rundfunksendern benötigten Abstimmdaten zu ermöglichen.

Diese Aufgabe wird durch die in Anspruch 1 aufgeführten Maßnahmen gelöst. Nach der Erfindung werden die Abstimm-Daten und deren Zuordnung zu einer Programmnummer oder -Kennzeichnung automatisch einem Programmspeicher eines bereits programmierten Audio- oder Videogerätes entnommen.

In einem typischen Anwendungsfall ist ein vorhandenes Fernsehempfangsgerät bereits auf manuelle Weise programmiert worden. Ein nun zusätzlich installierter Videorecorder wird erfindungsgemäß dadurch programmiert, daß die im Programmspeicher des Fernsehempfangsgerätes gespeicherten Abstimm-Daten und deren Zuordnung zu einer Programmnummer oder -Kennzeichnung automatisch entnommen und zu dem Programmspeicher des Videorecorders übertragen werden. Dieses Übertragen erfolgt vorzugsweise mittels einer Infrarot-Strecke.

Ist im einen Gerät, also beispielsweise im Fernsehempfangsgerät, Zugriff auf einen Videotextdecoder gegeben, so kann die über das Videotextsystem empfangene augenblickliche Uhrzeit ebenfalls dem zu programmierenden Gerät zugeführt werden, um dessen geräteeigene Uhr auf die aktuelle Uhrzeit richtig einzustellen.

Das Übertragen der Daten kann in der Weise erfolgen, daß ein bei einem fernbedienbaren Audio- oder Videogerät ohnehin vorgesehenes Fernbedienungsübertragungsverfahren verwendet wird. Werden beispielsweise die zum Programmieren benötigten Daten einer an dem Fernsehempfangsgerät angeordneten Infrarot-Sendeeinheit in geeigneter Weise zugeführt, kann so für das zu programmierende Gerät ein Programmieren über den ihm zugeordneten manuellen Infrarot-Fernbedienungsgeber simuliert werden. Dies hat den Vorteil, daß an dem automatisch zu programmierenden Gerät, also beispielsweise am oben erwähnten Videorecorder, keine zusätzlichen Vorkehrungen zu treffen sind.

Der Benutzer kann ferner - etwa beim manuell ausgeführten erstmaligen oder erneuten Programmieren des einen Gerätes -von der Ablaufsteuerung der Infrarot-Sendeeinheit aufgefordert werden, den Typ des automatisch zu programmierenden Audio- oder Videogerätes einzugeben. Ist das manuell programmierte Gerät ein Fernsehempfangsgerät, so kann eine solche Aufforderung beispielsweise so geschehen, daß in einer am Bildschirm des Fernsehempfangsgerätes eingeblendeten Vorschlagsliste mittels eines Cursors eine Auswahl zu treffen ist. Einem Speicher, in dem eine Zuordnung von einzelnen Typen von Audio- oder Videogeräten zu deren Fernbedienungsübertragungsverfahren gespeichert ist, kann die Infrarot-Sendeeinheit dann das geeignete Übertragungsformat entnehmen.

Vorteilhafte Weiterbildungen der Erfindung sind in den Unteransprüchen beschrieben.

Weitere Vorteile, Merkmale und Einzelheiten der Erfindung werden im folgenden an einem bevorzugten Ausführungsbeispiel anhand der Zeichnung erläutert, die in einem stark vereinfachten Blockschaltbild einen einem nicht dargestellten Fernsehempfangsgerät zugeordneten ersten Mikroprozessor (TVμP) zeigt, von dem über eine Infrarot-Strecke (IR) Informationen zu einem einem nicht dargestellten Videorecorder zugeordneten zweiten Mikroprozessor (VCRμP) übertragen wer-

den.

Sowohl der erste als auch der zweite Mikroprozessor (TVμP) bzw. (VCRμP) weisen einen sogenannten Programmspeicher (TVMEMO) bzw. (VCRMEMO) auf, in denen zu jeder dort vorgesehenen Programmnummer (PR) ein gewünschter Kanal (CH) eingegeben werden kann, auf den der betreffende Tuner bei Aufruf der Programmnummer (PR) abgestimmt werden soll. Beispielsweise ist bei Aufruf der Programmnummer (PR01) auf den Kanal (CH04), der Programmnummer (PR02) auf den Kanal (CH22), der Programmnummer (PR03) auf den Kanal (CH57) usw. abzustimmen.

Der Programmspeicher (VCRMEMO) des Videorecorders weist außerdem noch einen für die aktuelle Uhrzeit reservierten Speicherplatz (CLOCK) auf.

Eine Videotext-Decodereinrichtung (VT), die im dargestellten Beispiel aus empfangenen Signalen soeben - wie ersichtlich -die aktuelle Uhrzeit 10:00 decodiert, symbolisch mit "Videotext clock" angedeutet, ist über einen sogenannten I²C-Bus (I1) an den ersten Mikroprozessor (TVμP) angeschlossen, dem sie über diesen I²C-Bus (I1) die aktuelle Uhrzeit übermittelt. Von dort wird die aktuelle Uhrzeit ebenfalls über die Infrarot-Strecke (IR) zum zweiten Mikroprozessor (VCRμP) übertragen, in dessen Programmspeicher (VCRMEMO) sie auf dem Speicherplatz (CLOCK) abgelegt wird und sodann zum richtigen Einstellen einer nicht dargestellten, dem Videorecorder zugeordneten elektronischen Uhr dient.

Im ersten Mikroprozessor (TVμP) ist schematisch ein Datenweg (I2), ausgehend vom Programmspeicher (TVMEMO) und hinführend zum Ausgangspunkt der Infrarot-Strecke (IR), angedeutet. Aus dem Programmspeicher (TVμP) ausgelesene Daten werden über diesen Datenweg (I2), beispielsweise eine einem Treibertransistor für eine Infrarot-Sendediode zugeführte Signalleitung, einer nicht dargestellten Infrarot-Sendeeinheit zugeleitet. Die ausgesandten Signale werden in bekannter Weise am anderen Ende der Infrarot-Übertragungsstrecke (IR) von einer nicht dargestellten Infrarot-Empfangseinheit empfangen und von dort schließlich dem Programmspeicher (VCRMEMO) des Videorecorders zugeführt.

Im dargestellten Beispiel war der Benutzer bereits aufgefordert worden, den für die Infrarot-Strekke (IR) gewünschten Übertragungscode einzugeben, wobei - hier im einzelnen nicht ausgeführt - der für den schon ohnehin fernbedienbaren Vidoerecorder gültige Fernbedienungscode gewählt wurde, der im vorliegenden Fall in einem nicht dargestellten Festwertspeicher des ersten Mikroprozessors (TVμP) auf Abruf bereitstand. Hierauf wurde dann über die interne Ablaufsteuerung des ersten Mikroprozessors (TVμP) automatisch das Auslesen seines Programmierspeichers (TVMEMO) und das Abfragen der über den I²C-Bus (I1) angelieferten aktuellen Uhrzeit sowie das Aussenden aller dieser Informationen mittels der Infrarot-Sendeeinheit veranlaßt. Im dargestellten Beispiel sind diese Informationen - wie ersichtlich - bereits bis zu den hierfür vorgesehenen Speicherplätzen im Programmspeicher (VCRMEMO) des Videorecorders erfolgreich, das heißt fehlerfrei weitergeleitet worden. Dort stehen sie nun in derselben Zuordnung von Programmnummern zu Abstimmkanälen zur Verfügung, wie dies bei dem Fernsehempfangsgerät der Fall ist.

Diese Gleichartigkeit der Zuordnung hat nicht nur für den technisch weniger versierten Benutzer die oben geschilderten Bedienungserleichterungen zum Vorteil. Auch etwa der berufsmäßig mit solchen Geräten arbeitende Benutzer kann entlastet werden. Ist beispielsweise bei Ausstellungen, Messen oder dgl. eine größere Anzahl von Geräten zu programmieren, so genügt es, wenn eines davon erfindungsgemäß ausgebildet ist. Nach erfolgtem manuellen Programmieren dieses einen Gerätes können dann die übrigen Geräte in der beschriebenen Weise automatisch programmiert werden, wobei - genügende Sendeleistung beispielsweise der Infrarot-Sendeeinheit und geeigne ter Übertragungscode vorausgesetzt - alle übrigen Geräte in einem einzigen Zug automatisch programmiert werden.

Ansprüche

1. Verfahren und/oder Einrichtung zum Programmieren eines Audio- oder Videogerätes, insbesondere eines Videorecorders, mit zum Empfang von Fernseh- und/oder Hör-Rundfunksendern benötigten Abstimm-Daten (Kanal, Frequenz o. dgl.), wobei die einen Sender betreffenden Abstimm-Daten unter Zuordnung zu einer Programmnummer oder -Kennzeichnung in einen Programmspeicher (VCRMEMO) des Audio- oder Videogerätes eingebbar sind, **dadurch gekennzeichnet**, daß die Abstimm-Daten und deren Zuordnung zu einer Programmnummer oder -Kennzeichnung automatisch einem Programmspeicher (TVMEMO) eines bereits programmierten Audio- oder Videogerätes, insbesondere eines Fernsehempfangsgerätes, entnommen werden.

2. Verfahren und/oder Einrichtung nach Anspruch 1, **dadurch gekennzeichnet**, daß das Entnehmen erfolgt durch Auslesen der Abstimmdaten und deren Zuordnung zu den betreffenden Programmnummern oder -Kennzeichnungen aus dem einen Programmspeicher (TVMEMO) des bereits programmierten Gerätes, drahtloses oder drahtgebundenes Übertragen dieser Informationen von

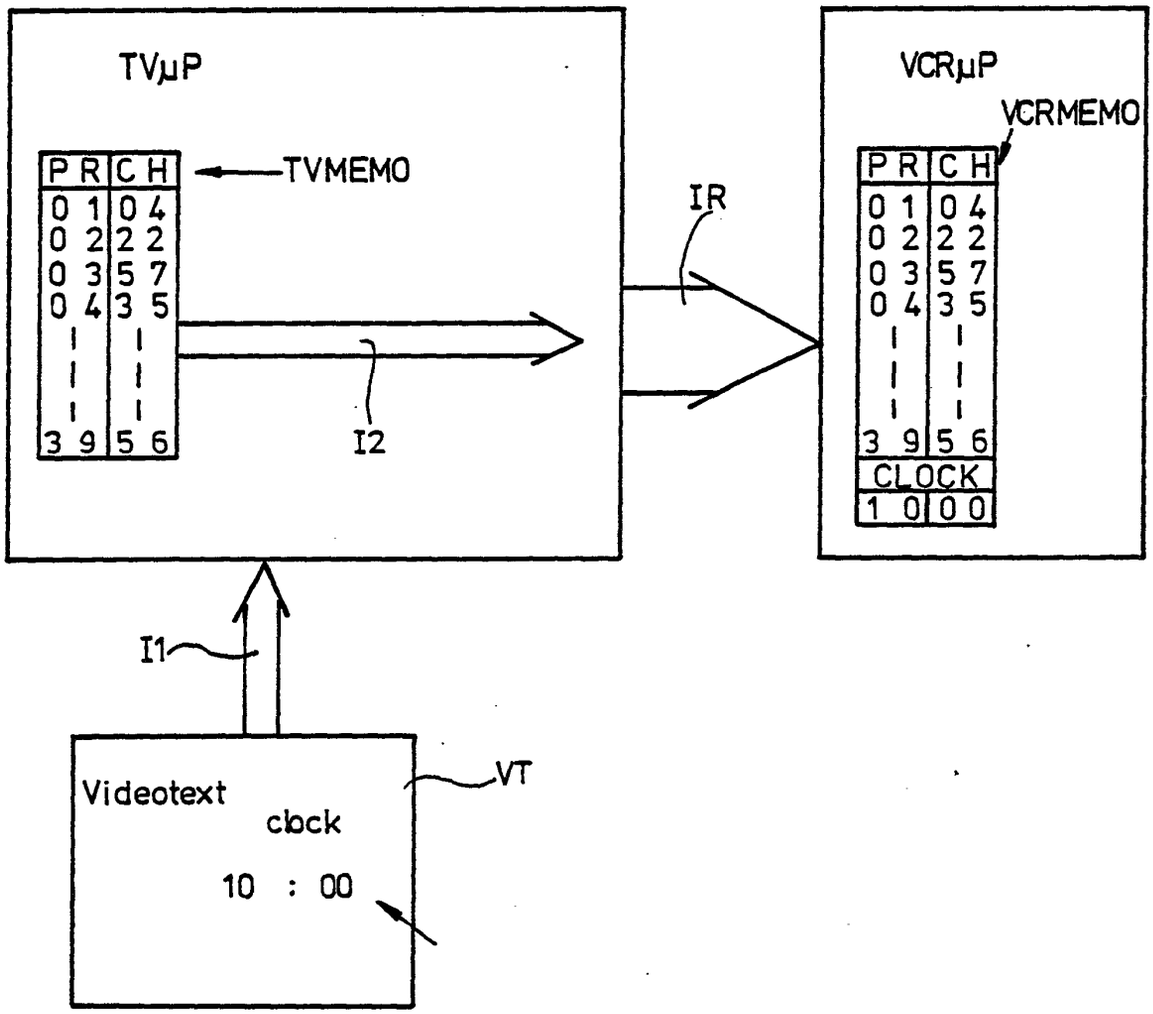
dem bereits programmierten zu dem zu programmierenden Gerät und Einspeichern der übertragenen Informationen in den anderen Programmspeicher (VCRMEMO) des zu programmierenden Gerätes.

3. Verfahren und/oder Einrichtung nach Anspruch 2, **dadurch gekennzeichnet**, daß das Übertragen über eine Infrarot-Strecke (IR) erfolgt.

4. Verfahren und/oder Einrichtung nach einem der Ansprüche 1 - 3, **dadurch gekennzeichnet**, daß als Übertragungscode derselbe Code zur Anwendung gelangt, wie er für eine dem zu programmierenden Gerät zugeordnete Fernbedienung vorgesehen ist.

5. Verfahren und/oder Einrichtung nach einem der Ansprüche 1 - 4, **dadurch gekennzeichnet**, daß bei einem manuell erfolgenden Programmieren des einen Gerätes eine Eingabemöglichkeit vorgesehen ist, nach deren Aktivieren ein vorbestimmtes oder zu bezeichnendes anderes Gerät automatisch mit den im Programmspeicher des einen Gerätes enthaltenen Informationen bezüglich der Abstimm-Daten und deren Zuordnung zu den jeweiligen Programmnummern oder -Kennzeichnungen programmiert wird.

6. Verfahren und/oder Einrichtung nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet**, daß zusätzlich zu den Informationen bezüglich der Abstimm-Daten und deren Zuordnung zu den jeweiligen Programmnummern oder -Kennzeichnungen die mittels einer Videotext-Decodereinheit (VT) empfangene augenblickliche Uhrzeit zu dem zu programmierenden Gerät übertragen wird und zum Einstellen dessen geräteeigener Uhr dient.



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Office européen des brevets

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(51) Int. Cl.4: **H03J 9/06 , G11B 31/00 , H04B 1/20**

(30) Priorität: **30.09.87 DE 3733015**

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(84) Benannte Vertragsstaaten: **AT BE CH DE ES FR GB GR IT LI LU NL SE**

(88) Veröffentlichungstag des später ver öffentlichten Recherchenberichts: **09.08.89 Patentblatt 89/32**

(71) Anmelder: **Deutsche Thomson-Brandt GmbH**
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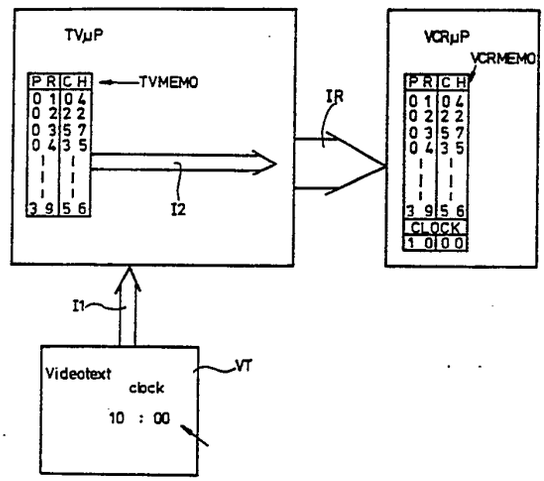
(74) Vertreter: **Körner, Peter, Dipl.-Ing.**
Deutsche Thomson-Brandt GmbH Patent- und Lizenzabteilung Göttinger Chaussee 76
D-3000 Hannover 91(DE)

(54) Programmierverfahren und/oder -Einrichtung für Audio- oder Videogeräte.

(57) Die Erfindung betrifft ein Verfahren und/oder eine Einrichtung zum Programmieren eines Audio- oder Videogerätes, insbesondere eines Videorecorders, mit zum Empfang von Fernseh-und/oder Hör-Rundfunksendern benötigten Abstimm-Daten (Kanal, Frequenz o. dgl.), wobei die einen Sender betreffenden Abstimm-Daten unter Zuordnung zu einer Programmnummer oder -Kennzeichnung in einen Programmspeicher des Audio-oder Videogerätes eingebbar sind. Die Abstimm-Daten und deren Zuordnung zu einer Programmnummer oder -Kennzeichnung werden automatisch einem Programmspeicher eines bereits programmierten Audio- oder Videogerätes, insbesondere eines Fernsehempfangsgerätes, entnommen. Zusätzlich kann vorgesehen sein, auch die aktuelle Uhrzeit zu übernehmen. Dadurch wird ein für den Benutzer einfaches Programmieren von Audio- oder Videogeräten mit zum Empfang von Fernseh-und/oder Hör-Rundfunksendern benötigten Abstimmdaten und/oder der aktuellen Uhrzeit ermöglicht.



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Europäisches Patentamt

EUROPÄISCHER RECHERCHENBERICHT

Nummer der Anmeldung

EP 88 11 5438

EINSCHLÄGIGE DOKUMENTE

Kategorie	Kennzeichnung des Dokuments mit Angabe, soweit erforderlich, der maßgeblichen Teile	Betrifft Anspruch	KLASSIFIKATION DER ANMELDUNG (Int. Cl.4)
A	WO-A-8 703 766 (DEUTSCHE THOMSON-BRANDT GmbH) * Seite 6, Zeilen 6-25; Seite 7, Zeilen 21-31 * ---	1-3,5,6	H 03 J 9/06 G 11 B 31/00 H 04 B 1/20
A	RUNDFUNKTECHNISCHE MITTEILUNGEN, Jahrgang 26, 1982, Heft 6, Seiten 254-257, Hamburg, DE; G. HOFMANN et al.: "Videotext programmiert Videorecorder" * Seite 255, rechte Spalte, Zeilen 1-4; Seite 257, linke Spalte, Zeilen 37-40 * -----	1,2,6	

RECHERCHIERTE SACHGEBIETE (Int. Cl.4)

G 11 B
H 03 J
H 04 B
H 04 N

Der vorliegende Recherchenbericht wurde für alle Patentansprüche erstellt

Recherchenort	Abschlußdatum der Recherche	Prüfer
DEN HAAG	22-05-1989	PEETERS M.M.G.

KATEGORIE DER GENANNTEN DOKUMENTE

X : von besonderer Bedeutung allein betrachtet
Y : von besonderer Bedeutung in Verbindung mit einer anderen Veröffentlichung derselben Kategorie
A : technologischer Hintergrund
O : nichtschriftliche Offenbarung
P : Zwischenliteratur

T : der Erfindung zugrunde liegende Theorien oder Grundsätze
E : älteres Patentdokument, das jedoch erst am oder nach dem Anmeldedatum veröffentlicht worden ist
D : in der Anmeldung angeführtes Dokument
L : aus andern Gründen angeführtes Dokument

& : Mitglied der gleichen Patentfamilie, übereinstimmendes Dokument

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(11) Veröffentlichungsnummer: **0 354 313**
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(12) EUROPÄISCHE PATENTANMELDUNG

(21) Anmeldenummer: **89110072.9**

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(30) Priorität: **11.08.88 DE 3827211**

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(71) Anmelder: **GRUNDIG E.M.V.**
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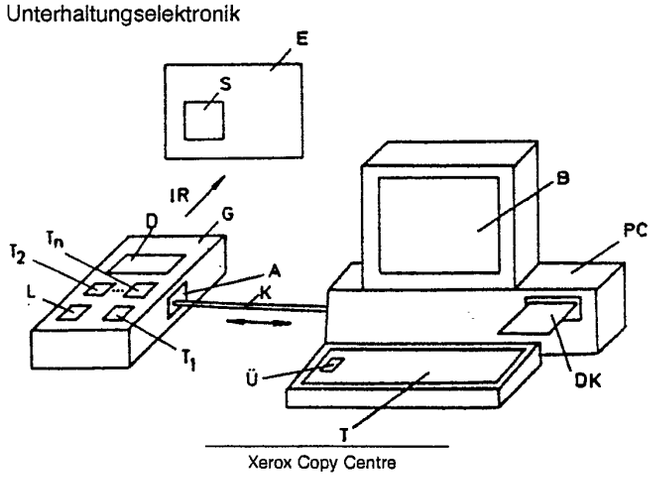
(72) Erfinder: **Rosenberger, Winfried c/o Grundig E.M.V.**
holländ. Stiftung & Co KG Kurgartenstrasse 37
D-8510 Fürth/Bay(DE)

(54) Einrichtung zur Überführung von Abstimmdaten in Empfangsgeräte.

(57) Eine bekannte Einrichtung zur Überführung von Abstimmdaten in Empfangsgeräte weist einen nichtflüchtigen Abstimmdatenspeicher auf, von dem aus die Abstimmdaten in die Abstimmdatenspeicher der Empfangsgeräte übertragen werden. Die Einspeisung der Abstimmdaten in die bekannte Einrichtung erfolgt umständlich unter Verwendung einer auf der bekannten Einrichtung angeordneten Tastatur. Bei der neuen Einrichtung soll die Einspeisung der Abstimmdaten vereinfacht sein.

Dies wird dadurch erreicht, daß die Einrichtung zur Überführung von Abstimmdaten in Empfangsgeräte eine Anschlußbuchse aufweist, über die die im nichtflüchtigen Abstimmdatenspeicher abzuspeichernden Abstimmdaten eingespeist werden.

Empfangsgeräte der Unterhaltungselektronik



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EINRICHTUNG ZUR ÜBERFÜHRUNG VON ABSTIMMDATEN IN EMPFANGSGERÄTE

Die Erfindung betrifft eine Einrichtung zur Überführung von Abstimmdaten in Empfangsgeräte mit den im Oberbegriff des Anspruchs 1 angegebenen Merkmalen.

Eine derartige Einrichtung ist aus der DE-OS 36 42 365 der Anmelderin bekannt. Die bekannte Einrichtung geht von der Erkenntnis aus, daß aufgrund des zunehmenden Programmangebotes, insbesondere auch über Kabel und Satellit, der Abstimmvorgang von Empfangsgeräten bei deren Inbetriebnahme immer aufwendiger und zeitintensiver wird. Um den Abstimmvorgang zu vereinfachen und zu beschleunigen ist bei der bekannten Einrichtung ein nichtflüchtiger Abstimmdatenspeicher vorgesehen, in welchen die Abstimmdaten mittels einer Tastatur eingegeben werden. Von dieser Einrichtung mit dem nichtflüchtigen Abstimmdatenspeicher aus kann beispielsweise der Fachhändler bei der Aufstellung bzw. Inbetriebnahme des Empfangsgerätes die Abstimmdaten in den Abstimmdatenspeicher des Empfangsgerätes übertragen.

Eine ähnliche Einrichtung ist aus der DE-OS 36 40 437 bekannt.

Weiterhin ist es aus der nicht vorveröffentlichten Patentanmeldung P 37 13 235.0 der Anmelderin bekannt, als nichtflüchtiger Abstimmdatenspeicher eine Magnetbandcassette zu verwenden, auf der die Abstimmdaten in geeigneter Form aufgezeichnet sind.

Die Aufgabe der Erfindung besteht darin, bei einer Einrichtung der im Oberbegriff des Anspruchs 1 angegebenen Art einen Weg aufzuzeigen, wie die Eingabe der Abstimmdaten in den nichtflüchtigen Abstimmdatenspeicher vereinfacht werden kann.

Diese Aufgabe wird bei einer Einrichtung der im Oberbegriff des Anspruchs angegebenen Art durch die im kennzeichnenden Teil des Anspruchs 1 angegebenen Merkmale gelöst.

Vorteilhafte Ausgestaltungen der beanspruchten Einrichtung ergeben sich aus den Unteransprüchen.

Die Vorteile der Erfindung ergeben sich aus der Erläuterung eines Ausführungsbeispieles anhand der (einzigen) Figur.

Die Figur zeigt ein zu programmierendes Empfangsgerät E mit einem Abstimmdatenspeicher S, eine Einrichtung G zur Überführung von Abstimmdaten in Empfangsgeräte und einen Personal-Computer PC mit einem Bildschirm B und einer Tastatur T. Die Einrichtung G enthält ein Display D, Tasten T 1...T n, eine Ladetaste L, eine Anschlußbuchse A und einen (nicht gezeichneten) nichtflüchtigen Abstimmdatenspeicher. In den Personal-Computer PC ist eine Diskette DK ladbar, auf der ein Programm abgespeichert ist, welches vom Hersteller des zu programmierenden Gerätes E vorgegeben ist und zur Generierung der Abstimmdaten verwendet wird. Die Einrichtung G ist über ein Kabel K mit dem Personal-Computer (PC) verbunden.

Die Einspeisung der Abstimmdaten in die Einrichtung G geschieht wie folgt:

Nach der Betätigung einer Ladetaste L auf der Einrichtung G wird ein Startsignal erzeugt und damit die Kommunikationsschnittstelle für die Kommunikation mit dem Personal-Computer PC generiert. Damit ist die Einrichtung G zur Übernahme von Daten bereit.

Nach dem Einlegen einer Diskette DK in den Personal-Computer PC wird ein auf der Diskette DK abgespeichertes Programm gestartet. Das Programm listet auf dem Bildschirm B Abstimmdaten bzw. Daten für Kanäle, Sonderkanäle, Senderkennungen usw. in Tabellenform auf. Diese Daten sind entweder ebenfalls auf der Diskette DK abgespeichert oder werden aus dem nichtflüchtigen Abstimmdatenspeicher der Einrichtung G ausgelesen und dem Personal-Computer PC bzw. dessen Bildschirm B über das Verbindungskabel K zugeführt. Unter Verwendung der Tastatur T können diese Abstimmdaten modifiziert werden. Sind die gewünschten Abstimmdaten mittels der Tastatur T eingegeben, so wird eine Übernahmetaste Ü auf der Tastatur T des Personal-Computers PC betätigt. In Ansprache auf diese Tastenbetätigung werden die Abstimmdaten vom Personal-Computer PC über dessen (nicht gezeichnete) Druckerschnittstelle und das Verbindungskabel K in den nichtflüchtigen Abstimmdatenspeicher der Einrichtung G übertragen.

Von dort aus können die Abstimmdaten bei der Inbetriebnahme eines Empfangsgerätes E in dessen Abstimmdatenspeicher S geladen werden. Die letztgenannte Datenübertragung kann leitungslos, beispielsweise mittels einer Infrarot-Übertragung, oder auch über ein Verbindungskabel, erfolgen.

Ansprüche

1. Einrichtung zur Überführung von Abstimmdaten in Empfangsgeräte, welche einen nichtflüchtigen Abstimmdatenspeicher aufweist, von dem aus die Abstimmdaten in die Abstimmdatenspeicher der Empfangsgeräte übertragen werden, **dadurch gekennzeichnet**, daß sie eine Anschlußbuchse (A) aufweist, über die die im nichtflüchtigen Abstimmdatenspeicher abzuspeichernden Abstimmdaten eingespeist werden.

2. Einrichtung nach Anspruch 1, **dadurch ge-**

kennzeichnet, daß die über die Anschlußbuchse (A) eingespeisten Abstimmdaten in einem Personal-Computer (PC) erzeugt werden.

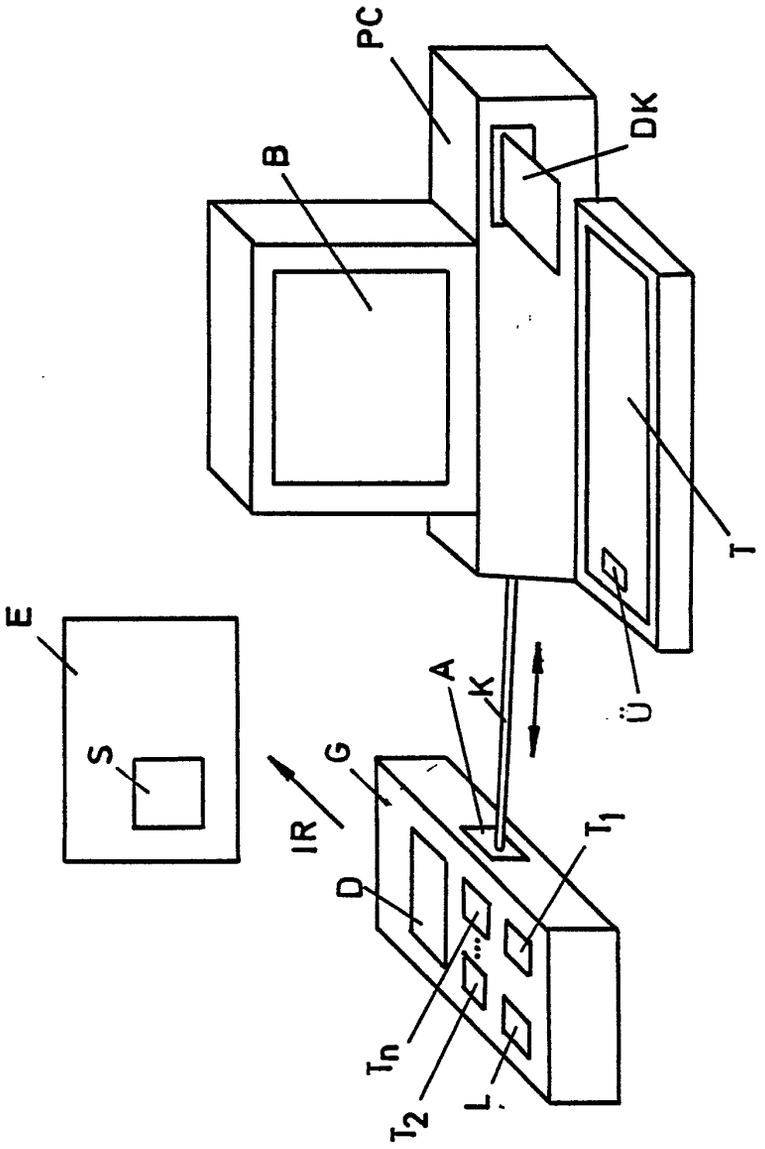
3. Einrichtung nach Anspruch 2, **dadurch gekennzeichnet**, daß die im Personal-Computer (PC) erzeugten Abstimmdaten über die Druckerschnittstelle des Personal-Computers (PC) ausgegeben und über ein Verbindungskabel (K) an die Anschlußbuchse (A) der Einrichtung (G) weitergegeben werden.

4. Einrichtung nach Anspruch 3, **dadurch gekennzeichnet**, daß

- sie eine Ladetaste (L) aufweist, durch deren Betätigung die Einrichtung (G) zur Übernahme von Abstimmdaten vorbereitet wird,
- ein auf einer Diskette (DK) gespeichertes Programm aufgerufen wird, welches Abstimmdaten auf einem Bildschirm (B) des Personal-Computers (PC) auflistet, und
- die auf dem Bildschirm (B) aufgelisteten Abstimmdaten mittels der Tastatur (T) des Personal-Computers (PC) modifizierbar sind.

5. Einrichtung nach Anspruch 4, **dadurch gekennzeichnet**, daß die auf dem Bildschirm (B) des Personal-Computers (PC) aufgelisteten Abstimmdaten auf der Diskette (DK) abgespeichert sind.

6. Einrichtung nach Anspruch 4, **dadurch gekennzeichnet**, daß die auf dem Bildschirm (B) des Personal-Computers (PC) aufgelisteten Abstimmdaten aus dem nichtflüchtigen Speicher der Einrichtung (G) ausgelesen werden.



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(51) Int. Cl.5: **H03J 9/06**

(22) Anmeldetag: **03.06.89**

(30) Priorität: **11.08.88 DE 3827211**

(43) Veröffentlichungstag der Anmeldung: **14.02.90 Patentblatt 90/07**

(84) Benannte Vertragsstaaten: **AT DE FR GB IT**

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(71) Anmelder: **GRUNDIG E.M.V.**
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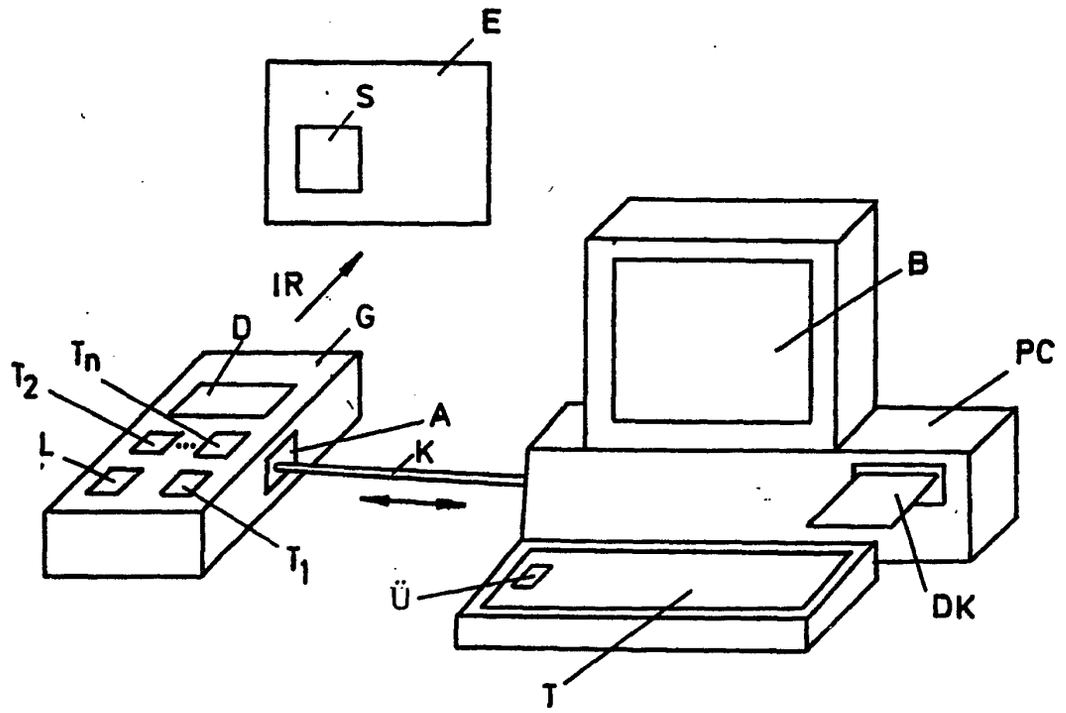
(72) Erfinder: **Rosenberger, Winfried c/o Grundig E.M.V.**
holländ. Stiftung & Co KG Kurgartenstrasse 37
D-8510 Fürth/Bay(DE)

(54) **Einrichtung zur Überführung von Abstimmdaten in Empfangsgeräte.**

(57) Die Einrichtung (9) enthält eine Anschlußbuchse (A), über die im nichtflüchtigen Abstimmdatenspeicher abzuspeichernden Abstimmdaten eingespeist werden. Diese Abstimmdaten werden in einem Personal-Computer (PC) erzeugt. Empfangsgeräte der Unterhaltungselektronik



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Europäisches Patentamt

EUROPÄISCHER RECHERCHENBERICHT

Nummer der Anmeldung

EP 89 11 0072

EINSCHLÄGIGE DOKUMENTE

Kategorie	Kennzeichnung des Dokuments mit Angabe, soweit erforderlich, der maßgeblichen Teile	Betrifft Anspruch	KLASSIFIKATION DER ANMELDUNG (Int. Cl.5)
X	PATENT ABSTRACTS OF JAPAN, vol. 010054, (E-385), 4. März 1986; & JP-A-60 206 299 (SONY) * Zusammenfassung * ---	1-6	H 03 J 9/06
X	EP-A-0 176 965 (SONY) * Seite 1, Zeile 1 - Seite 10, Zeile 4; Figuren 1,2 * ---	1-6	
A	PATENT ABSTRACTS OF JAPAN, vol. 010386, (E-467), 24. Dezember 1986; & JP-A-61 177 088 (NEC HOME ELECTRONICS) * Zusammenfassung * ---	1,2	
A	DE-U-8 717 283 (METZ-WERKE) * Seite 2, Zeile 13 - Seite 4, Zeile 24; Figur * ---	1,2	
A,D	EP-A-0 271 058 (GRUNDIG) * Zusammenfassung * ---	1,2	
A,D	DE-A-3 640 437 (SIEMENS) * Spalte 1, Zeile 42 - Spalte 3, Zeile 3; Figuren 1-3 * ---	1,2	RECHERCHIERTE SACHGEBIETE (Int. Cl.5) H 03 J H 04 B H 04 N
P,A	DE-A-3 726 972 (NOKIA GRAETZ) * Zusammenfassung; Figur 1 * ---	3,4	
P,A D	DE-A-3 713 235 (GRUNDIG) * Zusammenfassung * -----		

Der vorliegende Recherchenbericht wurde für alle Patentansprüche erstellt

Recherchenort	Abschlußdatum der Recherche	Prüfer
DEN HAAG	05-04-1990	DHONDT I.E.E.

EPO FORM 1503 03.82 (P0403)

KATEGORIE DER GENANNTEN DOKUMENTE

X : von besonderer Bedeutung allein betrachtet
Y : von besonderer Bedeutung in Verbindung mit einer anderen Veröffentlichung derselben Kategorie
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P : Zwischenliteratur

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E : älteres Patentdokument, das jedoch erst am oder nach dem Anmeldedatum veröffentlicht worden ist
D : in der Anmeldung angeführtes Dokument
L : aus andern Gründen angeführtes Dokument

& : Mitglied der gleichen Patentfamilie, übereinstimmendes Dokument

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(12) # EUROPEAN PATENT APPLICATION

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(22) Date of filing: **11.03.91**

(30) Priority: **13.03.90 JP 61529/90**

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(54) **Cycloconverter and the method of controlling the same.**

(57) A method of controlling a cycloconverter, for supplying an AC power having a given frequency to a converter group (23 to 26) having at least two cascade-connected converters (23, 24 or 25, 26) and controlling a firing angle of each of the converters (23 to 26), thereby converting the AC power supplied to the converter group (23 to 26) into an AC power having a predetermined frequency, includes the steps of controlling an output voltage from a converter (24, 26) in one stage of the converter group (23 to 26) to obtain an AC output voltage including a synthetic voltage of an AC voltage having an amplitude equal to a difference between a maximum output voltage of the converter (23) and a DC voltage and a predetermined DC voltage in accordance with the polarity of a reference voltage signal having a predetermined frequency, controlling an output voltage from a converter (24, 26) in the other stage of the converter (24, 26) to obtain an AC output voltage obtained by subtracting the output from of the converter (24, 26) in one stage from the reference voltage signal, and continuously varying a voltage value of the DC voltage in accordance with the frequency of the reference voltage signal.

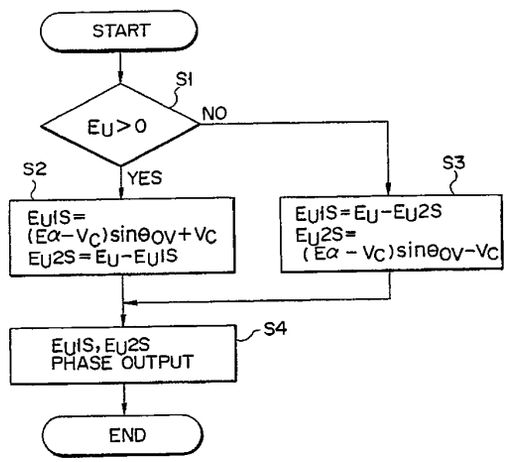

FIG. 2

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The present invention relates to a cycloconverter for converting an AC power having a given frequency into an AC power having an arbitrary frequency and the method of controlling the same.

A two-stage-cascade cyclic-current cycloconverter for driving an induction motor will be described below.

FIG. 6 shows an arrangement of a main circuit of this cycloconverter.

A main circuit 9 of the cycloconverter has U-, V-, and W-phase converter units in correspondence with U, V, and W phases of an induction motor 13, respectively. In the U-phase converter unit, positive converters 23 and 24 for flowing a positive component of an AC output current are two-stage-cascade-connected to negative converters 25 and 26 for flowing a negative component of the output AC current, and transformers 21 and 22 are connected to the converters 24 and 26 in the first stage and the converters 23 and 25 in the second stage, respectively. The U-phase converter unit further includes a reactor 27 for suppressing a cyclic current.

The V-phase converter unit is constituted by connecting transformers 31 and 32, positive converters 33 and 34, negative converters 35 and 36, and a reactor 37 in the same manner as in the U-phase converter unit. The W-phase converter unit is constituted by connecting transformers 41 and 42, positive converters 43 and 44, negative-converters 45 and 46, and a reactor 47 in the same manner as in the U-phase converter unit.

Outputs from the U-, V-, and W-phase converter units of the main circuit 9 are connected to the induction motor 13.

In the cycloconverter having the above arrangement, firing signals generated by an asymmetrical controller 20 are supplied to the positive and negative converters of each of the U-, V-, and W-phase converter units. For example, firing signals U1TA and U2TB for determining an output voltage U1S are supplied to the converters 24 and 26, respectively, in the first stage of the U-phase converter unit, and firing signals U2TA and U2TB for determining an output voltage U2S are supplied to the converters 23 and 25, respectively, in its second stage.

The two converters of each of the positive and negative groups output equal voltages at the same time upon application of the firing signals, and an average voltage V of the voltage outputs from the two converters is supplied to the induction motor 13. This average voltage V is given by the following equation:

$$V = (U1S + U2S) = (1/2)(U1SA + U2SB) + (1/2)(U2SA + U2SB)$$

Although effective values of the output voltages from the positive and negative converters are equal to each other, a cyclic current flows from the positive converters 23 and 24 to the negative converters 25 and 26 due to a differential voltage caused by output voltage waveforms. The level of the cyclic current is suppressed by the reactor 27 for cyclic current suppression. The foregoing goes for the V- and W-phase converter units.

The asymmetrical controller 20 will be described below. FIG. 7 shows waveforms of an output voltage E_u1S from the positive and negative converters in the first stage, an output voltage E_u2S from the positive and negative converters in the second stage, and a total output voltage E_u of the U-phase converter unit. FIG. 8 is a flow chart for generating an output voltage reference.

In order to obtain the output voltages E_u1S and E_u2S in the corresponding stages of the U-phase converter unit, the two converters in each stage are controlled as follows. That is, the output voltage of the two converters in one stage is fixed at a maximum voltage $E\alpha$ of the converter, and the output voltage of the two converters in the other stage is so controlled as to obtain the total output voltage E_u of the U-phase converter unit.

Converter output voltage references in the respective stages are obtained by the following equations. That is, if the total output voltage reference of the converter unit is $E_u > 0$:

1st-stage converter output voltage reference

$$E1_u = E\alpha$$

2nd-stage converter output voltage reference

$$E2_u = E\sin\theta ov - E\alpha$$

for $|E\sin\theta ov| \leq 2E\alpha$, where $E\alpha$ is the maximum output voltage of the converter. If the total output voltage reference of the converter unit is $E_u \leq 0$:

$$E_u1S = E\sin\theta ov + E\alpha$$
$$E_u2S = -E\alpha$$

By controlling the output voltages from the converters as described above, the voltage to be applied to the motor acquires a sine wave as indicated by the waveform E_u shown in FIG. 7.

When the asymmetrical control as described above is performed, the converters in the first stage constantly generate the maximum voltage with a high input power factor. As compared with symmetrical control in which the same sine-wave output voltage is given to both the first and second

stages, therefore, the input power factor can be largely improved.

The symmetrical control system can be applied with no problem when a frequency of the output voltage reference is low, i.e., in a low-speed operation range. If, however, a frequency is as high as 20 to 30 Hz or more, for example, an output voltage waveform in each stage for outputting the above asymmetrical control cannot be correctly output. As a result, no sine wave can be obtained as an output voltage to a motor, and a distortion in sine wave becomes a disturbance such as a torque ripple. The above asymmetrical control, therefore, can be applied in only a low-frequency range.

In order to realize a cycloconverter capable of driving a motor at a high speed and having a high input power factor, control must be performed such that the asymmetrical control is used to improve an input power factor as a cycloconverter in a low-speed range (at about a base speed) in which the input power factor is particularly degraded and the symmetrical control is used in a high-speed range to correctly supply an output waveform during a high-frequency operation.

It is an object of the present invention to provide a cycloconverter and the method of the same capable of continuously, smoothly performing switching from asymmetrical to symmetrical control or vice versa in accordance with an operation range of a motor, thereby realizing a high-speed operation without disturbing an output voltage waveform, and having a high input power factor in a low-speed range.

The present invention is a method of controlling a cycloconverter, for supplying an AC power having a given frequency to a converter group having at least two cascade-connected converters and controlling a firing angle of each of the converters, thereby converting the AC power supplied to the converter group into an AC power having a predetermined frequency, comprising steps of controlling an output voltage from a converter in one stage of the converter group to obtain an AC output voltage including a synthetic voltage of an AC voltage having an amplitude equal to a difference between a maximum output voltage of the converter and a DC voltage and a predetermined DC voltage in accordance with the polarity of a reference voltage signal having a predetermined frequency, controlling an output voltage from a converter in the other stage of the converter group to obtain an AC output voltage obtained by subtracting the output from of the converter in one stage from the reference voltage signal, and continuously varying a voltage value of the DC voltage in accordance with the frequency of the reference voltage signal.

According to the present invention as described above, since switching from asymmetrical to symmetrical control can be continuously, smoothly performed, an input power factor can be improved in a low-speed operation range, and a high-speed operation with good output characteristics can be realized without disturbing an output voltage waveform in a high-speed operation range.

This invention can be more fully understood from the following detailed description when taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a functional block diagram for driving an induction motor by using a cycloconverter according to the present invention;

FIG. 2 is a flow chart for realizing a method of controlling the cycloconverter according to the present invention;

FIG. 3 is a graph showing a relationship between a speed and a DC bias Vc for explaining an operation of the present invention;

FIG. 4A is a timing chart for explaining an operation of the cycloconverter according to the present invention, showing first and second output voltage signals obtained in asymmetrical control;

FIG. 4B is a timing chart for explaining an operation of the cycloconverter according to the present invention, showing the first and second output voltage signals obtained while asymmetrical control transits to symmetrical control or vice versa;

FIG. 4C is a timing chart for explaining an operation of the cycloconverter according to the present invention, showing the first and second output voltage signals obtained in symmetrical control;

FIG. 4D is a timing chart showing a reference voltage signal of the cycloconverter according to the present invention;

FIG. 5 is a functional block diagram showing a control unit of the cycloconverter according to the present invention;

FIG. 6 is a main circuit diagram of a cycloconverter;

FIG. 7 is a timing chart for explaining an operation of a conventional cycloconverter; and

FIG. 8 is a flow chart for realizing asymmetrical control of the conventional cycloconverter.

FIG. 1 shows a circuit arrangement for driving an induction motor by a cycloconverter according to an embodiment of the present invention.

This cycloconverter is constituted by a reference voltage generator for generating a reference voltage signal determined in accordance with the frequency of an AC power to be subjected to frequency conversion, a controller 8 for converting the reference voltage signal into a firing signal on the basis of a flow chart shown in FIG. 2, and a

main circuit 9 having a plurality of converters each having a firing angle controlled by the firing signal supplied from the controller 8. The arrangement of the main circuit 9 is the same as that shown in FIG. 6.

As will be described below, the reference voltage generator generates U-, V-, and W-phase reference voltage signals E_u, E_v, and E_w having phases shifted through 120° from each other and outputs the generated signals to the controller 8.

The controller 8 has functional blocks shown in FIG. 5 and operates on the basis of the flow chart shown in FIG. 2. The operation of the controller 8 will be described below by taking a U phase as an example.

When the reference voltage signal E_u having an AC waveform shown in FIG. 4 is input, the controller 8 starts processing shown in step S1 of FIG. 2. In step S1, a polarity determining section 51 determines a current polarity of the input signal. If the reference voltage signal E_u falls within the range of the positive polarity, the flow advances to step S2, and a first output voltage generating section 52 generates first and second voltage signals E_u1S and E_u2S. The signals E_u1S and E_u2S are obtained by the following equations:

$$E_u1S = (E\alpha - Vc)\sin\theta ov + Vc$$
$$E_u2S = E_u - E_u1S$$

where $E\alpha$ is the maximum output voltage of the converter, Vc is the DC voltage component, θov is the voltage phase of the reference voltage signal E_u.

If the polarity of the reference voltage signal Eu falls within the range of the negative polarity, the flow advances to step S3, and a second output voltage generating section 53 generates the first and second voltage signals E_u1S and E_u2S. In this case, the signals E_u1S and E_u2S are calculated as follows:

$$E_u1S = E_u - E_u2S$$
$$E_u2S = (E\alpha - Vc)\sin\theta ov - Vc$$

Note that the DC voltage component used in the arithmetic operation performed in steps S2 and S3 is varied by a DC component varying section 54 as a function of the speed of an induction motor 13. For example, as shown in FIG. 3, the DC voltage component Vc is set at the maximum output voltage $E\alpha$ when the speed is set from 0 to a low-frequency operation speed $\omega\alpha$, continuously decreased from $E\alpha$ to 0 when the speed is set from the low-frequency operation speed $\omega\alpha$ to a high-frequency operation speed $\omega\beta$, and set at 0 when the speed is set at the high-frequency operation speed $\omega\beta$ or higher. Although $\omega\alpha$ and $\omega\beta$ can be arbitrarily set within the range of $0 < \omega\alpha < \omega\beta$, the frequency $\omega\alpha$ is set within a frequency range where asymmetrical control can be performed without any problem for an output voltage distortion of the cycloconverter, and the high-speed operation frequency $\omega\beta$ is set within a frequency range applicable to the system, wherein the output voltage waveform is distorted unless symmetrical control is executed. The speed of the induction motor 13 is in proportion to the frequency of the reference voltage signal E_u. That is, if the speed is increased, the frequency of the reference voltage signal is increased, and vice versa.

When the first and second voltage signals E_u1S and E_u2S are generated in step S2 or S3, the flow advances to step S4. In step S4, The signals E_u1S and E_u2S are converted into firing signals corresponding to their voltage levels by a table 55. That is, when the first voltage signal E_u1S is input, the table 55 outputs firing signals U1TA and U1TB which allow a synthetic output voltage (1/2)(U1SA + U1SB) of two converters in the first stage to be the first voltage signal E_u1S. Similarly, when the second voltage signal E_u2S is input, the table 55 outputs firing signals U2TA and U2TB which allow a synthetic output voltage (1/2)(U2SA + U2SB) of two converters in the second stage to be the second voltage signal E_u2S. The signals U1TA and U1TB are supplied to the two converters in the first stage. The signals U2TA and U2TB are supplied to the two converters in the first stage.

The arrangement of the reference signal generator is shown in detail in FIG. 1.

In the reference generator, as shown in FIG. 1, a deviation between an externally supplied speed reference ωr^* and a real speed ωr of the induction motor 13 detected by a speed detector 12 is input to a speed controller 1. The speed controller 1 executes a PID arithmetic operation for the input deviation to obtain a torque reference T and outputs the obtained reference T to a divider 2. When the input real speed ωr of the induction motor 13 reaches a predetermined value, a flux arithmetic operation unit 3 calculates a flux reference ϕ for decreasing the speed in accordance with an inverse proportional function. The divider 2 divides the torque reference T^* by the flux reference ϕ and supplies the quotient to a vector controller 4.

On the basis of the output from the divider 2 and the flux reference ϕ, the vector controller 4 decomposes the primary current of the induction motor 13 into a torque current component I_{1q}^* and a flux current component I_{1d}^* by using the constants (a secondary resistance R2, a secondary inductance L2, and a mutual inductance M) of the induction motor 13.

That is, the controller 4 multiplies the output

from the divider 2 by L_2/R_2M to generate the torque current component I_{1q}^*. In addition, the controller 4 divides the flux reference ϕ by the mutual inductance M and supplies the quotient to a flux saturation function circuit 4a. In accordance with a relationship between the flux reference ϕ of the induction motor 13 and an excitation current Io, the circuit 4a calculates the excitation current Io in consideration of saturation of the magnetic flux. In addition, a differentiator 4b differentiates the flux reference ϕ and multiplies the differential result by L_2/R_2M to obtain a forcing current I_{FOR}. This current I_{FOR} compensates for a delay when the magnetic flux changes. The sum of the forcing current I_{FOR} and the excitation current Io is the flux current component I_{1g}^*.

In addition, a slip frequency reference ωs of the induction motor 13 is calculated by dividing the product of the output from the divider 2 and the secondary resistance R_2 by the flux reference ϕ.

Current detectors 14a, 14b, and 14c detect input currents I_u, I_v, and I_w of the motor 13, respectively. These input currents are decomposed into two-phase DC amounts $I_{1q\text{-}F}$ and $I_{1d\text{-}F}$ by a three-phase/two-phase converter 11.

A deviation between the torque current component I_{1q}^* an output from the vector controller 4 and the real current $I_{q\text{-}F}$ and that between the flux current component I_{1d}^* and the real current $I_{1d\text{-}F}$ are supplied to a current controller 5 constituted by proportional-plus-integral control elements.

The controller 5 independently executes proportional-plus-integral control for the deviation between the torque current component and the real current and that between the flux current component and the real current to obtain voltage references Eq and Ed and outputs the obtained references Eq and Ed to a voltage vector arithmetic operation unit 6.

The unit 6 uses the voltage references Eq and Ed to calculate a voltage amplitude reference E and a voltage phase θv in accordance with the following arithmetic operations:

$$E = \sqrt{Eq^2 + Ed^2}$$
$$\theta v = \tan^{-1}(Eq/Ed)$$

A primary frequency ωo as the sum of the real speed ωr and the slip frequency reference ωs is converted into a primary frequency phase θo via an integrator 10, and a voltage phase θ from a voltage reference fixed winding is calculated on the basis of the primary frequency phase θ and the voltage phase θv. The calculated voltage phase θ and the above voltage amplitude reference E are supplied to a three-phase reference arithmetic operation unit 7. The unit 7 executes the following arithmetic operations to output the reference voltage signals E_u, E_v, and E_w of three phases U, V, and W, respectively, consisting of sine waves having phases shifted through 120° from each other:

$$E_u = E\sin\theta ov$$
$$E_v = E\sin(\theta ov - 2/3\pi)$$
$$E_w = E\sin(\theta ov + 2/3\pi)$$

The operation of the cycloconverter having the above arrangement will be described below with reference to FIG. 4.

The reference voltage signal E_u calculated as described above is input to the controller 8. The controller 8 executes asymmetrical control within the range of $|\omega r| \leqq \omega\alpha$ and symmetrical control within the range of $|\omega r| \geqq \omega\beta$ (> 0). Within the range of $\omega\alpha \leqq \omega r \leqq \omega\beta$, in order to continuously, smoothly switch control for the output voltage in each stage from the asymmetrical to symmetrical control, the controller 8 calculates the reference voltage signals E_u1S and E_u2S on the basis of the flow chart shown in FIG. 2:

if $E_u \geqq 0$,
$E_u1S = (E\alpha - Vc)\sin\theta ov + Vc$
$E_u2S = E_u - E_u1S$
if $E_u < 0$,
$E_u1S = E_u - E_u2S$
$E_u2S = (E\alpha - Vc)\sin\theta ov - Vc$

Since Vc satisfies $Vc = E\alpha$ within the range of $|\omega r| \leqq \omega\alpha$, the reference voltage signals E_u1S and E_u2S have voltage waveforms shown in FIG. 4A. That is, the firing angle of converters 24 and 26 in the first stage are controlled such that their output voltages become the signal E_u1S, and those of converters 23 and 25 in the second stage are controlled such that their output voltages become the signal E_u2S. Therefore, the AC power supplied from the U-phase converter unit to the induction motor 13 has the same sine wave as that of the reference voltage signal E_u shown in FIG. 4D. Note that in the asymmetrical control, the firing angles of the converters in the first and second stages of the U-phase converter unit are controlled such that the output voltages from the two stages become the reference voltage signals E_u1S and E_u2S shown in FIG. 4A, respectively.

Since Vc satisfies $Vc = 0$ within the range of $|\omega r| \geqq \omega\beta$, the reference voltage signals E_u1S and E_u2S have voltage waveforms shown in FIG. 4C. That is, the reference voltage signals E_u1S and E_u2S have the identical symmetrical waveforms, and the firing angles of the converters 24 and 26 in the first stage and the converters 23 and 25 in the

second stages are controlled such that their output voltages become E_u1S and E_u2S, respectively. Therefore, the AC power supplied from the U-phase converter unit to the induction motor 13 has the same sine wave as that of the reference voltage signal E_u shown in FIG. 4D. Note that the control as described above is the symmetrical control.

Vc varies from Vc = $E\alpha$ to Vc = 0 within the range of $\omega\alpha \leqq \omega r \leqq \omega\beta$. That is, the firing angles of the converters in the first and second stages are controlled so that the output voltages E_u1S and E_u2S in the first and second stages of the U-phase converter unit have voltage waveforms shown in FIG. 4B in accordance with the speed as shown in FIG. 3, thereby obtaining the reference voltage signal E_u as a synthetic voltage of the two converter outputs, i.e., a voltage to be supplied to the motor 13.

As a result, the asymmetrical control can be switched to the symmetrical control and vice versa without distorting the output voltage to be supplied to the induction motor 13. In addition, a stable operation can be realized in a high-speed operation range.

Although the operation has been described above by taking the U-phase output voltage as an example, the output voltage can be similarly determined with respect to the V or W phase.

As has been described above, according to the present invention, there is provided a cycloconverter capable of improving the input power factor in a low-speed operation range and realizing a stable operation up to a high-speed operation range without distorting the output voltage and a method of controlling the same.

Although the cycloconverter of the present invention is applied to a frequency converting apparatus of an induction motor in the above embodiment, the present invention is not limited to the above embodiment.

Claims

1. A cycloconverter characterized by comprising:

a converter group(23 to 26), having at least two cascade-connected converters (23, 24 or 25, 26) for controlling a firing angle of each of said converter (23 to 26) to convert an AC power given to each of said converters into an AC power having an arbitrary frequency;

reference voltage generating means (1 to 7) for generating a reference voltage signal having a frequency corresponding to the frequency of the AC power to be output from said converter group (23 to 26);

first output voltage generating means (52) for generating a first voltage signal obtained by adding a DC voltage to an AC signal having an amplitude corresponding to a difference between a maximum output voltage of said converter (23 to 26) and the DC voltage, and a second voltage signal obtained by subtracting the first voltage signal from the reference voltage signal;

second output voltage generating means (53) for generating a third voltage signal obtained by subtracting the DC voltage from an AC signal having an amplitude corresponding to a difference between the DC voltage and the maximum output voltage of said converter (23 to 26), and a fourth voltage signal obtained by subtracting the third voltage signal from the reference voltage signal;

DC component varying means (8) for varying the DC voltage in accordance with the frequency of the reference voltage signal;

first firing angle control means (55) for supplying, while the reference voltage signal is positive, a firing signal corresponding to a voltage value of the first voltage signal to one of said converters (24, 26) and a firing signal corresponding to a voltage value of the second voltage signal to the other of said converters (23, 25); and

second firing angle control means (55) for supplying, while the reference voltage signal is negative, a firing signal corresponding to a voltage value of the third voltage signal to said the other said converters (23, 25) and a firing signal corresponding to a voltage value of the fourth voltage signal to said one of said converters (24, 26).

2. A cycloconverter according to claim 1, characterized in that said DC component varying means (8) includes means (S2, S3) for continuously decreasing the DC voltage when the frequency of the reference voltage signal changes from a first frequency to a second frequency higher than the first frequency and continuously increasing the DC voltage when the frequency changes from the second frequency to the first frequency.

3. A cycloconverter according to claim 2, characterized in that said DC component varying means (8) includes means (S2, S3) for fixing the DC voltage at the maximum output voltage of said converter when the frequency of the reference voltage signal is lower than the first frequency.

4. A cycloconverter according to claim 2, characterized in that said DC component varying means (8) includes means (S2, S3) for fixing

the DC voltage at 0 while the frequency of the reference voltage signal is higher than the second frequency.

5. A cycloconverter according to claim 1, characterized in that said converter group (23 to 26) outputs the frequency-converted AC power to a motor (13), and

said DC component varying means (8) varies the DC voltage in accordance with an operation frequency of said motor (13).

6. A cycloconverter according to claim 1, characterized in that said converter group includes a plurality of positive converters (23 to 26) through which a positive component of an AC current supplied to said converter group (23 to 26) flows and plurality of a negative converters (23, 24) through which a negative component of the AC current flows.

7. A cycloconverter according to claim 6, characterized in that each of said positive and negative converters (23 to 26) is constituted by at least one thyristor.

8. A cycloconverter according to claim 1, characterized in that a cyclic current flows from said positive converters (23, 24) to said negative converters (25, 26) in said converter group (23 to 26).

9. A cycloconverter according to claim 1, characterized in that said voltage reference generating means (1 to 7) includes flux arithmetic operating means (3) for calculating a flux reference of a motor (13) which receives the AC power output from said converter group (23 to 26) in accordance with a real speed of the motor (13), means (1) for calculating a torque reference of the motor (13) in accordance with an externally supplied speed reference and the real speed, means (4) for calculating a torque current component and a flux current component in accordance with the flux reference and the torque reference, means (11) for detecting a real current as an input current to the motor (13) and converting the detected current into two-phase real currents, means (5) for executing proportional-plus-integral control for a deviation between one of the real currents generated by said converting means (11) and the torque current component and a deviation between the other real current generated by said converting means (11) and the flux current component and outputting an arithmetic operation result signal, means (6) for calculating a voltage amplitude reference and a voltage phase in accordance with the arithmetic operation result signal output from said proportional-plus-integral control means (6), means for calculating a primary frequency phase in accordance with the real speed and a slip frequency reference of said motor (13), means for calculating a phase of the voltage reference in accordance with the voltage phase and the primary frequency phase, and means (11) for calculating the voltage reference in accordance with the phase calculated by said phase calculating means and the voltage amplitude reference.

10. A method of controlling a cycloconverter, for supplying an AC power having a given frequency to a converter group (23 to 26) having at least two cascade-connected converters (23, 24 or 25, 26) and controlling a firing angle of each of said converters (23 to 26), thereby converting the AC power supplied to said converter group (23 to 26) into an AC power having a predetermined frequency, characterized by comprising the steps of:

controlling an output voltage from one of said converters (24, 26) of said converter group (23 to 26) in accordance with the polarity of a reference voltage signal having a predetermined frequency to obtain an AC output voltage including a synthetic voltage including an AC voltage and a predetermined DC voltage, said AC voltage having an amplitude equal to a difference between a maximum output voltage of said converter and a DC voltage;

controlling an output voltage from the other of said converters (23, 25) to obtain an AC output voltage corresponding to a difference between the output voltage from said one of said converters (24, 26) and the reference voltage signal; and

continuously varying a voltage value of the DC voltage in accordance with the frequency of the reference voltage signal.

11. A method according to claim 10, characterized by further comprising:

a asymmetrical control step of controlling the output voltage from said one of said converters (24, 26) of said converter group (23 to 26) to be the maximum output voltage of said one of said converters (24, 26), and controlling the output voltage from said the other of said converters (23, 25) of said converter group (23 to 26) to be the AC output voltage obtained by subtracting the maximum output voltage from the reference voltage signal;

a symmetrical control step of controlling the output voltage from each of said converters

(23 to 26) to one and be a voltage value about 1/2 that of the reference voltage signal; and

a switching step of executing switching between said asymmetrical and symmetrical control steps in accordance with a distortion in the output voltage supplied from said converter group (23, 26).

12. A method according to claim 10, characterized by further comprising steps of:

generating a reference signal having a frequency corresponding to a frequency of the AC power to be output from said converter group (23 to 26);

generating a first voltage signal obtained by adding a DC voltage to an AC signal having a difference between the maximum output voltage of said converter (23 to 26) and the DC voltage as an amplitude thereof and a second voltage signal obtained by subtracting the first voltage signal from the reference voltage signal;

generating a third voltage signal obtained by subtracting the DC voltage from the AC signal having a difference between the DC voltage and the maximum output voltage of said converter (23 to 26) as an amplitude thereof and a fourth voltage signal obtained by subtracting the third voltage signal from the reference signal;

varying the DC voltage in accordance with the frequency of the reference voltage signal;

supplying, while the reference voltage signal is positive, a firing signal corresponding to a voltage value of the first voltage signal to said one of said converters (24, 26) and a firing signal corresponding to a voltage value of the second voltage signal to said the other of said converters (23, 25); and

supplying, while the reference voltage signal is negative, a firing signal corresponding to a voltage value of the third voltage signal to said the other of converters (23, 25) and a firing signal corresponding to a voltage value of the fourth voltage to said one of said converters (24, 26).

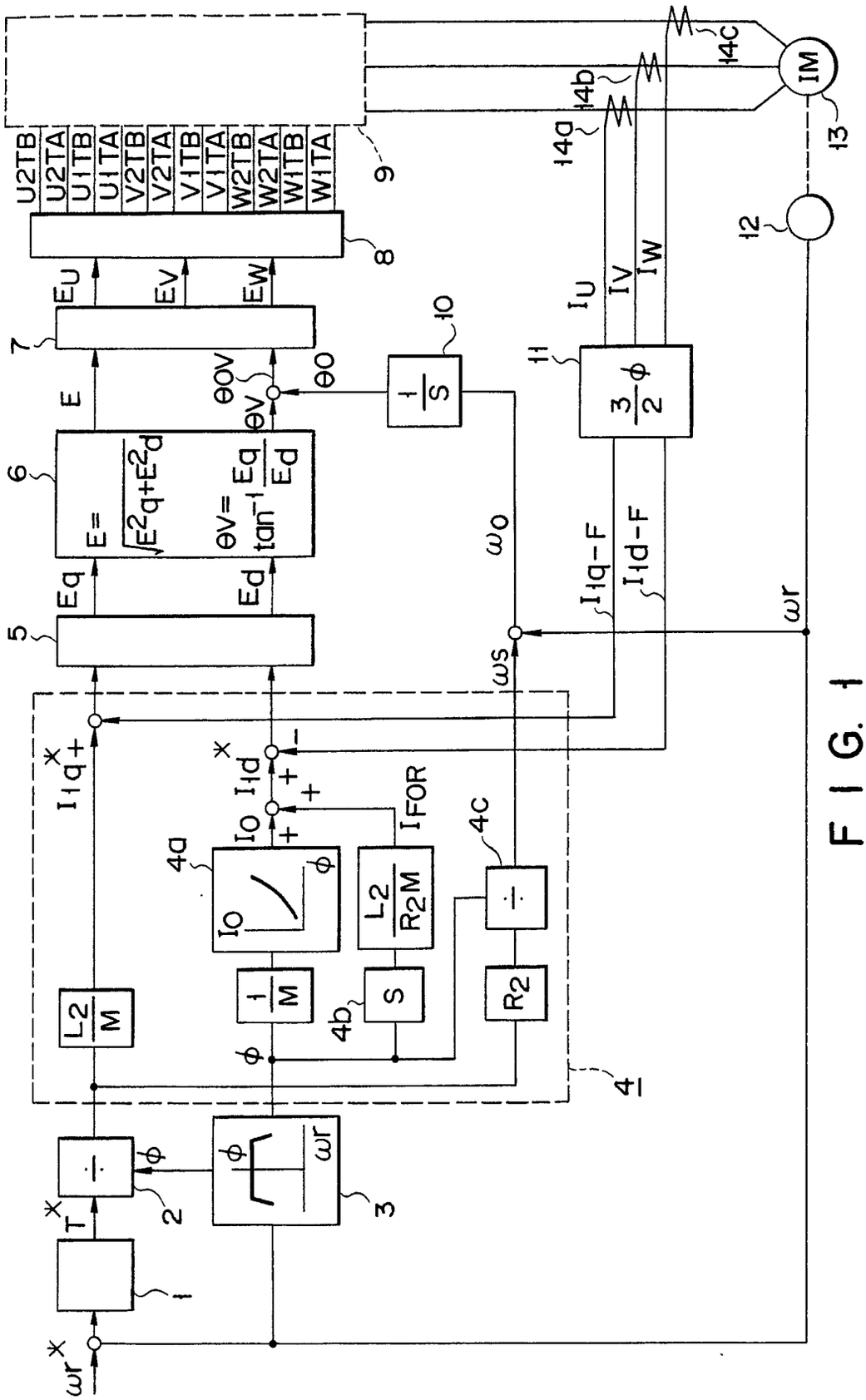


FIG. 1

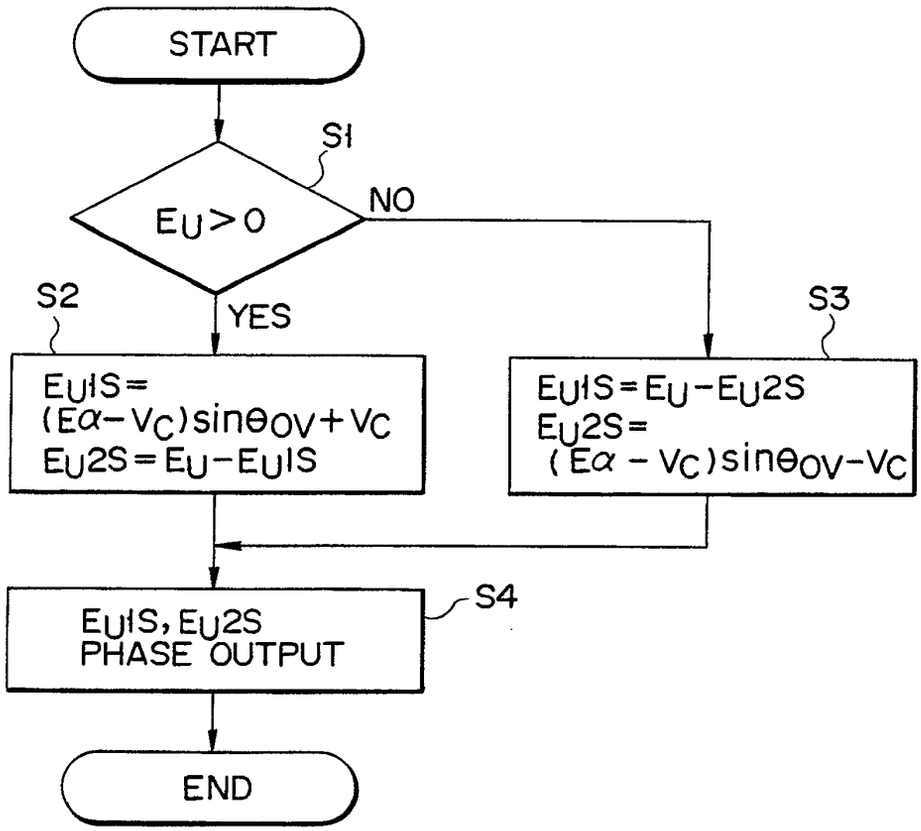


FIG. 2

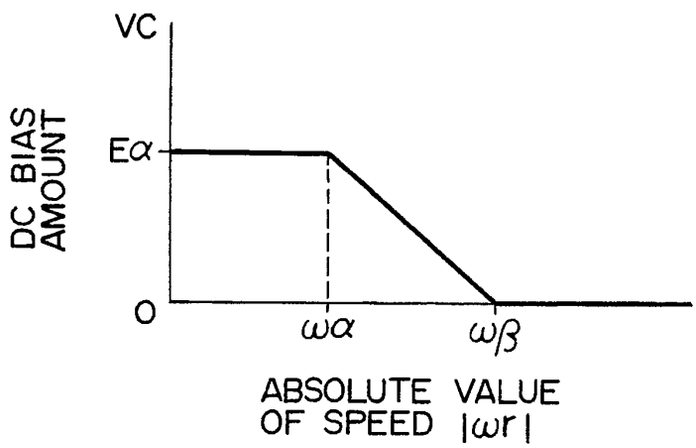
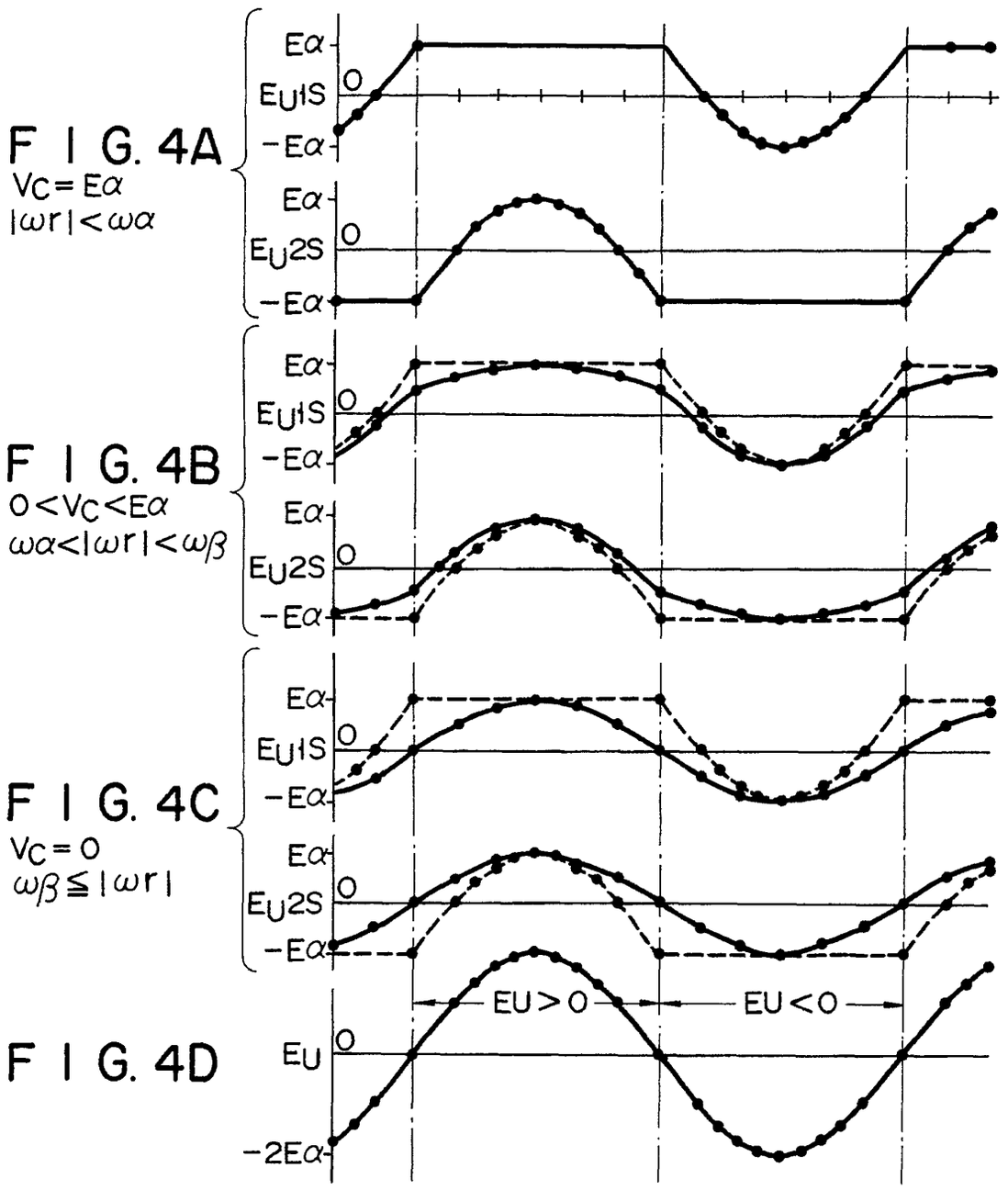


FIG. 3



F I G. 4A
$V_C = E\alpha$
$|\omega r| < \omega\alpha$

F I G. 4B
$0 < V_C < E\alpha$
$\omega\alpha < |\omega r| < \omega\beta$

F I G. 4C
$V_C = 0$
$\omega\beta \leqq |\omega r|$

F I G. 4D

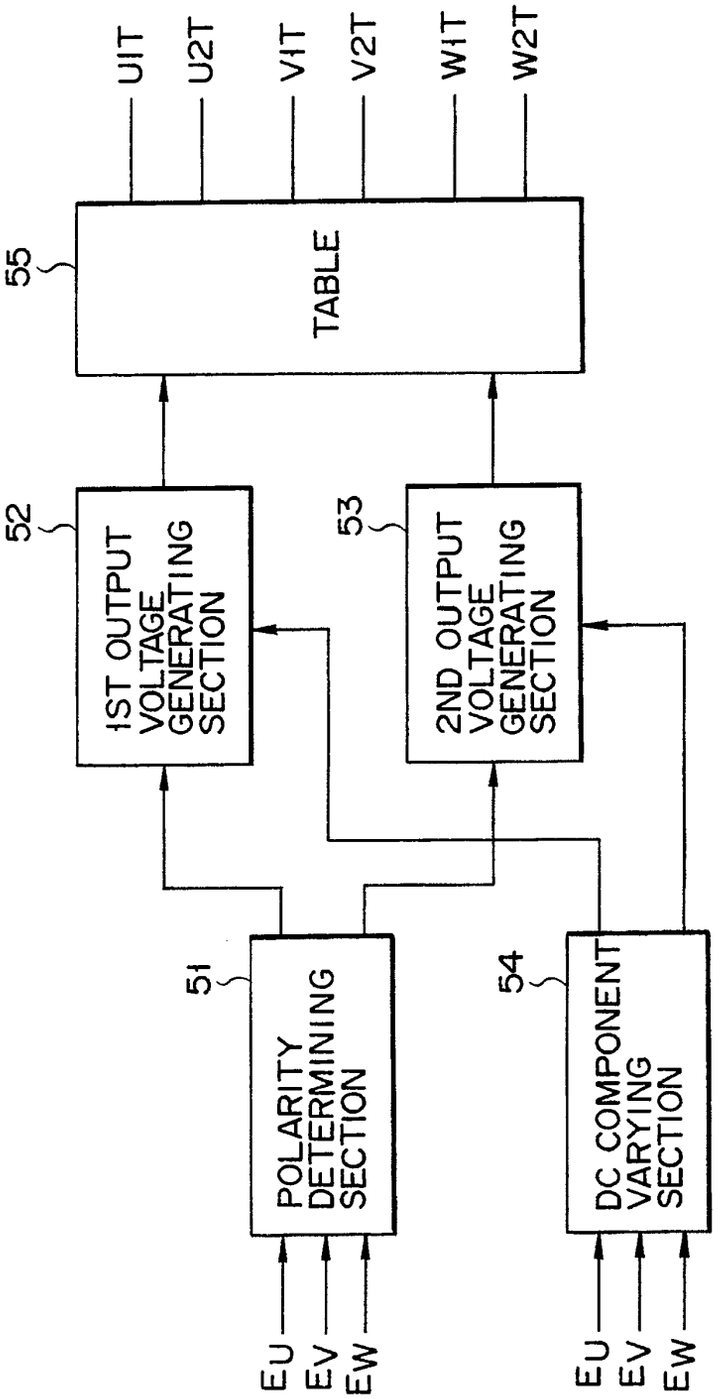


FIG. 5

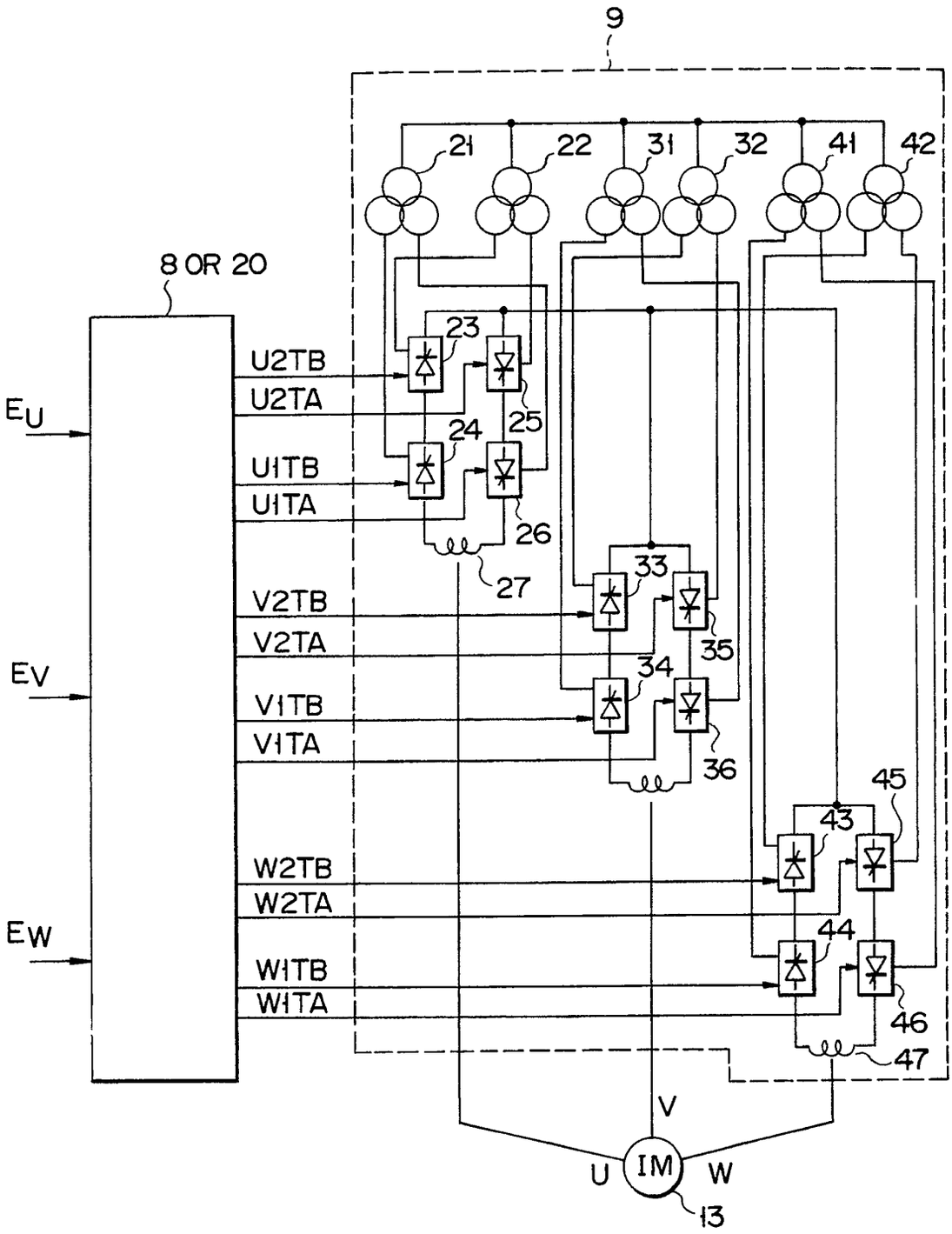


FIG. 6

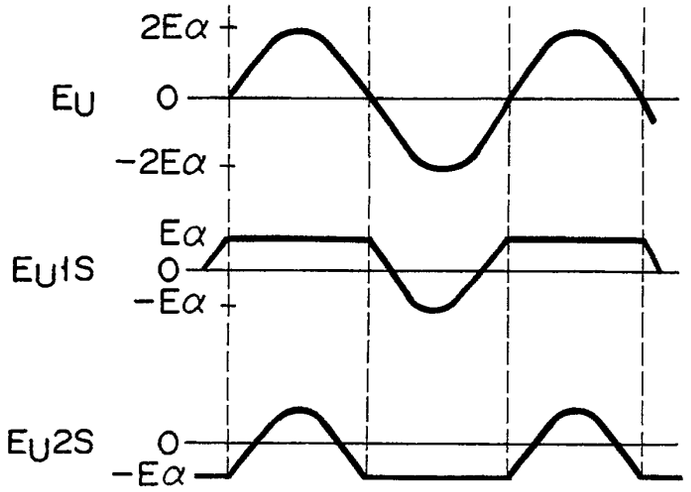


FIG. 7

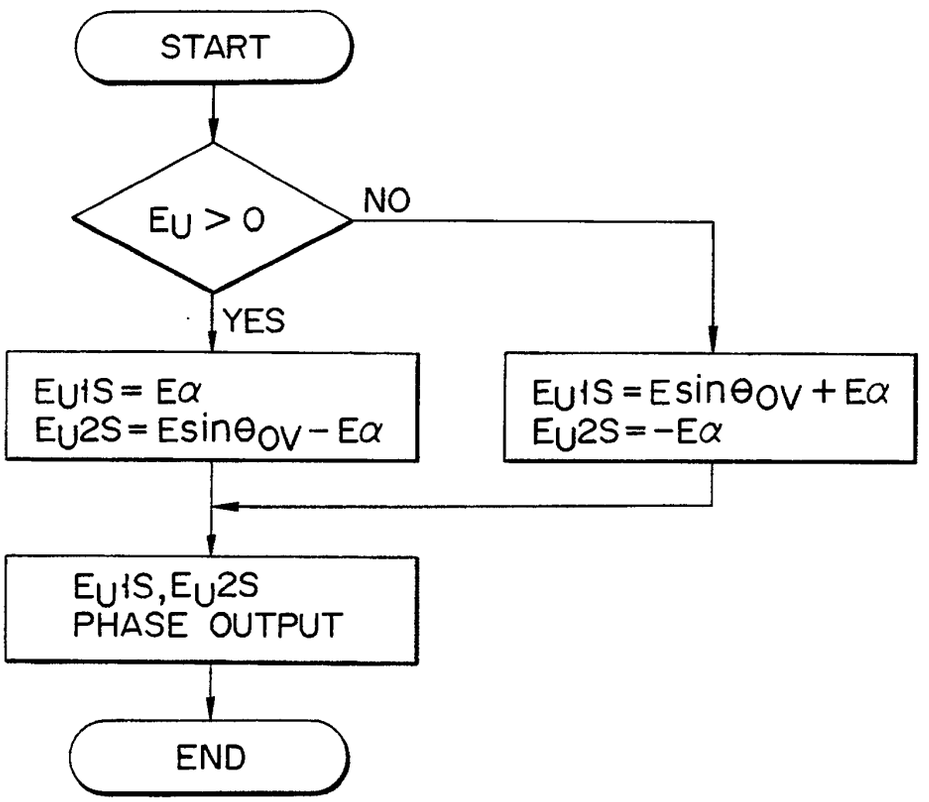


FIG. 8

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European Patent Office
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(54) **Cycloconverter and the method of controlling the same.**

(57) A method of controlling a cycloconverter, for supplying an AC power having a given frequency to a converter group (23 to 26) having at least two cascade-connected converters (23, 24 or 25, 26) and controlling a firing angle of each of the converters (23 to 26), thereby converting the AC power supplied to the converter group (23 to 26) into an AC power having a predetermined frequency, includes the steps of controlling an output voltage from a converter (24, 26) in one stage of the converter group (23 to 26) to obtain an AC output voltage including a synthetic voltage of an AC voltage having an amplitude equal to a difference between a maximum output voltage of the converter (23) and a DC voltage and a predetermined DC voltage in accordance with the polarity of a reference voltage signal having a predetermined frequency, controlling an output voltage from a converter (24, 26) in the other stage of the converter (24, 26) to obtain an AC output voltage obtained by subtracting the output from of the converter (24, 26) in one stage from the reference voltage signal, and continuously varying a voltage value of the DC voltage in accordance with the frequency of the reference voltage signal.

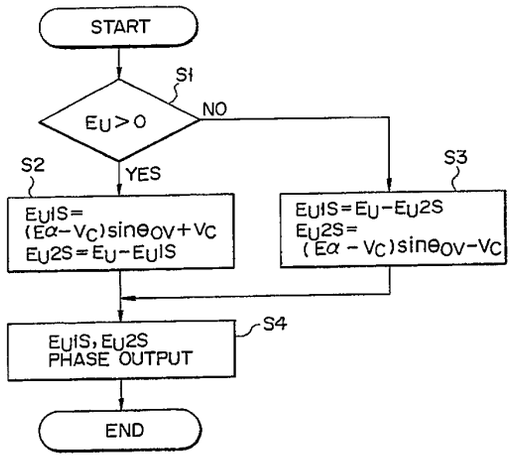


FIG. 2

EP 0 446 844 A3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 10 3707

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	DE-A-2 543 066 (FUJI ELECTRIC) * the whole document * *	1,6,7,10	H 02 M 5/27
A	1986 IEEE IAS CONFERECE RECORD 28 September 1986, DENVER pages 36 - 41; SAITO ET.AL.: 'A multi-processor-based, fully digital, AC drive system for rolling mills' * abstract; figures 3,6 * *	1,6,9	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

H 02 M

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	28 October 91	GENTILI L.

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
Y: particularly relevant if combined with another document of the same catagory
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention

E: earlier patent document, but published on, or after the filing date
D: document cited in the application
L: document cited for other reasons

&: member of the same patent family, corresponding document

(19) BUNDESREPUBLIK DEUTSCHLAND

DEUTSCHES PATENTAMT

(12) **Offenlegungsschrift**

(11) **DE 33 13 493 A1**

(51) Int. Cl. 3: **H04Q 9/08**

(21) Aktenzeichen: P 33 13 493.6
(22) Anmeldetag: 14. 4. 83
(43) Offenlegungstag: 18. 10. 84

DE 33 13 493 A1

(71) Anmelder:

Telefunken Fernseh und Rundfunk GmbH, 3000 Hannover, DE

(72) Erfinder:

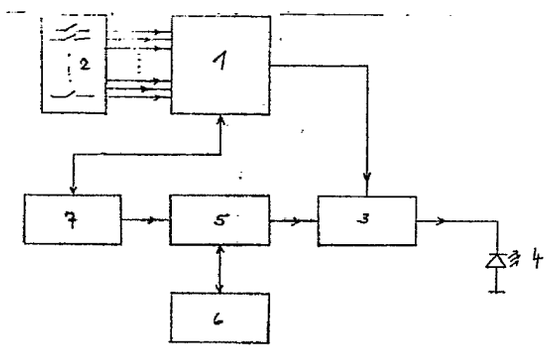
Schiering, Rolf; Platte, Hans-Joachim, Dr.-Ing., 3005 Hemmingen, DE

(56) Recherchenergebnisse nach § 43 Abs. 1 PatG:

DE-OS 32 02 949
DE-OS 31 31 357
DE-OS 27 44 057
DE-Z: Funkschau, 1978, H.20, S.963-966;
DE-Z: Funkschau, 1978, H.21, S.1025-1028;

(54) Fernbedienungsgerät zur drahtlosen Steuerung verschiedener Geräte

Ein Fernbedienungsgerät zur drahtlosen Steuerung verschiedener Geräte einer Gerätegattung enthält einen Steuercodegenerator (3), der bei Betätigung eines Bedienungselementes (2) unterschiedliche Steuersignale zur Auslösung unterschiedlicher Funktionen an dem Gerät erzeugen kann.



DE 33 13 493 A1

BUNDESDRUCKEREI 08. 84 408 042/320 7/60

Patentansprüche

1. Fernbedienungsgerät zur vorzugsweise einheitlichen und drahtlosen Steuerung verschiedener bekannter Geräte von ein und derselben Gerätegattung, vorzugsweise aus dem Heimelektronik-Bereich, wie z.B. verschiedener Fernsehgeräte, verschiedener Videorekorder oder verschiedener HiFi-Anlagen, dadurch gekennzeichnet, daß

   a) das Fernbedienungsgerät geeignete Bedienungselemente (2) für die Steuerung eines Gerätes der jeweiligen Gerätegattung enthält,

   b) das Fernbedienungsgerät einen Steuercodegenerator (3) enthält, der bei Betätigung eines Bedienungselementes (2) unterschiedliche Steuersignale derart erzeugen kann, daß damit an jedem Gerät einer vorbestimmten Gruppe bekannter Geräte aus derselben Gerätegattung die dem betätigten Bedienungselement (2) des Fernbedienungsgerätes zugeordnete Funktion ausgelöst wird.

2. Fernbedienungsgerät nach Anspruch 1, dadurch gekennzeichnet, daß der Steuercodegenerator (3) verbunden ist mit einer Code-Auswahlschaltung (5), die bei Vorliegen einer eindeutigen Information über das gerade zu steuernde spezielle Gerät der vorbestimmten Gerätegruppe mit Betätigung eines Bedienungselementes (2) am Fernbedieungsgerät den jeweils gültigen Steuercode auswählt und dasjenige Steuersignal generieren läßt, das die dem betätigten Bedienungselement (2) des Fernbedienungsgerätes zugeordnete Funktion am gerade zu

- 2 -

steuernden Geraet ausloest.

Fernbedienungsgeraet nach Anspruch 2, dadurch gekennzeichnet, dass die Code-Auswahlschaltung(5) verbunden ist mit einer Code-Bestimmungsschaltung(7), die jeweils bei Inbetriebnahme des Fernbedienungsgeraetes mit einem speziellen zu steuernden Geraet in Funktion tritt und dann durch einen vom Benutzer kontrollierten Probiervorgang oder zielgerichtet durch mehrere dieser Probiervorgaenge mit unterschiedlichen Steuercodewoertern aus den Steuercodes der vorbestimmten Geraetegruppe eindeutig denjenigen kompletten Steuercode ermittelt, der am speziellen zu steuernden Geraet die gewuenschten Funktionen ausloest.

Fernbedienungsgeraet nach Anspruch 3, dadurch gekennzeichnet, dass waehrend der Inbetriebnahmephase die Code-Bestimmungsschaltung (7) bei Betaetigung eines Bedienungselementes(2) am Fernbedienungsgeraet solange verschiedene in Frage kommende Steuercode-Woerter zum zu steuernden Geraet ausssendet, bis der Benutzer vorzugsweise durch Loslassen des Bedienungselementes(2) oder durch Betaetigung eines quittierenden Bedienungselementes(2) zu erkennen gibt, dass die gewuenschte Funktion mit dem zuletzt ausgesendeten Steuercode-Wort ausgeloest wurde, und die Code-Bestimmungsschaltung(7) dann den entsprechenden Vorgang bei Betaetigung anderer Bedienungselemente(2) solange fortsetzt, bis die so ermittelten gueltigen Steuercode-Woerter logisch eindeutig den kompletten Steuercode des jeweiligen zu steuernden Geraetes aus der Menge aller im Fernbedienungsgeraet gespeicherten Codes identifizieren.

Fernbedienungsgeraet nach Anspruch 3, dadurch gekennzeichnet, dass waehrend der Inbetriebnahmephase die Code-Bestimmungsschaltung(7)bei wiederholter Betaetigung desselben Bedienungselementes (2)am Fernbedienungsgeraet jeweils ein anderes der in Frage kommenden Steuercode-Woerter zum zu steuernden Geraet ausssendet und aus dem Ende der Betaetigungswiederholung schliesst, dass die gewuenschte Funktion mit dem zuletzt ausgesendeten Steuercode-Wort ausgeloest wurde, und die Code-Bestimmungsschaltung(7) dann den entsprechenden Vorgang bei

Betaetigung anderer Bedienungselemente (2) solange fortsetzt, bis die so ermittelten gueltigen Steuercode-Woerter logisch eindeutig den kompletten Steuercode des jeweiligen zu steuernden Geraetes aus der Menge aller im Fernbedienungsgeraet gespeicherten Codes identifizieren.

6. Fernbedienungsgeraet nach einem oder mehreren der Ansprüche 3 - 5, dadurch gekennzeichnet, dass die Inbetriebnahmephase mit der speziellen Funktion der Code-Bestimmungsschaltung (7) jeweils automatisch dann wieder begonnen wird, wenn ein normalerweise nur kurzzeitig zu betaetigendes Bedienungselement (2) signifikant laenger betaetigt wird.

7. Fernbedienungsgeraet nach einem oder mehreren der Ansprüche 3 - 5, dadurch gekennzeichnet, dass die Inbetriebnahmephase mit der speziellen Funktion der Code-Bestimmungsschaltung (7) jeweils automatisch dann wieder begonnen wird, wenn ein normalerweise nur einmal zu betaetigendes Bedienungselement(2)in durch kein anderes Bedienungselement unterbrochener Folge wiederholt betaetigt wird.

8. Fernbedienungsgeraet nach einem oder mehreren der Ansprüche 3 - 5, dadurch gekennzeichnet, dass die Inbetriebnahmephase mit der speziellen Funktion der Code-Bestimmungsschaltung(7) jeweils dann wieder begonnen wird, wenn ein spezielles, vorzugsweise gegen unbeabsichtigte Betaetigung geschuetztes Bedienungselement 2 betaetigt wird.

9. Fernbedienungsgeraet nach einem oder mehreren der Ansprüche 1-8, dadurch gekennzeichnet, dass die Code-Auswahlschaltung (5) und die Code-Bestimmungsschaltung(7)ganz oder teilweise durch ein Programm in einem entsprechenden programmierbaren Schaltungsteil des Fernbedienungsgeraetes realisiert werden.

T E L E F U N K E N
Fernseh und Rundfunk G m b H
Göttinger Chaussee 76
3000 Hannover 91

Hannover, den 06.04.1983
PTL-Wp/ds

Fernbedienungsgerät zur drahtlosen Steuerung verschiedener Geräte

Die Erfindung betrifft ein Fernbedienungsgerät, insbesondere zur Steuerung von elektronischen Geräten des Unterhaltungselektronikbereiches, das jedes Gerät aus einer vorbestimmten Gruppe bekannter Geräte zu steuern vermag, ohne daß eine komplizierte Einstellung oder Umstellung des Fernbedienungsgerätes auf das vom jeweiligen Benutzer jeweils zu steuernde Gerät erfolgen muß. Das erfindungsgemäße Fernbedienungsgerät kann daher gut als kompatibles, gerätetyp- und herstellerunabhängiges Fernbedienungsgerät ausgeführt werden.

Bekannte Fernbedienungsgeräte sind durch den schaltungsmäßig vorweg festgelegten Fernsteuercode zumeist eindeutig auf die Steuerung eines bestimmten Gerätes eines bestimmten Herstellers fixiert. Für den Benutzer folgt hieraus, daß er zu jedem neuen Gerät ein neues spezielles Fernbedienungsgerät erwerben und in der Umgebung des Geräteaufstellortes, das ist bei Geräten der Unterhaltungselektronik in der Regel der unmittelbare Wohnbereich, betriebsbereit aufbewahren muß. Jedes neu erworbene Fernbedienungsgerät, selbst wenn es

- 5 -

für ein zweites Gerät einer dem Benutzer bereits vertrauten Gerätegattung bestimmt ist, erfordert vom Benutzer wiederum eine Eingewöhnung: Er muß sich spezielle, zumeist nur konstruktiv bedingte Bedienungsbesonderheiten merken und diese von den Besonderheiten anderer bereits vorhandener Fernbedienungsgeräte dauerhaft unterscheiden. Selbst prinzipiell identische Funktionen, wie Senderwahl bei Empfangsgeräten oder Zeitprogrammierung bei uhrzeitgesteuerten Funktionen, sind von bekannten Fernbedienungsgeräten aus recht unterschiedlich zu bedienen. Diese Vielfalt verwirrt beim direkten Nebeneinander verschiedener Fernbedienungsgeräte slebst den technisch versierten Benutzer und führt zwangsläufig zu einer größeren Fehlbedienungshäufigkeit als nötig.

Der Erfindung liegt die Aufgabe zugrunde, ein Fernbedienungsgerät zu schaffen, mit dem eine ganze Gruppe bekannter Geräte, die unabhängig von der jeweiligen Herstellerfirma festzulegen ist, ferngesteuert werden kann.

Diese Aufgabe wird durch die im Anspruch 1 angegebene Erfindung gelöst. Vorteilhafte Weiterbildungen des Anspruchs sind durch die Unteransprüche gegeben. Die Erfindung ist besonders vorteilhaft

fuer alle solche Fernbedienungsgeraete einsetzbar, mit denen eine Hersteller- und Geraetetyp-unabhaengige einheitliche Fernsteuerung von Geraeten derselben Geraetegattung erreicht werden soll.

Die Erfindung wird nachstehend anhand eines Ausfuehrungsbeispiels naeher erlaeutert. Es zeigen

Fig.1 das prinzipielle Funktionsblockschaltbild des erfindungsgemaessen Fernbedienungsgeraetes,

Fig.2 das grundsaetzliche Entscheidungsdiagramm zur Codebestimmung und Geraete-Identifikation waehrend einer Inbetriebnahmephase,

Fig.3 die prinzipielle Organisation der Code-Speichertabelle fuer ein Videorekorder-Fernbedienungsgeraet

Fig.1 zeigt das prinzipielle Funktionsblockschaltbild des erfindungsgemaessen Fernbedienungsgeraetes. Ein Steuerwerk 1, das als Mikroprozessorsystem ausgefuehrt ist, setzt die vom Benutzer vorgenommenen Betaetigungen der Bedienungselemente 2 in entsprechende schaltungs- oder programmtechnische Anweisungen an den Steuercode-Generator 3 um. Dieser generiert daraufhin Fernsteuersignale, welche ueber eine Infrarot-Sendediode 4 an das zu steuernde Geraet ausgesendet werden und dort diejenige Funktion ausloesen, die dem vom Benutzer betaetigten Bedienungselement am Fernbedienungsgeraet zugeordnet war. Eine Besonderheit des Steuercode-Generators ist seine Eigenschaft, auf jede Anweisung des Steuerwerkes hin verschiedene Fernsteuersignale erzeugen zu koennen, die an verschiedenen Geraeten einer vorbestimmten Geraetegruppe die der betaetigten Fernbedienungstaste zugeordnete Funktion ausloesen koennen.

Die Information, welche spezielle Codevorschrift jeweils zur Generierung eines Fernsteuersignales zu verwenden ist, erhaelt der Steuercode-Generator 3 von der

Code-Auswahlschaltung 5. Diese waehlt aus der Speichertabelle 6, in der alle moeglichen Steuersignale nach den vorbestimmten Geraeten gegliedert enthalten sind, jeweils nur eine Spalte mit den Steuersignalen fuer ein bestimmtes Geraet zur Verfuegung. Eine die Code-Auswahlschaltung steuernde Code-Bestimmungsschaltung 7 ermittelt und gibt dann vor, welches Geraet der vorbestimmten Gruppe jeweils anzusprechen und damit auch, welche Spalte der Code-Speichertabelle jeweils zur Erzeugung der Fernsteuersignale heranzuziehen ist.

Die Code-Bestimmungsschaltung 7 liefert nur dann eine die Codeauswahl durch die Schaltungsteile 5 und 6 aendernde Information, wenn aus spezieller Tastenbetaetigung nach den Anspruechen 6, 7 und 8 eine Phase der Inbetriebnahme des Fernbedienungsgeraetes mit einem speziellen zu steuernden Geraet oder mit einem anderen als vorher anzunehmen ist. In einer solchen Inbetriebnahmephase veranlasst die Code-Bestimmungsschaltung 7, dass bei Betaetigung eines Bedienungselementes nacheinander verschiedene gespeicherte Codes probiert werden, d.h. dass dem zu steuernden Geraet Steuersignale verschiedener Geraete aus der vorbestimmten Gruppe angeboten werden. Dieser Vorgang wird zunaechst mit einem zufaellig aus allen moeglichen Steuersignalen ausgewaehlten Signal begonnen und spaeter bei anderen Tastenbetaetigungen ggfs. so wiederholt, dass zielgerichtet nur noch Steuersignale aus einer Untermenge aller moeglichen Signale ausprobiert werden. Die Inbetriebnahmephase endet automatisch dann, wenn die Untermenge der auszuprobierenden Steuercodes nur noch aus einem Code besteht, d.h. der Fernsteuercode des zu steuernden Geraetes zweifelsfrei und vollstaendig in der Menge der gespeicherten Codes identifiziert ist.

Fig.2 zeigt das logische Ablaufschema des Codebestimmungsvorganges in der Inbetriebnahmephase. Ist der Code des jeweils zu steuernden Geraetes identifiziert, so endet die Funktion der Code-Bestimmungsschaltung und damit die Inbetriebnahmephase. Nachfolgende Benutzereingaben werden dann automatisch nur noch in Steuersignales des

ermittelten Codes umgesetzt. Mit einem gegen unbeabsichtigte Betaetigung geschuetzten Bedienungselement kann der Benutzer wissentlich und willentlich die oben beschriebene Inbetriebnahmephase und den automatischen Uebergang auf einen anderen, bis auf weiteres geltenden Fernsteuercodes wieder ausloesen.

Fig.3 zeigt als Beispiel einen schematisierten Ausschnitt aus der Code-Speichertabelle. Jede Zeile spezifiziert die Steuersignale aller vorbestimmten Geraete einer Geraetegattung fuer eine bestimmte Funktion. Jede Spalte enthaelt den fuer ein bestimmtes zu steuerndes Geraet gueltigen Satz von Steuersignalen in einer geeigneten fuer den Steuercode-Generator verwendbaren Beschreibung. Wird nun am Beispiel der Fig.3 eine Inbetriebnahmephase mit Betaetigung der Taste "PLAY" begonnen, so werden automatisch nacheinander die Signale s(PLAY), g(PLAY), h(PLAY) usw. erzeugt und ueber die Infrarot-Sendediode 4 zum zu steuernden Geraet ausgesendet. Wird die in diesem Beispiel bis f(PLAY) fortzusetzende Folge von Steuerversuchen vom Benutzer nach h(PLAY) quittierend abgebrochen, so registriert die Code-Bestimmungsschaltung das Signal h(PLAY) als ein die Funktion "PLAY" am zu steuernden Geraet ausloesendes Fernsteuersignal. Danach prueft die Code-Bestimmungsschaltung die folgenden Tabelleneintraege innerhalb der Zeile aller PLAY-Signale und dann sicherheitshalber auch noch die komplette restliche Tabelle auf eventuelle Mehrdeutigkeiten des Steuersignales h(PLAY) fuer andere Geraet als nur Geraet h und auch fuer andere Funktionen anderer Geraete. Im Beispiel der Fig.3 stimmt das Signal h(PLAY) innerhalb einer vorgegebenen Fehler- bzw. Unterscheidungsgrenze ueberein mit den Signalen z(PLAY) und f(PLAY) der hier mit z und f bezeichneten Geraete eines anderen Typs bzw. eines anderen Herstellers.

Nach diesem ersten Probierschritt wird mit einer naechsten Betaetigung, hier z.B. der Taste STOP, probierend nur noch auf die Steuersignale h(STOP), z(STOP) und f(STOP) der Untermenge der 3 Geraete h, z und f zurueckgegriffen, unter deren Steuersignalen die Mehrdeutigkeit von h(PLAY) des

ersten Versuches festgestellt worden war. Probierend werden h(STOP), z(STOP) und f(STOP) dann an das zu steuernde Geraet ausgesendet. Bricht der Benutzer diesen zweiten Probiervorgang nach Aussendung von z(STOP) quittierend ab, so endet damit die Funktion der Code-Bestimmungsschaltung 7, da das quittierte Steuersignal z(STOP) mit keinem anderen in der Tabelle beschriebenen Steuersignal mehr uebereinstimmt. Das zu steuernde Geraet gilt hiermit als eindeutig zu "z" identifiziert. In der Folge werden bis zu einer bewusst vom Benutzer eingeleiteten oder automatisch wieder begonnenen Inbetriebnahmephase bei Betaetigung von Fernbedienungstasten nur noch die fuer das Geraet z in der entsprechenden Spalte der Fig. 3 spezifizierten Steuersignale verwendet.

Nachgereicht

Nummer: 33 13 493
Int. Cl.³: H 04 Q 9/08
Anmeldetag: 14. April 1983
Offenlegungstag: 18. Oktober 1984

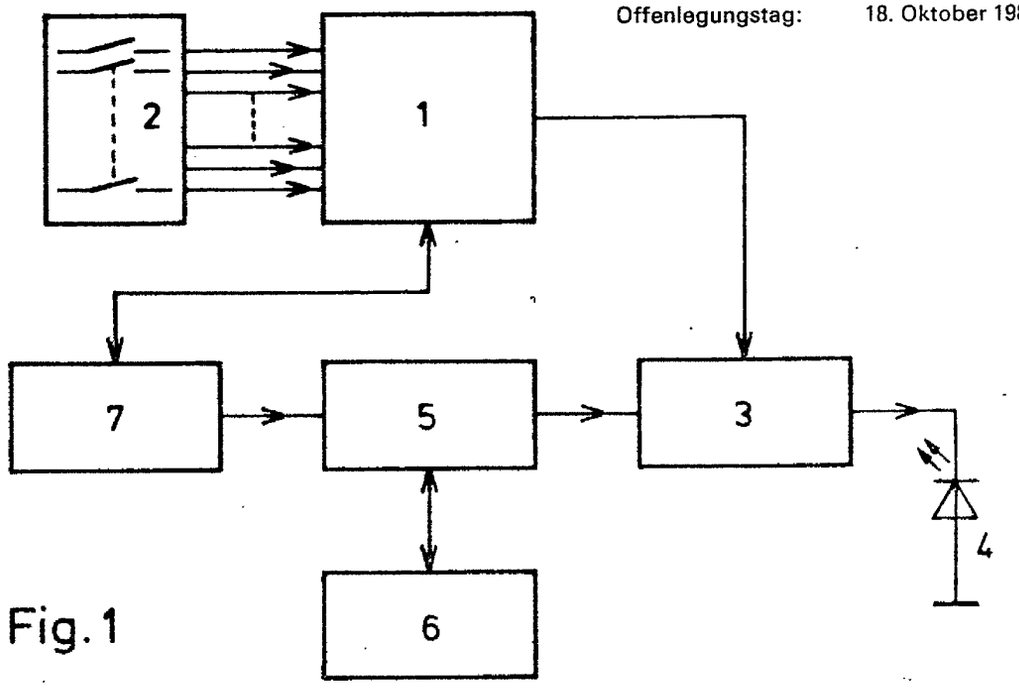


Fig. 1

Gerät / Funktion	s	g	h	z	f
Play	s(PLAY)	g(PLAY)	h(PLAY)	z(PLAY) =h(PLAY)	f(PLAY) =h(PLAY)
Rec	s(REC)	g(REC)	h(REC)	z(REC)	f(REC)
Stop	s(STOP)	g(STOP)	h(STOP)	z(STOP)	f(STOP)
Rew	s(REW)	g(REW)	h(REW)	z(REW)	f(REW)

Fig. 3

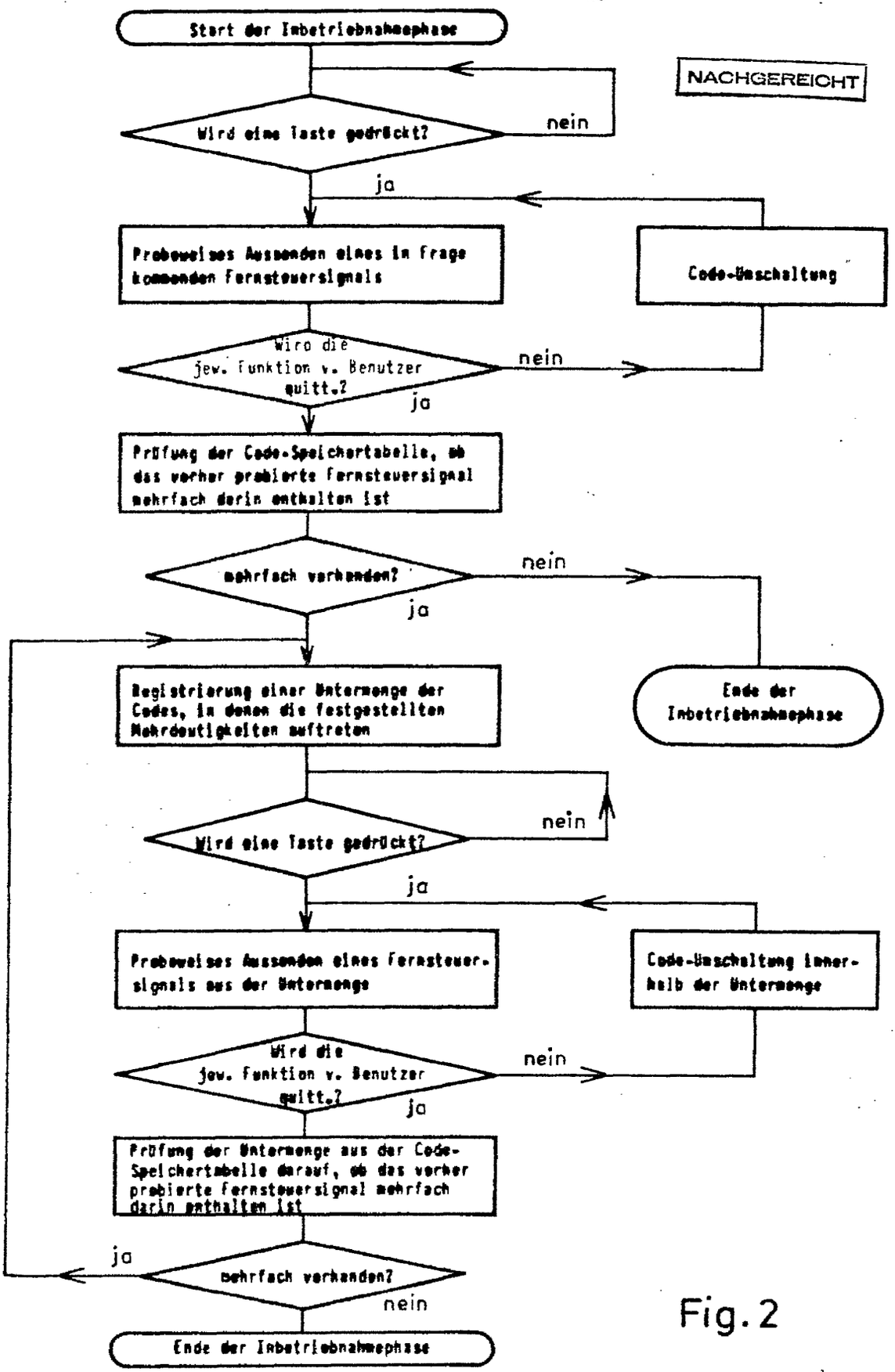


Fig. 2

COPY

PATENT SPECIFICATION (11) 1 487 784

1 487 784

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(44) Complete Specification published 5 Oct. 1977
(51) INT CL² G08B 1/00
(52) Index at acceptance
G4F 10X8 11 14

(72) Inventors GERALD OFFLEY CROWTHER
TERENCE ALAN DOUGLAS
HOWARD MALCOLM FARMER

(19)

(54) ULTRASONIC REMOTE CONTROL SYSTEMS

(71) We, MULLARD LIMITED, of Abacus House, 33, Gutter Lane, London, E.C.2., a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to ultrasonic remote control systems including a transmitter and a receiver, particularly for electronic apparatus such as a television.

In a known ultrasonic remote control system a number of different frequencies are generated in a transmitter held by an operator, a respective frequency being used to perform a different operation on, for example, the television set. With this known system, however, the frequencies have to be produced within fairly close limits in order to be certain of detection at the receiver and this necessitates the use of a number of frequency selective devices to receive the different frequencies. This known system is in practice therefore limited to the provision of a comparatively small number of different operations.

It is an object of the present invention to produce an ultrasonic remote control system which does not have the above limitation.

According to the present invention there is provided an ultrasonic remote control system including a transmitter and a receiver; in which the transmitter is adapted to transmit, in response to the selection of one of a plurality of remote control functions, ultrasonic signals corresponding to a sequence of four binary coded words, the first word being a start word common to all the remote control functions, the second word being an n-bit message word (where n is a predetermined number greater than 1) particular to the selected remote control function, and the third and fourth words being the complements of the start and message words respectively; and in which the receiver is adapted to be reset by an interruption in the receipt of ultrasonic signals corresponding to immediately successive binary bits and is adapted so that, after being reset, when ultrasonic signals are next received which correspond to an uninterrupted sequence of bits, said sequence of bits consisting of a start word followed by n bits followed by a complement start word followed by the complement of the n bits, then a remote control function is enabled corresponding to the message word constituted by the n bits following the start word.

The particular coding of the ultrasonic signals used in the system according to the invention has two main advantages. Firstly, the binary coding is efficient in the number of different codes available for a given number of bits in the message word. Secondly, the use of a comparatively large number of bits in the four word sequence and the use of complementing gives a high probability that the receiver will not give an incorrect response i.e. enable a remote control function other than the one selected if, when a user initially selects a particular remote control function, the appropriate code is incorrectly sent from the transmitter or is degraded in the transmission path to the receiver by e.g. reflections of the ultrasonic signals.

According to a preferred feature of the invention there is provided a system as described in the penultimate paragraph, in which the transmitter is adapted to transmit, in response to the continued selection of a particular remote control function, ultrasonic signals corresponding to immediately successive binary bits which form repeated sequences, each sequence consisting of said four binary coded words, and in which the receiver is adapted so that once a particular remote control function has been enabled, it is then disabled by the receiver being reset or otherwise only by the receipt of ultrasonic signals which correspond to an uninterrupted sequence of bits consisting of a start word followed by n bits followed by a complement start word followed by a further n-bits, which further n bits are not the complement message word corresponding to the particular remote control function which has been enabled.

The above preferred feature of the invention ensures that once a selected remote con-

trol function has been enabled at the receiver, then it is unlikely to be disabled or changed by degradation of the code in the transmission path while the same remote control function is continuously selected at the transmitter.

According to a further preferred feature of the invention the ultrasonic signals transmitted corresponding to a 0 binary bit and a 1 binary bit are two different ratios, within a predetermined bit period, of the duration of a tone burst to silence. As will become apparent later, this feature has the advantage that the system is not adversely affected by small variations from specified clock frequencies used in the transmitter and the receiver.

An embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings in which:—

Figure 1 shows a basic block diagram of an ultrasonic remote control system according to the invention,

Figure 2 shows the transmission code used in the system of Figure 1 and the modulation of ultrasonic signals according to that code,

Figure 3 shows a more detailed block diagram of the transmitter coder of the system of Figure 1,

Figure 4 shows waveforms used in the code of Figure 3,

Figure 5 shows a more detailed block diagram of the receiver decoder of the system of Figure 1,

Figure 6 shows a more detailed block diagram of the bit detector which forms part of the decoder of Figure 5, and

Figure 7 shows a more detailed block diagram of the monitoring unit which forms part of the decoder of Figure 5.

Referring now to Figure 1, there is shown in block diagrammatic form the basic ultrasonic remote control system. The transmitter consists of a function selection unit F, a control coding circuit C and a transmitter oscillator circuit OSC together with an output ultrasonic transducer TX which generates ultrasonic waves continuously, except when it is inhibited by an electrical signal from the control circuit C. The receiver consists of an ultrasonic transducer, TR, an amplifier and detector circuit A, a decoder D and an interface circuit IF. The outputs of the decoder D are converted by the interface circuit IF into signals which are used to control the required functions. In a television set, for example, these functions may include on/off, TV channel selection, colour, brilliance and volume control.

When used in connection with a television set the transmitter is in the form of a small box which can be held in a persons hand. At one end of the box the ultrasonic transducer is mounted and on the box a set of push buttons or other suitable control contacts are mounted. To change the volume and/or any of the other controls on the television set the ultrasonic transducer would be pointed towards the television set and the appropriate button on the transmitter depressed. For a simple channel change the button would be depressed for a short time only, but for a volume or brilliance change the appropriate button would be depressed until the required level of volume or brilliance had been attained.

Referring now to Figure 2, Figure 2(a) shows a selection of a remote control function X for a time t1 followed after an interval of time t2 by the selection of a different remote control function Y for a time t3. Figure 2(b) shows that in the time t1 a code, CODE X, which takes a time t4 to be transmitted, is initially transmitted, then immediately repeated in complete form, and then repeated again but not completed. In the time t3 a different code, CODE Y, which also takes the time t4 to be transmitted, is initially transmitted, then immediately repeated three times in complete form, and then repeated again but not completed. Figure 2(c) shows that code X consists of a sequence of four words, the first word being a start word SW common to all the remote control functions, the second word being a message word MWX particular to the remote control function X, and the third and fourth words being the complements of the start and message words, CSW and CMWX, respectively. Figure 2(d) shows that the four words SW, MWX, CSW and CMWX are each five-bit binary coded words. Figure 2(e) shows the code, CODE X, represented as a waveform containing, within a constant bit period, a short pulse for binary bit 0 and a long pulse for binary bit 1. The complete waveform shown in Figure 2(e) is the output of the coding control circuit C of the transmitter shown in Figure 1 for each time period t4 while the remote control function X is selected by the function selection unit F. Figure 2(f) shows the waveform of Figure 2(e) converted by the oscillator OSC and the ultrasonic output transducer TX into a sequence of short and long tone bursts of ultrasonic energy.

In the embodiment of Figure 1, which will be described in more detail below with reference to Figures 3 to 7, the time t4 is 160 milliseconds and contains 20 bit periods which are each 8 milliseconds duration. A short pulse for a binary bit of 0 has a duration of one sixth of the bit period, i.e. 1.33 milliseconds, and a long pulse for a binary bit of 1 has a duration of four sixths of the bit period, i.e. 5.33 milliseconds. The oscillator circuit OSC drives the output transducer TX at a frequency of approxi-

mately 40 kHz. The velocity of ultrasound in air is approximately 300 metres per second and so a range of 5 metres between the transmitter and receiver will impose a delay of less than 20 milliseconds. The reaction time for the whole system is less than 200 milliseconds and is thus substantially instantaneous for the human user of the system.

Referring now to Figures 3 and 4, there is shown a circuit and waveforms respectively of the coding control circuit C of the transmitter shown in Figure 1. A general description will first be given as follows.

Timing control means in the coding control circuit includes a clock pulse source CL1; a÷6 circuit DR1, a÷5 circuit DR2, and two÷2 circuits DR3 and DR4. The clock CL1 produces a square pulse waveform A of period 1.33 milliseconds, which period will hereinafter be referred to as x. Circuit DR1 produces six pulse waveforms B, C, D, E, F and G each having a pulse width x and period $6x$. Circuit DR2 is fed from waveform G and produces five pulse waveforms H, J, K, L and M each having a pulse width $6x$ and period $30x$. Circuit DR3 is fed from waveform M and produces a square pulse waveform N of period $60x$, and circuit DR4 is fed from waveform N and produces a square pulse waveform U of period $120x$. Gating circuits not shown are used to derive further pulse waveforms P=C.H.N, Q=D.H, R=A.D, S=A.E and T=A.B.

A message encoder provides in response to the operation by the user of the function selection means F shown in Figure 1, a five bit binary coded message word appropriate to the selected remote control function. This message encoder consists of a cross-point matrix MX whose condition is rendered unique to the selected remote control function in response to the operation of the function selection means F, a buffer unit BU1, a six-stage parallel-to-serial input shift register SR1, a five stage counter CR1 and a counter control circuit CRC.

The cross-point matrix MX consists of five columns to which the waveforms H. J. K. L and M are fed respectively, and six rows which lead via the buffer BU1 to the six stages respectively of the input shift register SR1. Each cross-point (except one, for a reason which will be explained later) is provided with a pair of contacts, and the function selection means is arranged (by means not shown) so that for the time during which a particular one out of twenty nine possible remote control functions is selected one pair of contacts in the matrix MX corresponding to that function is closed. The timing control is arranged to shift the condition of each cross-point of the matrix MX in turn through the register SR1 and to count the counter CR1 until the counter CR1 contains a message word corresponding to the selected function and is stopped.

The time taken to put a message word in the counter CR1 is a maximum of $30x$.

A data selector gating circuit DSEL enables a five-stage parallel-to-serial output shift register SR2 to be loaded via a buffer BU2 with either a message word from the counter CR1 or a fixed five bit binary coded start word contained in the circuit DSEL. A modulator circuit MOD is controlled from the output of the output shift register SR2 and is also controlled by a true/complement selector TCS.

In response to continued operation of the function selection means F, the timing control continuously shifts the output shift register SR2 and controls the data selector DSEL and the true-complement selector TCS so that the modulator circuit MOD provides a waveform corresponding to immediately successive binary bits which form a repetitive sequence of four words, the first word of each sequence being the start word, the second word being the appropriate message word, and the third and fourth words being the complements of the start and message words respectively.

Each sequence is output during a time of $120x$, i.e. $30x$ for each word. An example of a waveform for one such sequence was shown in Figure 2(e).

A more detailed description of Figures 3 and 4 will now be given.

When the user first selects a remote control function, the closure one of the pairs of contacts in the matrix MX switches power on to the transmitter and produces a pulse X which presets the circuit DR1 to C and clears B, D, E, F and G, presets the circuit DR2 to H and clears J. K. L and M, presets the circuit DR3 to N and presets the circuit DR4 to U. A pulse P=C.H.N clears the last stage of the shift register SR1 to 0 and enables the counter control circuit CRC to clear the counter CR1 to 00000.

During the time zero to $30x$ following the pulse P, the start word 000101 is output from the modulator MOD as follows. The condition N makes the start word available from the data selector circuit DSEL to the buffer unit BU2. The pulse Q=D.H. then parallel loads the five-stage output shift register SR2 with the start word, and the pulse waveform R=A.D. which has a pulse width $x/2$ and a period $6x$ shifts the start word from the register SR2 to the modulator circuit MOD during the period $30x$. The modulator circuit MOD is a gating circuit which is set by a pulse R at the beginning of each bit period of $6x$ and then is reset either by a pulse S=A.E after a time x to give a short pulse from the output OP corresponding to a binary bit 0 or by a

pulse T=A.B after a time 4x to give a long pulse from the output OP corresponding to a binary bit 1. The pulse S or T is gated for each bit according to the output of the shift register SR2 and the output of the true/complement selector TCS. The waveform U ensures that during the first 30x the true start word is output from the modulator circuit MOD.

During the time zero to 30x following the pulse P, while the start word is being output from the modulator circuit MOD, the message word is put into the counter CR1 as follows. The pulses of the waveform D load the 6-stage input shift register SR1 at intervals of 6x, and the entire contents of the shift register SR1 is shifted by the clock pulse waveform A into the counter control circuit CRC during each period of 6x. During each pulse D a pulse from one of the waveforms H, J, K, L and M will be applied to a respective one of the five columns of the matrix MX. If none of the pairs of contacts in a column of the matrix MX is closed when a pulse from the respective waveform H, J, K, L or M is applied to that column, then the pulse D occurring during that pulse will load five zeros, 00000, into the shift register SR1. According to which one of the pairs of contacts of the matrix MX is closed corresponding to a particular selected function, then a 1 will be loaded into the stage of the shift register SR1 corresponding to the row of matrix MX containing that closed contact pair by a pulse D when a pulse from the respective waveform H, J, K, L or M is applied to the column containing that closed contact pair. When that 1 is shifted from the register SR1 to the counter control circuit CRC the clock pulse waveform A is inhibited from counting the counter CR1 and the counter CR1 is stopped. The counter CR1 then contains a five bit binary coded message word corresponding to the selected function. If the contact pair on row 1 of column H is closed, the first bit shifted from the register SR1 is a 1, the counter CR1 is prevented from starting and the message word is 00000. If, for example the contact pair of row 5 on column J is closed, then the eleventh count of the counter CR1 is inhibited and the message word is 01010. No pair of contacts is present on row 3 of column M because this would give a message word which is reserved for the complement start word, i.e. 11010. The data selector gating circuit DSEL is arranged so that when the counter CR1 has a message word which is that reserved for the start word it is changed to the word 11111 which is a word not produced from the matrix MX.

During the time 30x to 60x following the pulse P, the message word in the counter CR1 is output from the modulator MOD as follows. The condition $\overline{N}$ makes the message word in the counter CR1 available via the circuit DSEL to the buffer unit BU2. The pulse Q=D.H. then parallel loads the shift register SR2 with the message word and the pulse waveform R=A.D. shifts the message word from the register SR2 to the modulator MOD. The waveform U ensures that during the time 30x to 60x the true message word is output from the modulator circuit MOD.

At the time 60x after the first pulse P, the next pulse P is produced which clears the last stage of the shift register SR1 to 0 and enables the counter control circuit CRC to clear the counter CR1 to 00000.

During the time 60x to 120x the same conditions apply as during the time zero to 60x except that the condition $\overline{U}$ complements the output of the modulator circuit. Thus during the time 60x to 90x, the complement start word 11010 is output from the modulator MOD. Also, the same message word as was put into the counter CR1 during the time zero to 30x is again put into the counter CR1 during the time 60x to 90x. This assumes that the same remote control function is being selected, which is a safe assumption since it is within human reaction time and so the user will be waiting to see the result of his selection. During the time 90x to 120x the complement message word is output from the modulator MOD.

So long as the user continues to select the same remote control function the process will continue, repeating the same sequence of four words every 120x. When a remote control function is no longer selected the shift register SR1 will not have a 1 loaded into it from any of the five columns of the matrix MX. The counter CR1 will as a result count up to 31, i.e. 11111, and on this count will give a signal PW which switches off the transmitter. It will be noted that if two remote control functions are simultaneously selected by the user then the one which closes that pair of contacts in the matrix MX which first loads a 1 into the shift register SR1 will take precedence and the other one will be ineffective.

Possible variations in the coding control circuit just described with reference to Figures 3 and 4 include the following. The message word encoder described above including the matrix MX, the input shift register SR1 and the counter CR1 is considered advantageous particularly since the matrix enables thirty functions to be selected using only five inputs and six outputs. However it would be possible to have a message word encoder which instead consisted of a large number of gates to decode the func-

tion and encode the appropriate message word, and a store to hold the encoded message word. As described above the true complement selector TCS is arranged to co-operate with the modulator circuit MOD. It could be arranged elsewhere, for example to co-operate with the data selector circuit DSEL.

In Figure 5 there is shown a block circuit diagram of the decoder D which forms part of the receiver in the system of Figure 1. The input IP in Figure 5 will be a waveform of short and long pulses, for example as shown in Figure 2(e), which has been produced by the amplifier and detector circuit A of the receiver shown in Figure 1 from a sequence of short and long tone bursts of ultrasonic energy, for example as shown in Figure 2(f), received from the transmitter shown in Figure 1.

Referring now to Figure 5, a bit discriminator BD produces, from the input wave-form IP, 0 and 1 binary bits suitable for input to a five-stage, serial-to-parallel converter shift register SR3 which is clocked by the input waveform IP. An output of the bit discriminator BD is also fed to an interrupt detector circuit ID which provides an output responsive to an interruption in the detection of immediately successive binary bits by the bit discriminator BD. The bit discriminator BD and the interrupt detector ID will be described later in more detail with reference to Figure 6. The contents of the shift register SR3 are continuously applied to a monitoring unit MON, are continuously applied to a comparator unit COM, and are transferred into a store MEM by an output signal TR from the monitoring unit MON. The contents of the shift register SR3 are continuously compared with the contents of the store MEM in the comparator unit COM. The result of the comparison is applied by the comparator COM to the D input of a bistable circuit BS1, and when the contents of the shift register SR3 are the complement of the contents of the store MEM a 0 is applied to the D input. The D input is transferred to the outputs of the bistable circuit BS1 when an output from the monitoring unit MON is applied to the clock input CK of the bistable circuit BS1, and if a 0 is so transferred than the $\overline{Q}$ output of the circuit BS1 becomes 1 and the Q output becomes 0. The $\overline{Q}$ output of the bistable circuit BS1 enables the contents of the store MEM to provide a remote control function if it is a 1 and disables the contents of the store from providing a remote control function if it is a 0. The Q output of the bistable circuit BS1 is applied to the monitoring unit MON from providing or enables it to provide an output signal TR according to whether that Q output is a 0 or a 1 respectively.

The monitoring unit MON, which will be described in more detail later with reference to Figure 7, is clocked by the input waveform IP. It is also adapted to recognise either a start word or a complement start word in the input shift register SR3, i.e. it can be set to recognise one or the other at a time. The output of the interrupt detector ID is connected to the monitoring unit MON and to an input PR of the bistable circuit BS1. An output from the interrupt detector ID in response to an interruption in the detection of immediately successive binary bits by the bit discriminator BD will set the monitoring unit MON to recognise a start word, and will provide a 0 on the $\overline{Q}$ output (disable remote control function) and a 1 on the Q output (enable output signal TR) of the bistable circuit BS1. The result of the above arrangement is that the monitoring unit MON will provide an output signal TR in response to the recognition of a start word which has followed an interrupt output from the interrupt detector ID and which is followed by the detection of five binary bits in the input waveform IP, and the monitoring unit MON will provide a signal to the clock input CK of the bistable circuit BS1 in response to the recognition of a start word followed by the detection of five bits followed by the recognition of a complement start word followed by the detection of a further five bits.

Thus the receiver is adapted to be reset by an interruption in the receipt of ultrasonic signals corresponding to immedately successive binary bits and is adapted so that, after being reset, when ultrasonic signals are next received which correspond to an uninterrupted sequence of bits, said sequence of bits consisting of a start word followed by five bits followed by a complement start word followed by the complement of five bits, then a remote control function is enabled corresponding to the message word constituted by the five bits following the start word.

Furthermore, the receiver is thus adapted so that once a particular remote control function has been enabled, it is then disabled by the receiver being reset or otherwise only by the receipt of ultrasonic signals which correspond to an uninterrupted sequence of bits consisting of a start word followed by five bits followed by a complement start word followed by a further five bits, which further five bits are not the complement message word corresponding to the particular remote control function which has been enabled.

The bit discriminator BD of the decoding circuit shown in Figure 5 is shown in more

detail in the block circuit diagram of Figure 6. Referring now to Figure 6, an up/down counter CR2 counts in response to pulses applied to its clock input CK from a clock CL2. In the case where the bit period of the input waveform IP is a nominal 8 milliseconds, a 4 kHz clock CL2 and a six-stage binary counter CR2 would be adequate.

However, if an 8 bit binary counter is used, bit periods much greater than 8 ms can be accommodated. These longer bit periods may be desirable in conditions of severe reflections.

The input waveform is applied to a clear input CL and to the up and the down inputs UD of the counter CR2 such that the counter CR2 responds to the beginning of a waveform pulse, i.e. a positive edge as shown in Figure 6, to commence counting up from clear condition and responds to the end of a waveform pulse, i.e. a negative edge as shown in Figure 6, to commence counting down. A bistable circuit BS2 responds to the end of a waveform pulse i.e., a negative edge of the input waveform IP supplied to its clock input CK to enable either a 1 or a 0 bit to be fed into the input shift register SR3 at the beginning of the next waveform pulse according to whether or not the counter CR2 has counted down to the clear condition before the beginning of the next waveform pulse i.e. the next positive edge of the input waveform IP. That is to say that the negative edge at the end of each waveform pulse will clock a permanent '1' on a D input of the bistable circuit BS2 through to the Q output which is fed to the input shift register SR3. If the input waveform is a short pulse corresponding to a 0 then the counter CR2 will count down to the clear condition before the beginning of the next input waveform pulse. In this case, an AND gate G1 responds to the clear condition of the counter CR2 and the low condition of the input waveform IP to apply a 0 to the clear input of the bistable circuit BS1, and this 0 is transferred to the Q output of the bistable circuit BS1 overriding the 1 which was clocked through from the D input. If the input waveform is a long pulse corresponding to a 1 then the counter CR2 will not count down to the clear condition before the beginning of the next input waveform pulse, and in this case the 1 which was clocked through from the D input will not be overridden. The particular realisation of the bit discriminator BD described above is not essential but it will be appreciated that with it the system will not be adversely affected by small variations from specified clock frequencies used in the transmitter and the receiver.

The sequence of events, in CR2, with a continuous bit stream is as follows; clear, count up, count down, perhaps pass once through clear (which event can be called 'Down Zero'), clear, count up, count down, etc. The number of times 'Down Zero' occurs between each clear is thus either nought or one. Two or more 'Down Zeroes' occur only if the reception of bits has ceased, that is a long period of count down. The interrupt detector ID, which is a count 2 counter, gives an output in response to two consecutive 'Down Zeroes'.

The monitoring unit MON which forms part of the decoding circuit shown in Figure 5 is shown in greater detail in the block schematic diagram of Figure 7. Referring now to Figure 7, a start word detector SW and a complement start word detector CSW are connected to the input shift register SR3. A latching circuit CCL gives an output from its set output S in response to an output from the interupt detector ID corresponding to an interruption in the detection of immediately successive bits or in response to the detection of a complement start word by the complement start word detector CSW. The latching circuit CCL gives an output from its reset output R in response to the detection of a start word by the start word detector SW. A divide-by-twenty counter CR3 is clocked by the input waveform IP. A decoding circuit includes a decoder DEC which decodes count of five, ten and fifteen from the counter CR3 and an AND gate G2. The counter CR3 is stopped and preset to all 1's in response to an output from the interrupt detector ID, corresponding to an interruption in the detection of immediately successive bits, applied to the preset input PR. The counter CR3 is cleared to all 0's and enabled to start counting by a signal applied to its clear input CL from an AND gate G3 in response to the latching circuit CCL being in its set condition and the detection of a start word from the start word detector SW. The decoder DEC decodes a count of five from the counter CR3 to give the output signal TR, unless a 0 is present on the Q output of the bistable circuit BS1 in which case the output signal TR is inhibited. The decoder DEC decodes a count of ten to give an output signal which is applied to an inhibit input of an AND gate G4 whose output is connected to the preset input PR of the counter CR3. The counter CR3 will be stopped and preset to all 1's by a decode ten output from the decoder DEC unless the latching circuit CCL is in its reset condition and a complement start word is detected by the complement start word detector CSW. The decoder DEC also decodes a count of fifteen to give an output signal to the AND gate G2. The AND gate G2 provides an output signal to the clock input of the bistable circuit BS1 if the decoder decodes fifteen and the latching circuit is in its set condition. The counter

CR3 is also arranged to be stopped and preset to all 1's when it has counted to twenty.

Referring now to both Figures 5 and 7 their operation may now be summarised as follows.

An interruption in the detection of immediately successive bits in the input waveform IP will give an output from the interrupt detector ID which is applied to the preset input PR of the bistable circuit BS1 to give a disable output, is applied to the preset input PR of the counter CR3 to stop the counter and preset it to all 1's and is applied to the latching circuit CCL to set it. The counter CR3 is then cleared to all 0's and starts counting when a start word is detected by the start word detector SW. Since there is a 1 on the Q output of the bistable circuit BS1, the signal TR is applied, after the detection of five further bits, to the store MEM so that those five further bits (a message word) are transferred from the input shift register SR3 to the store MEM. If when a further five bits have been detected these further five bits are detected as a complement start word by the complement start word detector CSW then the counter CR3 continues counting. If a complement start word is recognised by the complement start word detector at any time other than ten bits after the detection of a start word the counter CR3 would be stopped and preset. If a further five bits are detected then the AND gate G2 provides a signal to the clock input CK of the bistable BS1, and if at that time the comparator COM gives a 0 signal to the D input of the bistable circuit BS1, indicating that the contents of the shift register SR3 are the complement of the contents of the store MEM, then a 1 on the $\overline{Q}$ output of the bistable circuit BS1 enables the contents of the store MEM to perform a remote control function.

Thus after an interruption in the sequence of detected bits, only a correct sequence of twenty bits will enable a remote control function. That is to say the receiver will not give an incorrect response i.e. enable a remote control function other than the one selected if, when a user initially selects a particular remote control function, the appropriate code is incorrectly sent from the transmitter or is degraded in the transmission path to the receiver by e.g. reflections of the ultrasonic signals.

Once a particular remote control function has been enabled, then it will be disabled only by an interruption in the sequence of detected bits or by the receipt of a start word followed by five bits followed by a complement start word followed by five bits which are not the complement of the five bits in the store MEM. In the latter case a signal will be applied by the gate G2 of the monitoring unit MON to the clock input CK of the bistable circuit BS1, but a 1 will be applied to the D input of the bistable circuit BS1 by the comparator COM and so a 0 will appear on the $\overline{Q}$ output of the bistable circuit BS1 to disable the remote control function. Thus the receiver ensures that once a selected remote control function has been enabled, then it is unlikely to be disabled or changed by degradation of the code in the transmsision path while that same remote control function is continuously selected at the transmitter.

A five bit message word which is enabled will be decoded in the interface circuit IF of Figure 1 to perform the corresponding remote control function. In a television set some of the message words could be used for TV channel selection by using the most significant bit of the five bit message word to denote either TV channel selection as such or some other function. If TV channel selection is denoted then the other four bits of the message word can denote the particular TV channel and can be used, for example, to first select a predetermined TV channel and to preset a counter to a respective value, so that the number of counts to the counter from that respective value to a predetermined value will then determine the number of TV channels which are stepped through so that the desired TV channel is reached. If the most significant bit of the five bit message word denotes a function other than TV channel selection, then the other four bits of the message word will be decoded to determine that particular function e.g. whether a change in colour, volume or brilliance is required and whether that change is to be up or down. The decoded four bits can enable a selected counter to count up or down under the control of a slow clock. The value held in the selected counter can be continuously compared with the value of another counter which is under the control of a fast clock. This other counter can set and reset a bistable circuit when its value reaches a predetermined value and the value in the selected counter respectively, thus giving a pulse waveform output whose mark-to-space value depends on the value in the selected counter. This pulse waveform is integrated with a capacitor to provide a current in a control circuit whose value depends on the mark-to-space ratio. The value in the slowly clocked counter for each function can be preset to a mean value which determines a 1:1 mark-to-space ratio of the resulting pulse waveform and hence a mean current value when that function is not selected and the counter is not actually slowly clocked. When that function is selected then the respective counter will be slowly clocked

up or down hence slowly changing the mark-to-space ratio of the pulse waveform from the respective bistable circuit up or down for so long as that function is selected until a desired value is reached.

Some further possible variations in the system described above with reference to Figures 1 to 7 will now be mentioned. In this system the start word has the same number of binary bits as the message word. This is convenient for realisation of the system, but it is not an essential feature of the invention. Furthermore, in this system the ultrasonic signals corresponding to a 0 binary bit and a 1 binary bit are two ratios of the duration of a tone burst to silence. This realisation has the advantages which have been mentioned but is not essential to the invention. Any other ultrasonic signals which will distinguish a 0 binary bit from a 1 binary bit could also be used.

WHAT WE CLAIM IS:—

1. An ultrasonic remote control system including a transmitter and a receiver; in which the transmitter is adapted to transmit, in response to the selection of one of a plurality of remote control functions, ultrasonic signals corresponding to a sequence of four binary coded words, the first word being a start word common to all the remote control functions, the second word being an n-bit message word where n is a predetermined number greater than 1 particular to the selected remote control function, and the third and fourth words being the complements of the start and message words respectively; and in which the receiver is adapted to be reset by an interruption in the receipt of ultrasonic signals corresponding to immediately successive binary bits and is adapted so that, after being reset, when ultrasonic signals are next received which correspond to an uninterrupted sequence of bits, said sequence of bits consisting of a start word followed by n bits followed by a complement start word followed by the complement of the n bits, then a remote control function is enabled corresponding to the message word constituted by the n bits following the start word.

2. A system as claimed in Claim 1, in which the transmitter is adapted to transmit, in response to the continued selection of a particular remote control function, ultrasonic signals corresponding to immediately successive binary bits which form repeated sequences, each sequence consisting of said four binary coded words, and in which the receiver is adapted so that once a particular remote control function has been enabled, it is then disabled by the receiver being reset or otherwise only by the receipt of ultrasonic signals which correspond to an uninterrupted sequence of bits consisting of a start word followed by n bits followed by a complement start word followed by a further n-bits, which further n bits are not the complement message word corresponding to the particular remote control function which has been enabled.

3. A system as claimed in Claim 2, in which the start word contains n bits.

4. A system as claimed in Claim 3, in which the ultrasonic signals transmitted corresponding to a 0 binary bit and a 1 binary bit are two different duration ratios of ultrasonic signal tone burst to silence within a predetermined bit period.

5. A transmitter suitable for use in the system of any one of Claims 3 to 4, including function selection means, a message encoder which, in response to operation of the function selection means provides an n-bit binary coded message word appropriate to the selected function, a parallel-to-serial output shift register, a data selector which enables the output shift register to be loaded with either a message word or a fixed n-bit binary coded start word, an ultrasonic generator, means for controlling the ultrasonic generator from the output of the output shift register, a true-complement selector, and timing control means which, in response to continued operation of the function selection means, continuously shifts the output shift register and controls the data selector and the true-complement selector so that the generator transmits ultrasonic signals corresponding to immediately successive binary bits which form a repetitive sequence of four words, the first word of each sequence being the start word, the second word being the appropriate message word, and the third and fourth words being the complements of the start and message words respectively.

6. A transmitter as claimed in Claim 5, in which the message encoder includes a cross-point matrix whose condition is rendered unique to a selected remote control function in response to operation of the function selection means, a parallel-to-serial input shift register and an n-stage binary counter, and in which the timing control means is arranged to shift the condition of each cross-point of the matrix in turn through the input shift register and count the counter until the counter contains a message word corresponding to the selected function and is stopped.

7. A receiver suitable for use in the system of any one of Claims 3 to 4, including an ultrasonic receiver, a bit detector adapted to detect binary bits corresponding to received ultrasonic signals, an interrupt detector responsive to an interruption in the detection of immediately successive bits by the bit detector, a serial-to-parallel n-stage input shift register into which the detected bits are fed, a monitoring unit, said monitoring unit

being adapted to recognize either a start word or a complement start word in the input shift register, being settable by an output from the interrupt detector to recognize a start word, being adapted to provide a first output signal in response to the recognition of a start word which has followed an output from the interrupt detector and which is followed by the detection of n bits, and being adapted to provide a second output signal in response to the recognition of a start word followed by the detection of n bits followed by the recognition of a complement start word followed by the detection of a further n bits, an n-bit store into which the contents of the input shift register are transferred in response to said first output signal from the monitoring unit, a comparator adapted to compare the contents of the input shift register and the store, and a bistable circuit, said bistable circuit having an output arranged to enable or disable a remote control function corresponding to the contents of the store, having a first input arranged to provide a disable output from the bistable circuit in response to an output from the interrupted detector, having a second input to which said second output signal from the monitoring unit is applied as a clock signal, and having a third input connected to an output of the comparator such that the condition of the comparator is transferred by said clock signal to the output of the bistable circuit as a corresponding enable or disable output.

8. A receiver as claimed in Claim 7 for use in the system claimed in Claim 4, in which the bit detector includes means adapted to derive from the received ultrasonic signals a waveform of short pulses corresponding to a first type of binary bit and long pulses corresponding to a second type of binary bit, an up/down counter which counts in response to pulses from a clock, said up/down counter being responsive to the beginning of a waveform pulse to commence counting up from clear condition and being responsive to the end of a waveform pulse to commence counting down, and means responsive to the end of a waveform pulse to enable either a first type or a second type binary bit to be fed into the input shift register at the beginning of the next waveform pulse according to whether or not the counter has counted down to the clear condition before the beginning of the next waveform pulse.

9. A receiver as claimed in Claim 7 or Claim 8, in which the monitoring unit includes a start word detector and a complement start word detector connected to the input shift register, a latching circuit, said latching circuit being set in response to an interruption in the detection of immediately successive bits by the bit detector or being set by the complement start word detector, and being reset by the start word detector, a divide-by-$4n$ counter, said counter being clocked by the input pulse waveform, being stopped in response to an interruption in the detection of immediately successive bits by the bit detector, and being cleared and enabled to count in response to a set output from the latching circuit and the detection of a start word, and a decoding circuit, which decoding circuit decodes a count of n in the counter to give said first output signal but which is inhibited by an enable output from the bistable circuit, which decoding circuit also decodes a count of $2n$ in the counter to give an output signal which is arranged to stop the counter unless a complement start word is simultaneously detected, and which decoding circuit also decodes a count of $3n$ in the counter to give said second output signal but which is inhibited if the latching circuit is not set.

10. An ultrasonic remote control system substantially as described herein with reference to and as shown in the accompanying drawings.

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Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

1487784 COMPLETE SPECIFICATION
5 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 1

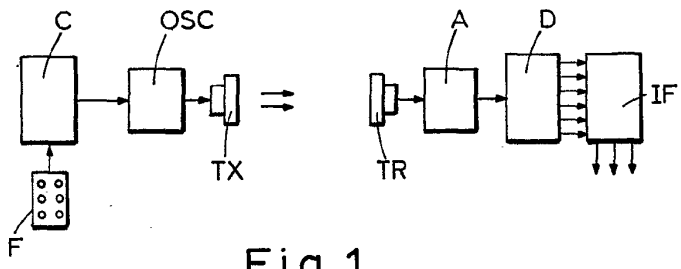

Fig.1.

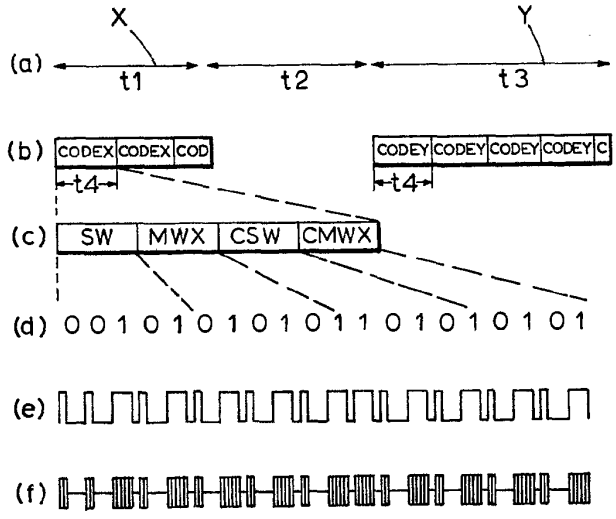

Fig.2.

1487784 COMPLETE SPECIFICATION
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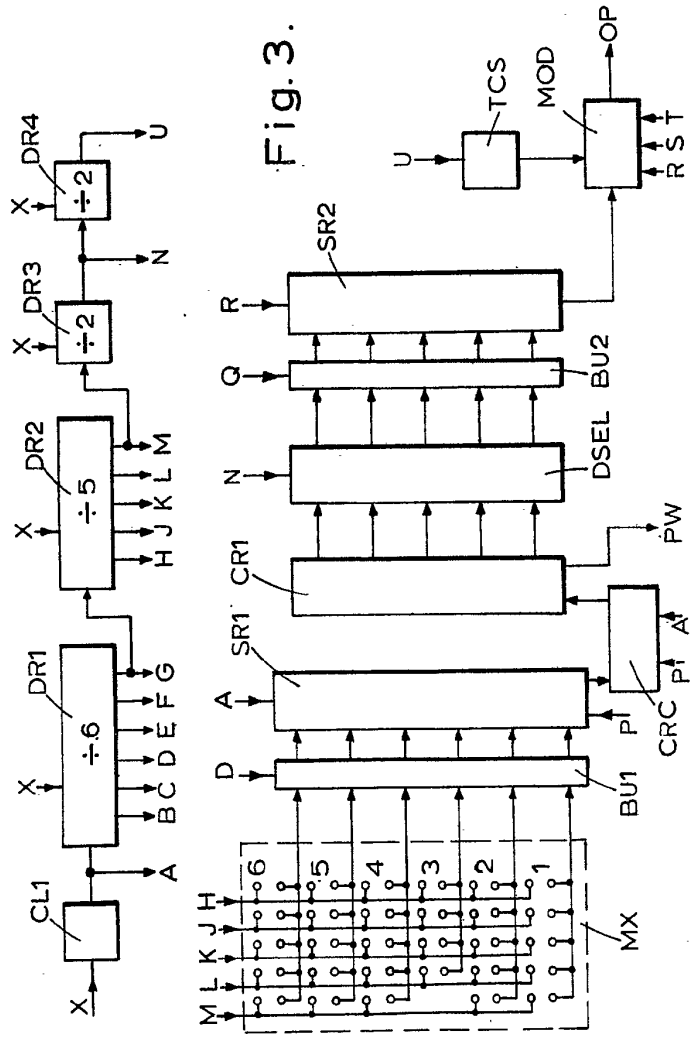
Sheet 2

Fig. 3.



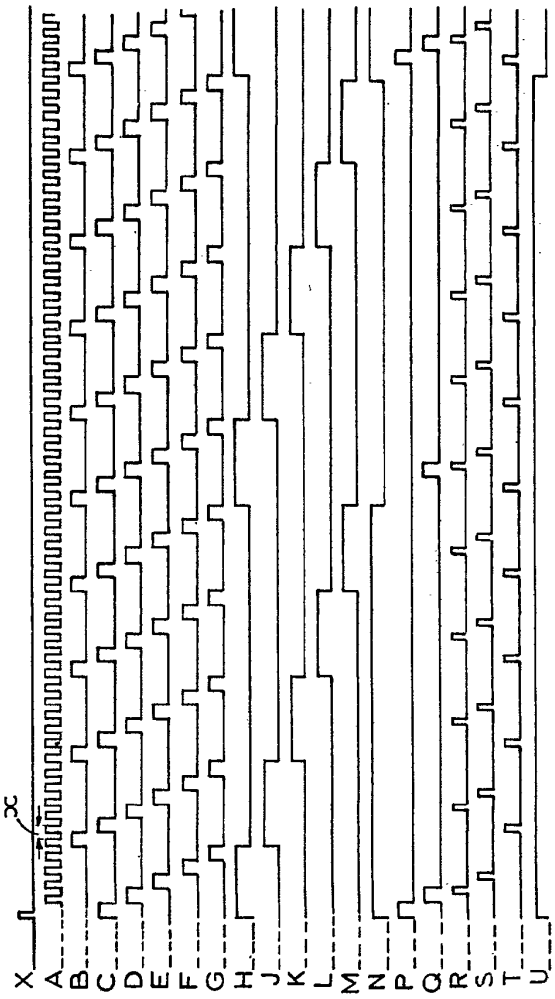


Fig. 4.

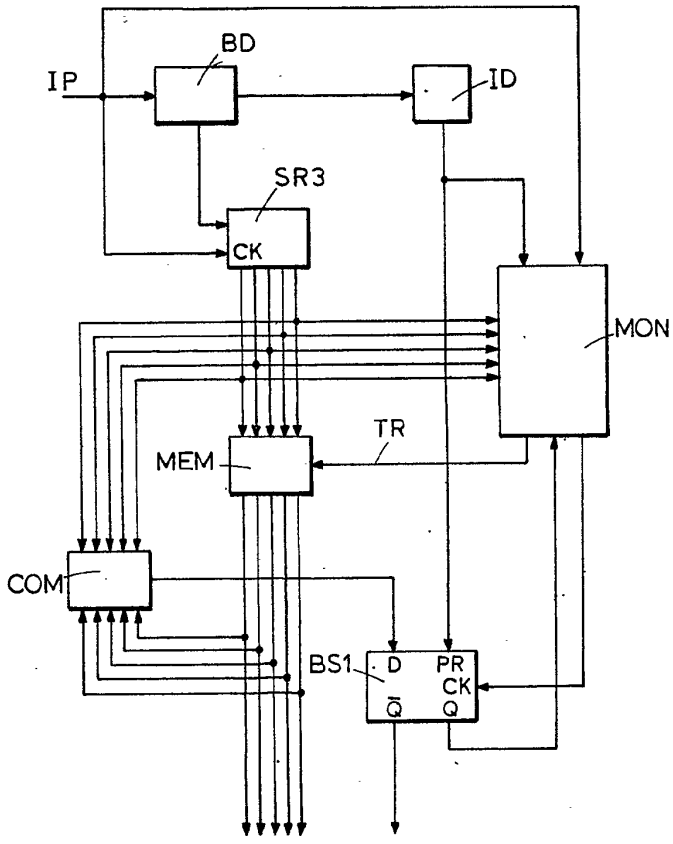


Fig.5.

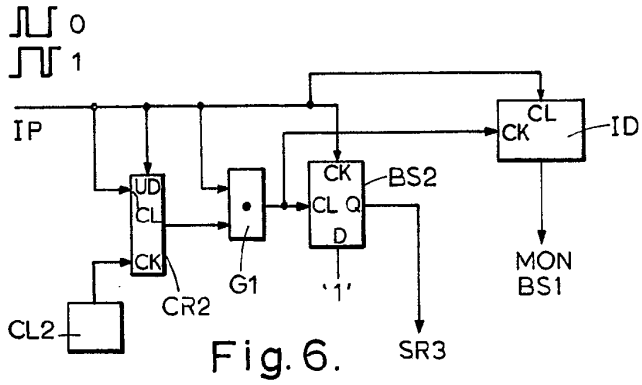


Fig. 6.

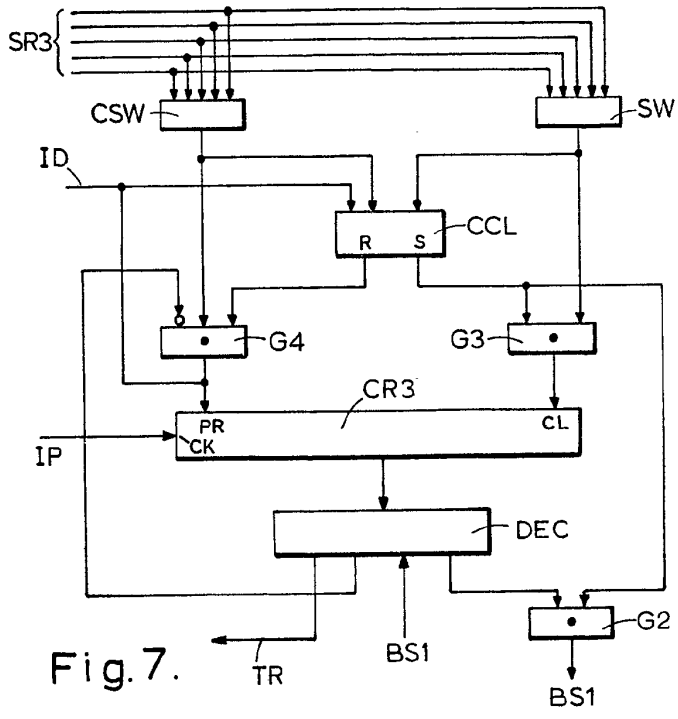


Fig. 7.

This application was originally filed on 21 Sept 1978 at the European Patent Office (EPO) under application number 78100948, and published on 27 June 1979 by the EPO under serial number 0002434 in the German language. The application has been converted to a UK application under section 81(1)(a) of the Patents Act 1977. The text of the application is contained in the publication made by the EPO as above identified, the accompanying text being an English translation thereof.

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(32) 30 Sept 1977
14 Dec 1977
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23/00//G06F 3/02
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RCE
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6R4X CD
(56) Documents cited by EPO
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"Seite 3, abschnitt "Erläuterung der erfindung", abbildung
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INT CL H03J 1/18 G08C 23/00 G06F 3/02
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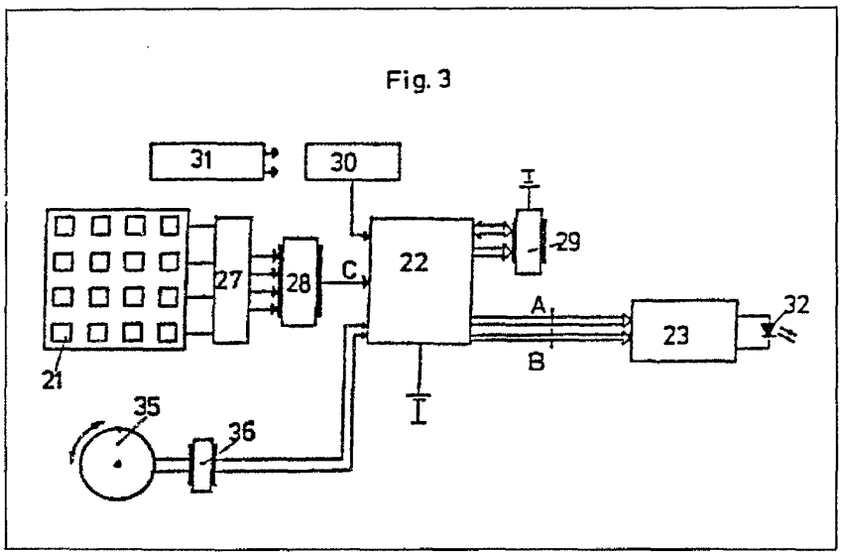
(54) Remote control for the controlling, switching on and switching over of variable and fixed equipment functions and functional magnitudes in telecommunications equipments.

(57) In wireless and wirebound remote controls of telecommunications equipments, such as television and radio receiving equipments, the setting information signals are on the actuation of appropriate functional keys (21) transmitted through a transmitting stage (23, 32) and received in the equipment to be controlled and fed after demodulation to the functional setters. The number of functions to be driven is restricted to the number of keys (21) maximally standing at disposal.

For the purpose of the enlarged use of a remote control and to be able to control a plurality of functions with least possible keyboards, the control commands are put into a computer (22) integrated in the remote control transmitter and converted by this through recorded programs into setting information signals which are transmitted through the transmitting stage (23, 32) to the receiver. The computer (22) lets itself be programmed for different signal evaluations with the aid of program carriers (31) which can be read in.

Fig. 3



GB 2 053 539A

(12) UK Patent Application (19) GB (11) 2 126 000 A

(21) Application No **8320121**
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14 Mar 1984
(51) **INT CL³**
G09G 3/06
(52) Domestic classification
G5C HC
U1S 2196 G5C
(56) Documents cited
GBA 2083673
GB 1458342
GB 1393357
GB 1389545
(58) Field of search
G5C
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Kern House, 61/62
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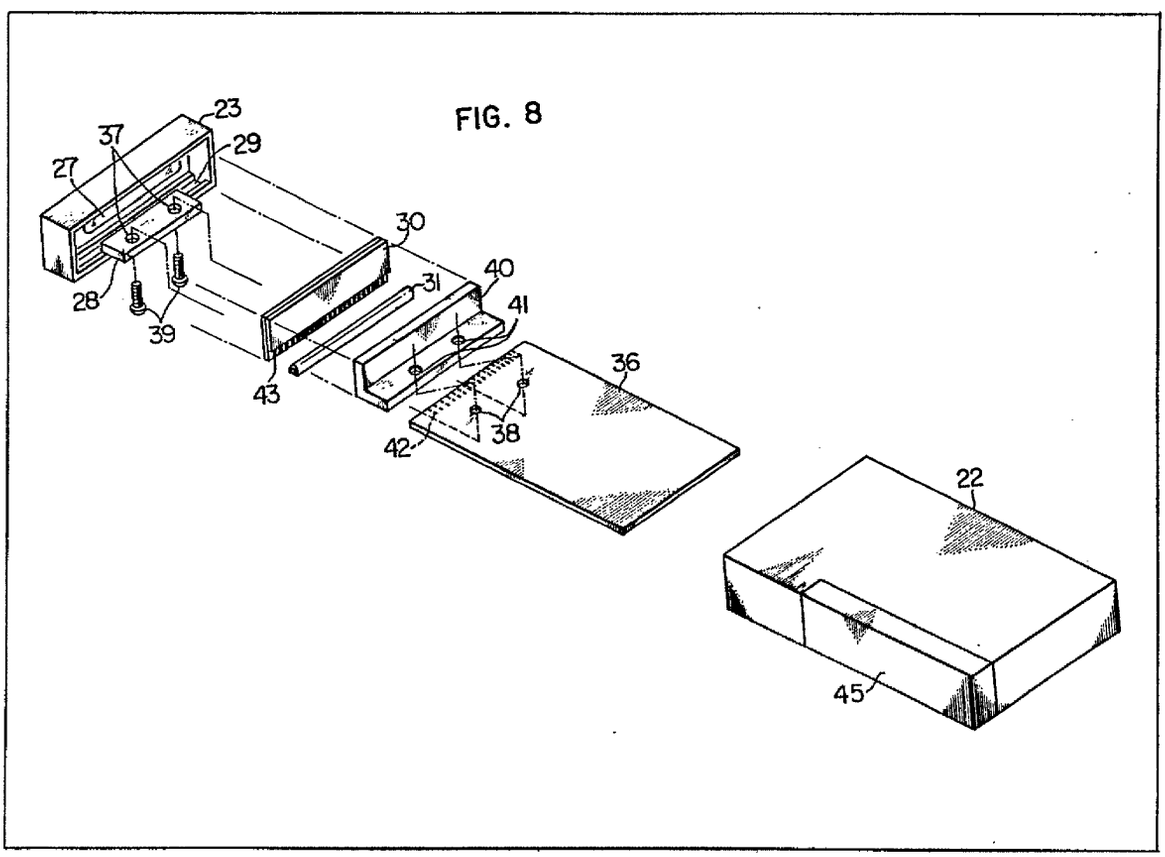
(54) A display device for portable type electrical and electric equipments

(57) A display device is used for electrical and electric equipments, and includes a casing 22, 23 for the equipments, a transparent plate 27 mounted to the casing, a display panel 30 inwardly of the transparent plate in the casing, a connector 31 received in a recess 29 formed in the casing, and a printed board 36 securedly held in the casing by means of fastening members 39, 40. The display panel is disposed adjacent the end of the printed board to extend in the direction perpendicular to the plane of the printed board. The connector serves to electrically connect the printed board to the display panel.

FIG. 8



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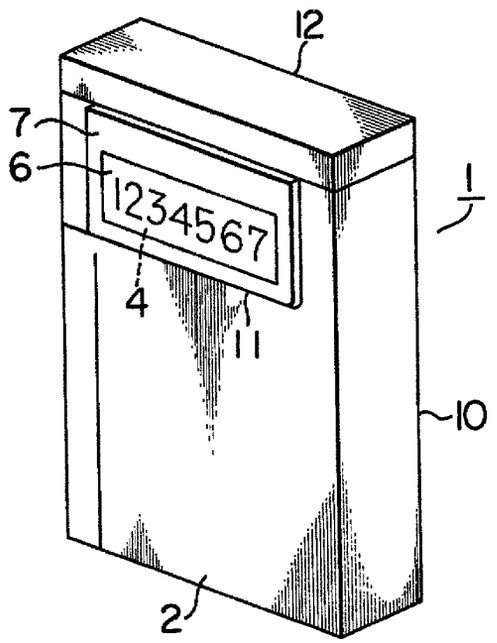
The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

FIG. 1
PRIOR ART



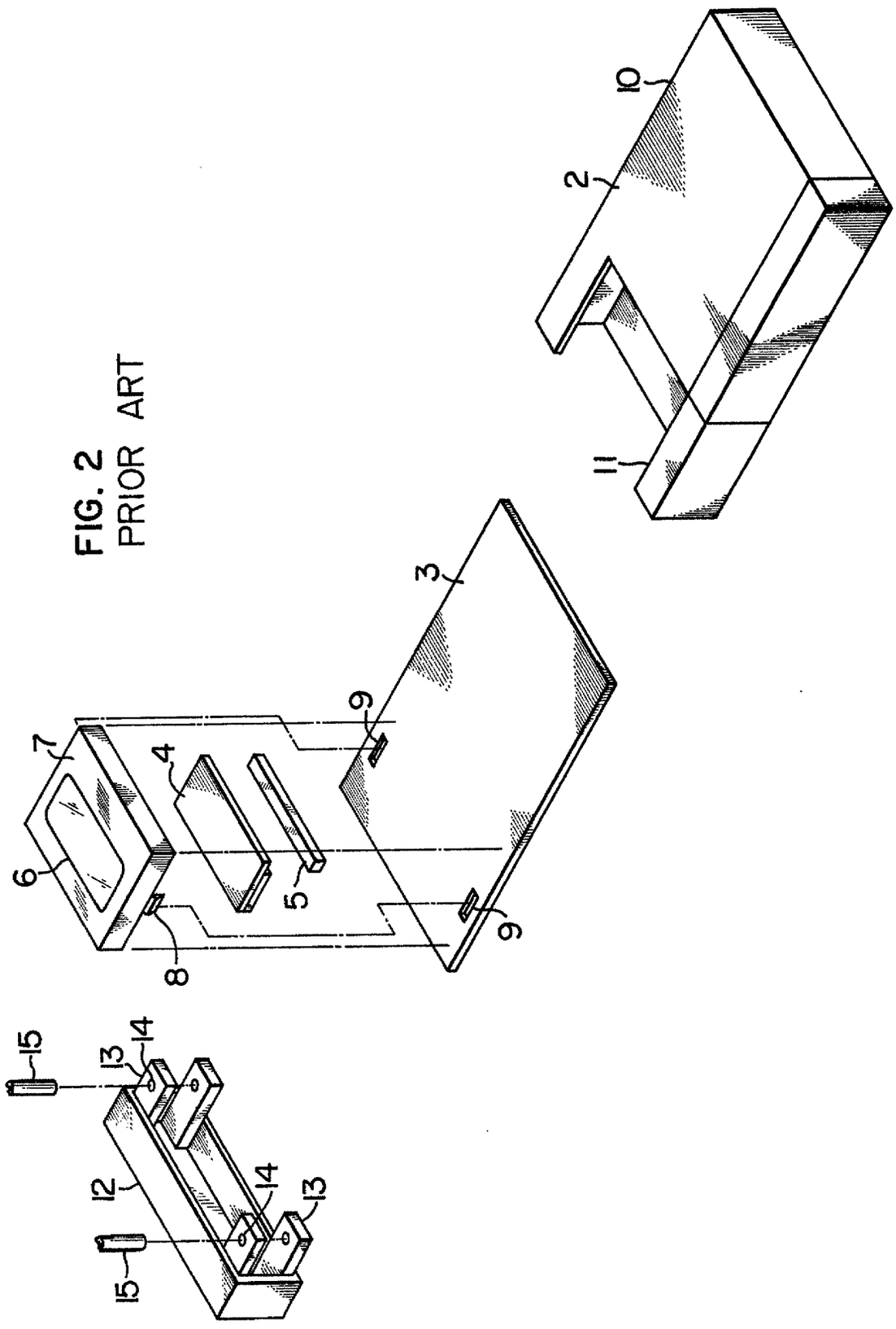


FIG. 2
PRIOR ART

FIG. 3
PRIOR ART

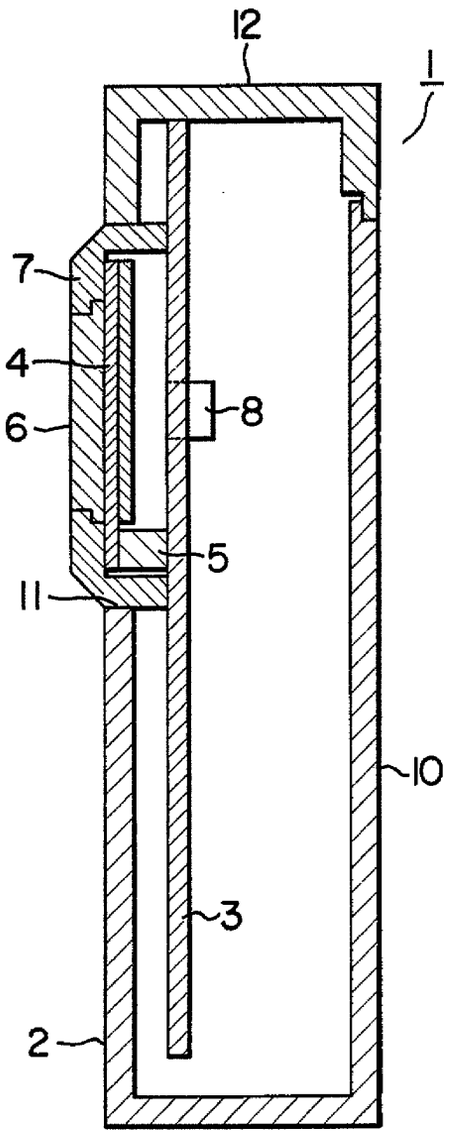


FIG. 4
PRIOR ART

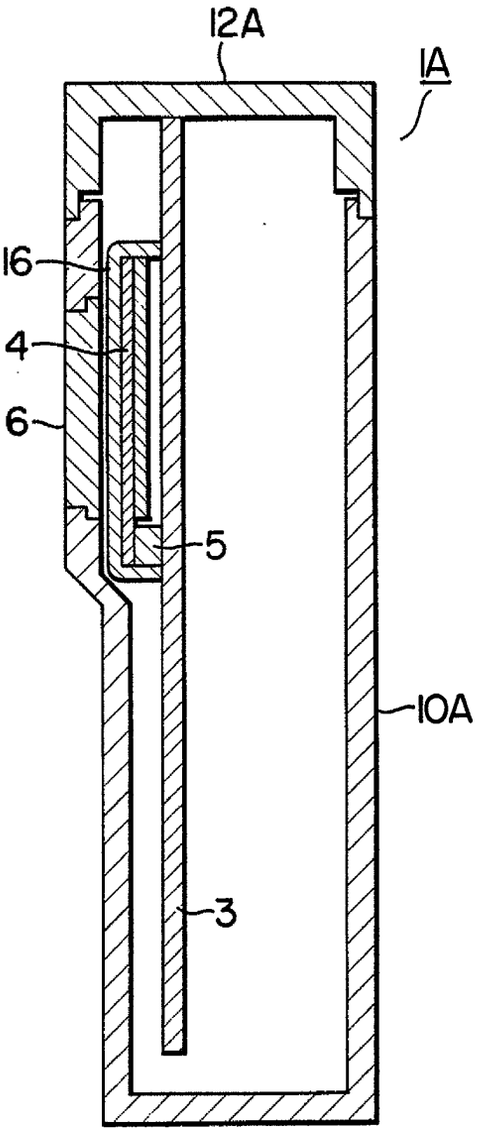


FIG. 5
PRIOR ART

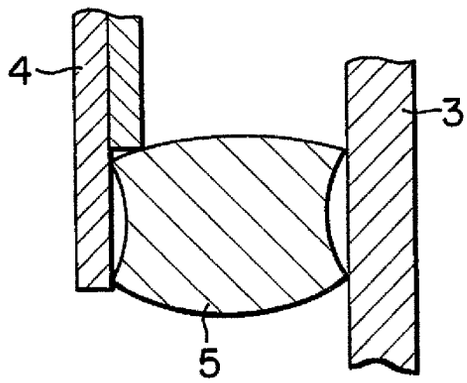


FIG. 6
PRIOR ART

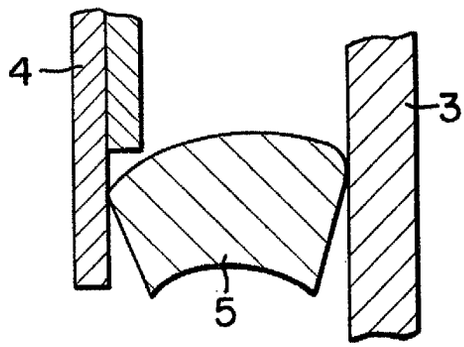
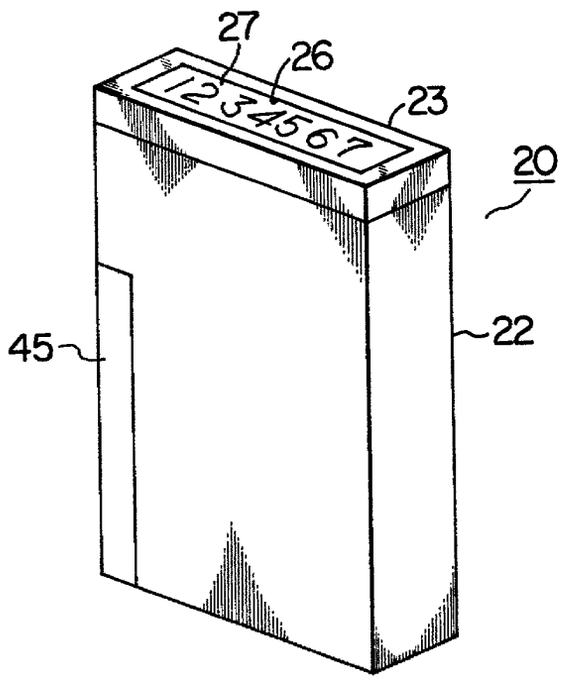


FIG. 7



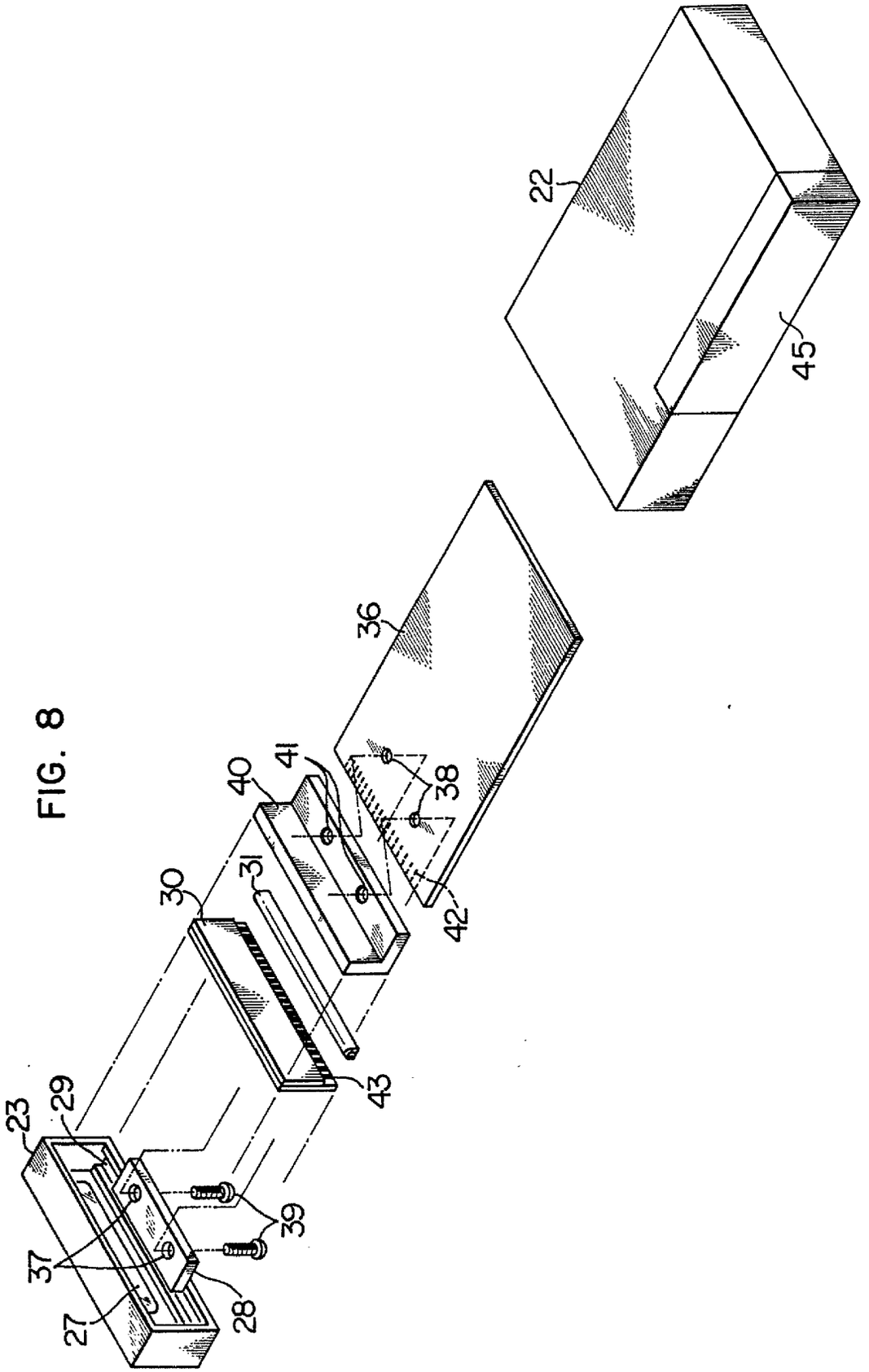


FIG. 8

FIG. 9

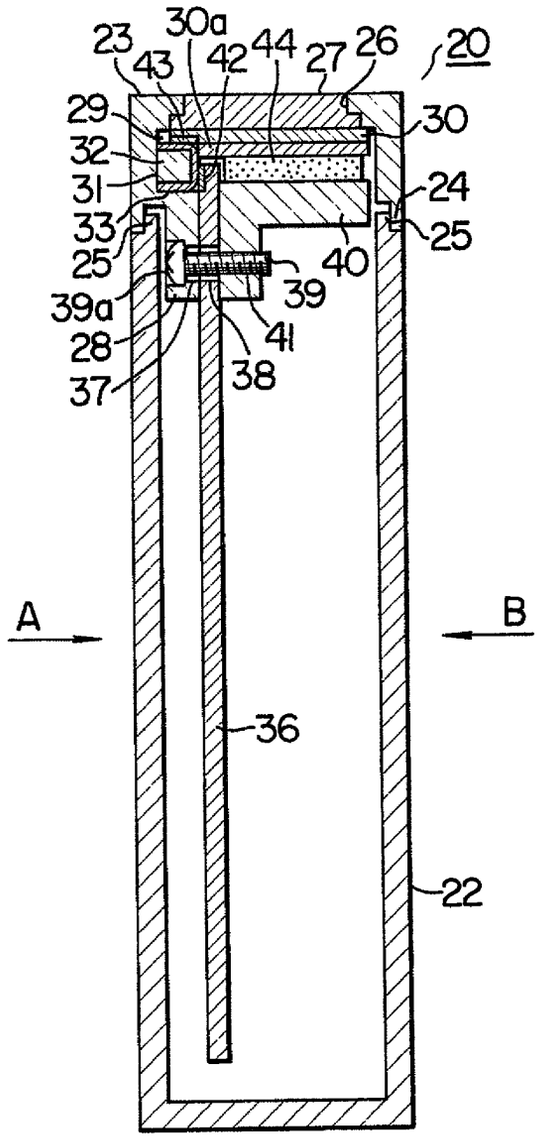
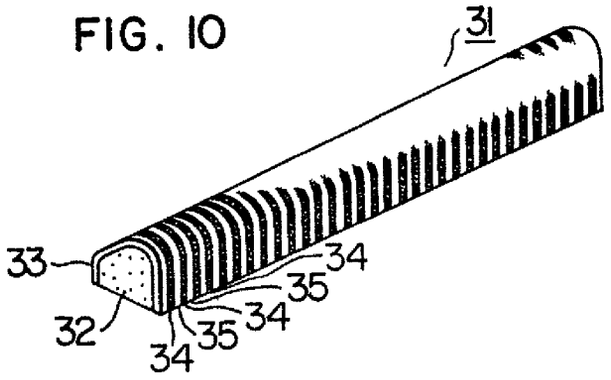


FIG. 10



SPECIFICATION

A display device for portable type electrical and electric equipments

BACKGROUND OF THE INVENTION

This invention relates to a display device for portable type electrical and electric equipment.

There have been provided electrical and electric equipments such as calling-type wireless equipment in which a phone number is displayed upon calling. In prior display devices of this type, indications such as numerals are displayed on a front side surface 2 of a casing 10, as shown in Figure 1. With an arrangement as shown in Figures 2 and 3, a display panel 4 is disposed in parallel to the front side surface 2 facing a printed board 3 which is electrically connected to the display panel 4 by means of a connector 5 or conducting wires. The display panel 4 is held stationary by inserting projections 8 of a holder 7 into apertures 9 of the printed board 3 in a snapping manner, and the printed board 3 as well as the associated parts is received in the casing 10 with the holder 7 projecting beyond a notch 11 on the front side surface of the casing 10. Thereafter, fitted in the casing 10 is a cover 12, to which the printed board 3 has been secured by inserting spring pins 15 through apertures 14 formed in leg portions 13 of the cover 12 as well as through the corresponding apertures in the printed board. The holder 7 for the display panel 6 is also provided with a transparent plate 6. Thus the display panel 4 is disposed on the front side surface of the casing in parallel to the printed board 3 which mounts thereon a control circuit and the like. As a result, when such display device is born on clothes of a user, it is difficult to read indications represented on the display panel. In addition, as the cover 12 and the holder 7, respectively, are separately fitted onto the casing 10 to provide so many fitting portions involving so many gaps, thereby presenting an undesirable, external appearance.

There have also been proposed display devices, as shown in Figure 4, in which the transparent plate 6 is mounted to a portion formed integral with the casing 10A. In this construction, so many fitting portions can be dispensed with to improve the external appearance of the display device, but the cover 12A is so large in size as to stand out clearly from the remaining portion of the display device, so that the entire display device looks large-sized although thin. In addition, the display device needs holder 16 for supporting the display panel.

In either type of display devices, a connector 5 in the form of a rectangular parallel piped for electrically connecting the printed board to the display panel is formed of a rubber-based material and is interposed between the display panel and the printed board whereupon possible deformation of the connector would make such electrical connection unstable, as shown in Figures 5 and 6. Thus control of the size and position of such connector is quite troublesome.

SUMMARY OF THE INVENTION

It is an object of the invention to provide a display device for portable type electrical and electric equipments, which device obviates the drawbacks involved in the prior display devices, in particular, in the display section thereof and in which device indications such as numerals can be displayed on a surface, for example, a top surface of a casing which is small in area.

According to the invention, electrical connection between a display panel and a printed board can be assured and the display panel can be stably held by a shock absorbing material. In addition, the display device according to the invention is hard to be influenced by pressures acting on surfaces of a casing and is hard to be charged with static electricity.

BRIEF EXPLANATION OF THE DRAWINGS

Figure 1 is a perspective view of a prior display device;

Figure 2 is an exploded, perspective view of the display device as shown in Figure 1;

Figure 3 is an elevational, sectional view of the display device as shown in Figure 1;

Figure 4 is an elevational, sectional view of another prior display device;

Figures 5 and 6 are enlarged, sectional views showing the positional relationship between a display panel, a printed board and a connector in the prior display devices as shown in Figures 1 and 4;

Figures 7 to 9 show a display device according to an embodiment of the invention, an exploded, perspective view of the display device and Figure 9 being an elevational, sectional view of the display device; and

Figure 10 is a perspective view of a connector used for the display device of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The invention relates to a display device for portable type electrical and electric equipments, said device comprising a transparent plate mounted on a casing of the equipment, a display panel supported inside of said transparent plate, a connector received in a recess formed in the casing, and a printed board fixed in the casing by means of fastening members, said display panel being disposed transversely to the surface of the printed board adjacent to the end thereof, said printed board being electrically connected to said display panel by means of said connector.

The invention will become apparent hereinbelow from the detailed explanation of an embodiment thereof with reference to the accompanying drawings.

Referring to Figures 7 to 9 of the drawings, a display device 20 includes a flatshaped casing consisting of a casing body 22 and a cover 23. As shown in Figure 9, a projection 24 circumferentially formed at the open end of the cover 23 is matingly fitted on a stepped portion 25 circumferentially formed at the top end of the casing body 22. The cover 23 is formed at its end

surface with a window 26, to which a transparent plate 27 made of a synthetic resin is mounted. The cover 23 is also formed with a leg portion 28 which is disposed inwardly of the longer side of the cover at the open end side, and a recess 29 is formed upwardly and inwardly of the leg portion 28. A display panel 30 is received inside the transparent plate 27 which has been mounted to the cover 23, and a connector 31 is received between the display panel 30 and the top surface of the leg portion 28 in the recess 29. The connector 31 comprises a rod-like core 32 and an envelope 33 having a channel-shaped section and covering the core 32, on which envelope are alternately arranged conducting sections 34 and insulating sections 35. The core 32 is formed of a resilient material having a lower hardness than that of the envelope 33. A printed board 36 is secured to the leg portion 28 of the cover 23 by means of a holder 40 and screws 39 with the upper portion of the printed board 36 held close to the inner surface of the leg portion 28 of the cover 23. In this regard, the screws 39 are inserted through apertures 37 and 38 formed in the leg portion 28 and the printed board 36, respectively, to be threaded into threaded holes 41 formed in the holder 40. With the arrangement, the display panel 30 is disposed perpendicular to the surface of the printed board 36, of which terminals 42 are electrically connected to terminals 43 of the display panel 30 via the conducting sections 34 of the connector 31. The connector 31 is compressed in the thicknesswise direction of the printed board 36 by driving the screws 39 to produce reaction forces in such direction as well as in the lengthwise direction of the printed board 36, so that the connector 31 is resiliently brought into close contact with the printed board 36 and the display panel 30 to ensure contact between the conducting sections 34 of the connector 31 and the terminals 42, 43. Such contact pressures are determined by the relationship between the volume of the recess 29 and the volume of the connector 31, and are readily adjusted as by setting appropriate values for the depth of the recess 29 and the width and height of the connector 31. A shock absorbing material 44 is adhered to the top surface of the horizontal portion of the holder 40 to support thereon the display panel 30. The shock absorbing material 44 serves to accommodate dispersions and strains involved in the manufacture of the display panel 30 and the holder 40 and to absorb shocks due to inadvertent falling of the display device. The cover 23 having mounted thereto the display panel 30, connector 31 and printed board 36 is secured to the casing body 22 by fitting the projection 24 thereof onto the stepped portion of the casing body 22. In this position, the leg portion 28 of the cover 23 and the head 39a of the screw 39 received the counter bore connected to the aperture 37 in the leg portion 28 cooperate to protect the casing body 22 against external forces acting in the direction *A*, and the vertical the surface of the holder 40 protects the casing body 22 against external forces in the direction of *B*, as shown in Figure 9. Furthermore, the screws 39 are contained in the casing body 22, so that it is possible to prevent obstacles from occurring in integrated circuits and the like due to stati electricity built up when a user touches the display device. In Figures 7 and 8, reference numeral 45 designates a cover provided as a part of the casing body 22 for the charging and removing of electric cells.

Thus, according to the invention, the display panel is arranged adjacent to the end of the printed board perpendicularly to the plane of the printed board, so that the display panel can be positioned at the surface of a relatively small area, for example, the top end surface of the casing body. This makes it possible for a user to read numerals, characters and the like on the display panel of the display device when the device is born on the user's clothes. In addition, the casing of the display device can be more flat-shaped than that as shown in the drawings since the display panel is disposed adjacent to the end of the printed board to extend in the direction transverse to the plane of the printed board. Moreover, the number of fitting portions exposed outside can be reduced to improve the external appearance.

In the above-described embodiment of the invention, the display device is constructed such that the corner portion 30a of the display panel 30 is flush with the terminals 42 of the printed board 36. However, the display panel 30 can be designed to have its corner portion 30a extend into the recess 29 in a manner that the display panel 30 and the printed board 36 are arranged to cooperatively define a T-shape in section. In such case, the corner portion 30a of the display panel 30 can be accommodated by cutting out the edge portion in the connector 31. Alternatively, the connector 31 may be designed to be hollow in section.

While the display panel is disposed on the top surface of the casing body 21 in the above embodiment, it may alternatively be disposed on the bottom surface which is also of a small area. It is to be noted here that characters in addition to numerals can be displayed on the display panel.

CLAIMS

1. A display device for electrical and electric equipment, said display device comprising a casing for the equipment, a transparent plate mounted to said casing, a display panel inwardly of said transparent plate in the casing, a connector received in a recess formed in said casing, and a printed board securedly held in said casing by means of fastening members, said display panel being disposed adjacent the end of said printed board to extend in the direction perpendicular to the plane of said printed board, said connector serving to electrically connect said printed board to said display panel.

2. A display device as set forth in claim 1 wherein said casing comprises a casing body and

a cover and wherein said transparent plate is mounted in a window formed in a face plate portion of said cover.

3. A display device as set forth in claim 2 wherein said cover is formed with a leg portion which is adapted to extend into said casing body and about which a recess is defined and wherein said fastening members comprise screws and a holder, said screws extending through apertures formed in said printed board and said leg portion of the cover, respectively, to be threaded into threaded holes of said holder, thus holding said printed board securedly and resiliently contacting said resilient connector with said display panel and said printed board.

4. A display device as set forth in claim 3 wherein said display panel is supported by a shock absorbing material which is interposed between said display panel and said holder.

5. A display device as set forth in claim 3 wherein said screws are contained within said casing.

6. A display device for electrical and electric equipments substantially as hereinbefore described with reference to Figures 7, 8, 9 and 10 of the accompanying drawings.

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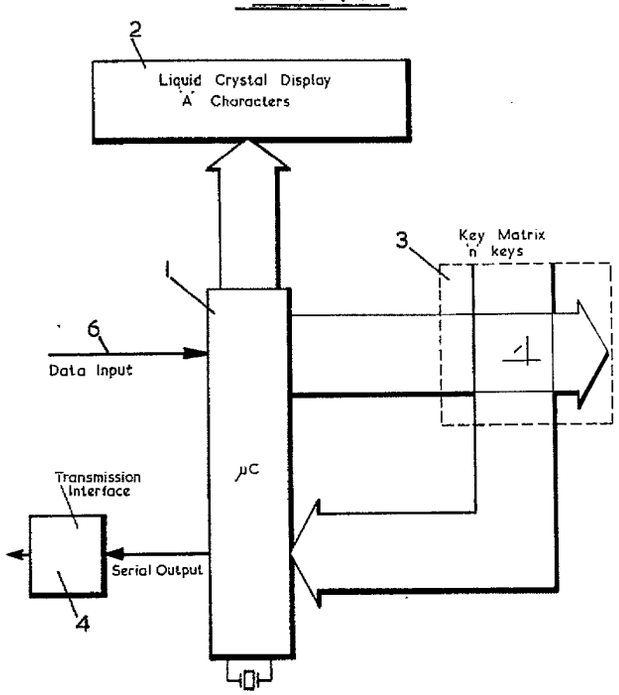
(54) Remote Control

(57) A remote control system comprising a handset which may be manipulated to transmit control signals, and at least two controlled devices each comprising a control signal detector to which the respective controlled device is responsive, each control signal detector being responsive to a different control signal format from the other detector or detectors. The handset comprises a memory in which data is stored from which control signals in each of the different formats can be generated, and a processor which is selectively controllable by manipulation of the handset to generate control signals from the stored data in any one of the different signal formats.

FIG. 1



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The drawings originally filed were informal and the print here reproduced is taken from later filed formal copies.

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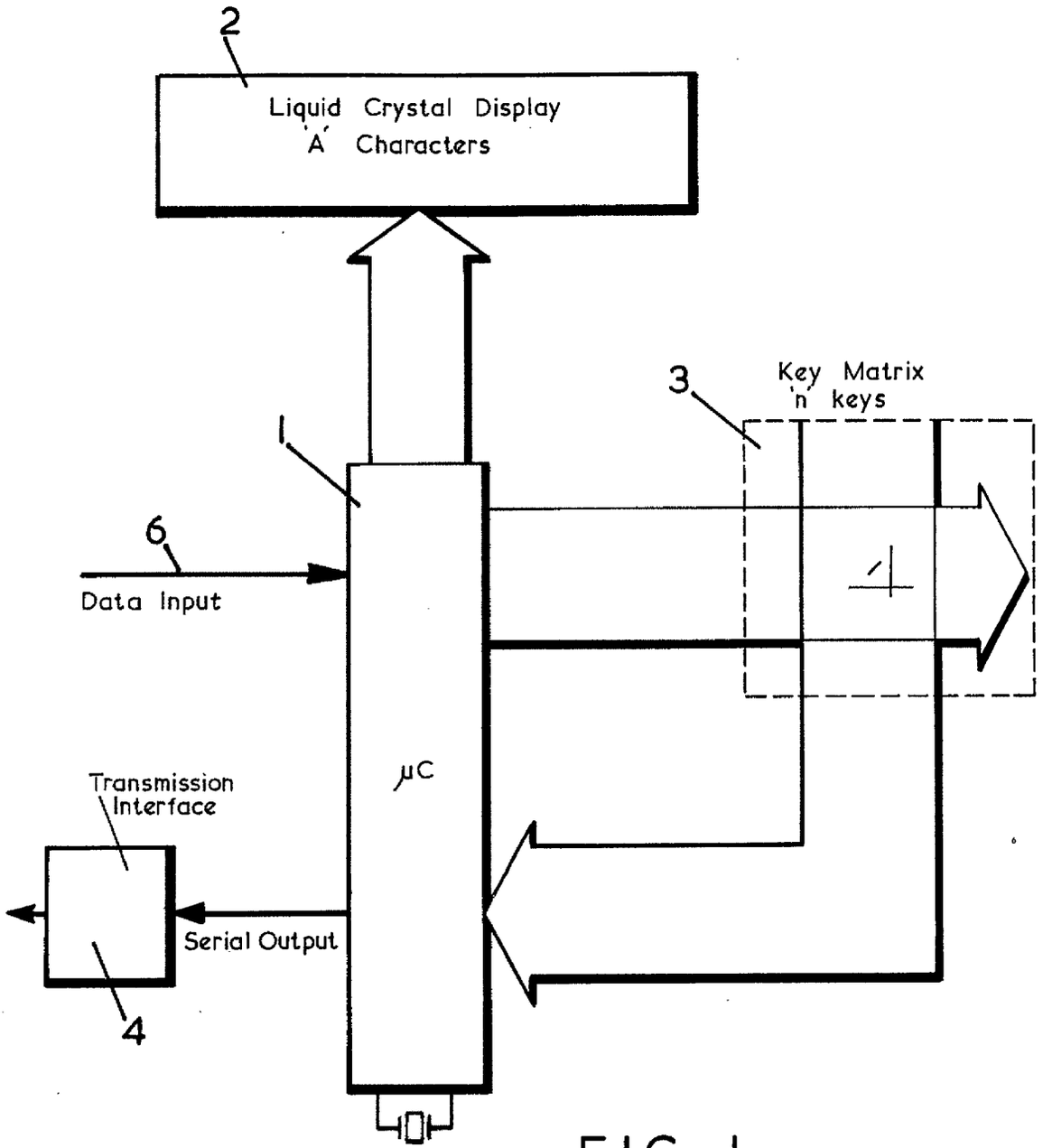

FIG. 1

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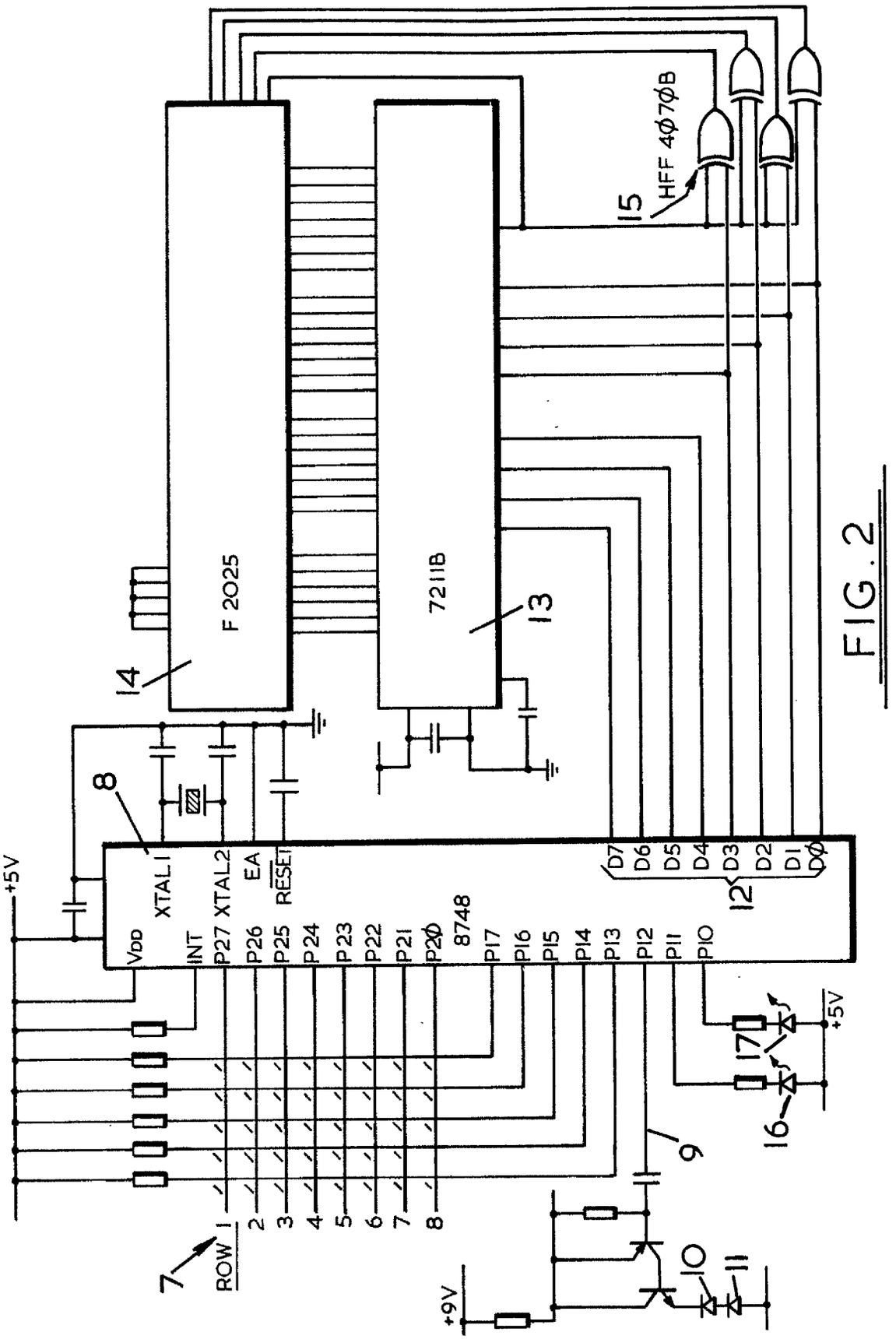

FIG. 2

SPECIFICATION

Remote Control System

The present invention relates to a remote control system.

Remote control systems are widely used for controlling for example television receivers. Generally such systems comprise a battery powered handset provided with buttons the manipulation of which energises a light emitting diode to transmit control signals to the controlled device, and a detector mounted on the controlled device to detect the control signals and control the device accordingly.

Heretofore each controlled device has a detector/handset arrangement dedicated to the control of one device, a variety of control signal formats being used by different manufacturers. As the use of remote control devices becomes more widespread, the provision of a separate handset for each item of controlled equipment becomes a problem. For example, cable television systems are now being proposed to which a subscriber can connect previously obtained receiving equipment. The selection of programmes requires control signals to which the cable system is responsive to supply selected programme signals to the receiver, whereas the control of for example the volume of a received programme requires control signals to which the receiver is responsive. This dual requirement could be met by a single complex handset specifically designed to be compatible with the system and the receiver, or by the use of two handsets. The former possibility is unacceptable because of cost considerations, particularly bearing in mind that a separate handset would be required to deal with each type of receiver (assuming a common cable system), and the latter possibility is undesirable because of the inconvenience of using two handsets to control what to the subscriber is a single item of equipment.

It is an object of the present invention to provide an improved remote control system.

According to the present invention, there is provided a remote control system comprising a handset which may be manipulated to transmit control signals, and at least two controlled devices each comprising a control signal detector to which the respective controlled device is responsive, each control signal detector being responsive to a different control signal format from the other detector or detectors, wherein the handset comprises a memory in which data is stored from which control signals in each of the different formats can be generated, and a processor which is selectively controllable by manipulation of the handset to generate control signals from the stored data in any one of the different signal formats.

The invention also provides a handset for use in the above system.

By providing a handset which can store data appropriate to a wide range of control signal formats a system can be supplied at reasonable cost that enables the control of a wide range of equipment using a single handset. After a consumers requirements have been assessed, he can be provided with a handset the characteristics of which are tailored to those requirements.

The system of the invention is thus applicable in a wide range of domestic, commercial and industrial circumstances.

An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a schematic block diagram of a control signal transmitter embodying the present invention; and

Fig. 2 is a diagram illustrating the layout of one possible circuit for implementing the arrangement of Fig. 1.

Referring to Fig. 1, a microcomputer 1 provides outputs to a liquid crystal display 2 and a keyboard matrix 3. The keyboard 3 returns data to the microcomputer 1 which provides a serial output to a transmission interface 4 driving a transmission medium such as an LED.

The microcomputer comprises a memory storing data received via input 6. The stored data enables the computer to assemble control signals having a format appropriate to devices to be controlled and provides logical functions to ease the operation of the device from a user viewpoint.

Assuming the device is to control a television receiver and to control the supply of television signals to the receiver from a cable system it will comprise a series of numbered keys, depression of which selects a given channel and a series of keys which control functions of the receiver. When the keys are depressed to select a particular channel, the selected channel number is displayed and control signals are transmitted in a format appropriate to control of the cable system, the format being determined by stored data. Likewise, if the keys are depressed to select a particular control function of the receiver, a different format of control signal is generated in accordance with a different portion of the stored data. By storing appropriate format data in the microcomputer, a wide range of different devices can be remotely controlled using a single keypad.

Referring now to Fig. 2, a keypad matrix 7 may be manipulated by the user to supply predetermined sets of instructions to an 8748 processor 8, the keypad being scanned by the processor at a rate determined by processor software. A serial output appropriate to the key or keys that have been depressed is applied via output 9 to a pair of infra-red transmitting diodes 10 and 11.

Eight output lines 12 are used to control a liquid crystal display driver 13 (type 7211B) which in turn controls the four digits of a display 14 (type F2025).

Additional LCD arrow indicators are driven by a quad. EXCLUSIVE OR gate 15 (type HEF 4070B). Two light emitting diodes 16, 17 provide indications of the transmit function selected, e.g.

"Cable" or "receiver". The user thus has a clear indication of all the control functions which he has selected.

It will be appreciated the processor 8 comprises a memory in which it is necessary to store data related to appropriate signal formats and to the processing of that data in response to operation of the keypad in a way which is easily understandable to the system user. The techniques required to achieve this are however known to persons skilled in the application of microprocessors.

Although the embodiment of the invention described above is concerned with controlling a television receiver and a cable system to which that receiver is connected, a wide variety of other devices can be controlled, e.g. VCR's, Hi-Fi, heating, lighting etc. Furthermore, a variety of signal transmitting devices other than infra-red devices can be controlled, e.g. ultrasonic, radio, or combinations thereof.

CLAIMS

1. A remote control system comprising a handset which may be manipulated to transmit control signals, and at least two controlled devices each comprising a control signal detector to which the respective controlled device is responsive, each control signal detector being responsive to a different control signal format from the other detector or detectors, wherein the handset comprises a memory in which data is stored from which control signals in each of the different formats can be generated, and a processor which is selectively controllable by manipulation of the handset to generate control signals from the stored data in any one of the different signal formats.

2. A handset for use in a remote control system comprising at least two controlled devices each comprising a control signal detector to which the respective controlled device is responsive, each control signal detector being responsive to a different control signal format from the other detector or detectors, wherein the handset comprises a memory in which data is stored from which control signals in each of the different formats can be generated, and a processor which is selectively controllable by manipulation of the handset to generate control signals from the stored data in any one of the different signal formats.

3. A remote control system substantially as hereinbefore described with reference to the accompanying drawings.

4. A handset for use in a remote control system substantially as hereinbefore described with reference to the accompanying drawings.

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H4K OF
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(56) Documents cited
None

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H4K
Selected US specifications from IPC sub-classes
H04M H04Q

(54) Remote control adapter of electric equipment using telephone lines

(57) A remote control adapter 6 is connectible to a conventional remote control device 4 for electric equipment e.g. a VCR and includes engaging means for automatically engaging and disengaging a telephone line TEL1-TEL2. A remote control signal sent through the telephone line after engagement thereof is decoded by a tone decoder and a microprocessor controls the operation of the remote control device in accordance with the decoded signal, to thereby control the electric equipment. When the calling party hangs-up the telephone line is disengaged from the adapter.

FIG.3

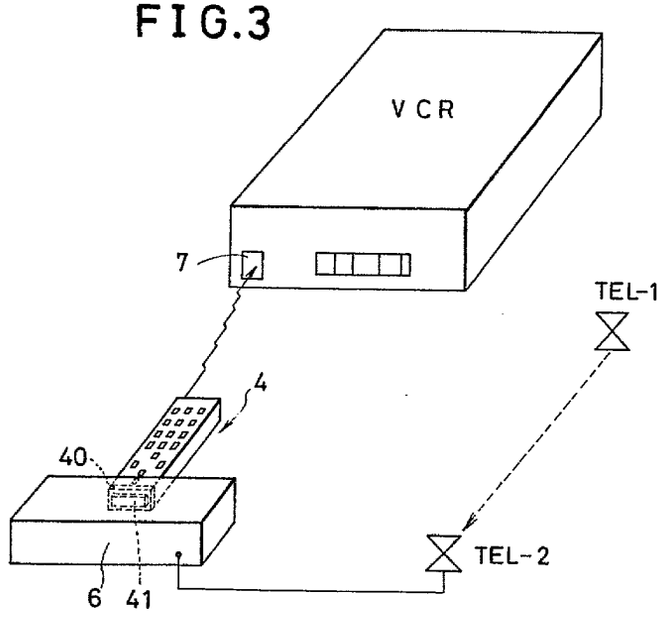

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FIG.1

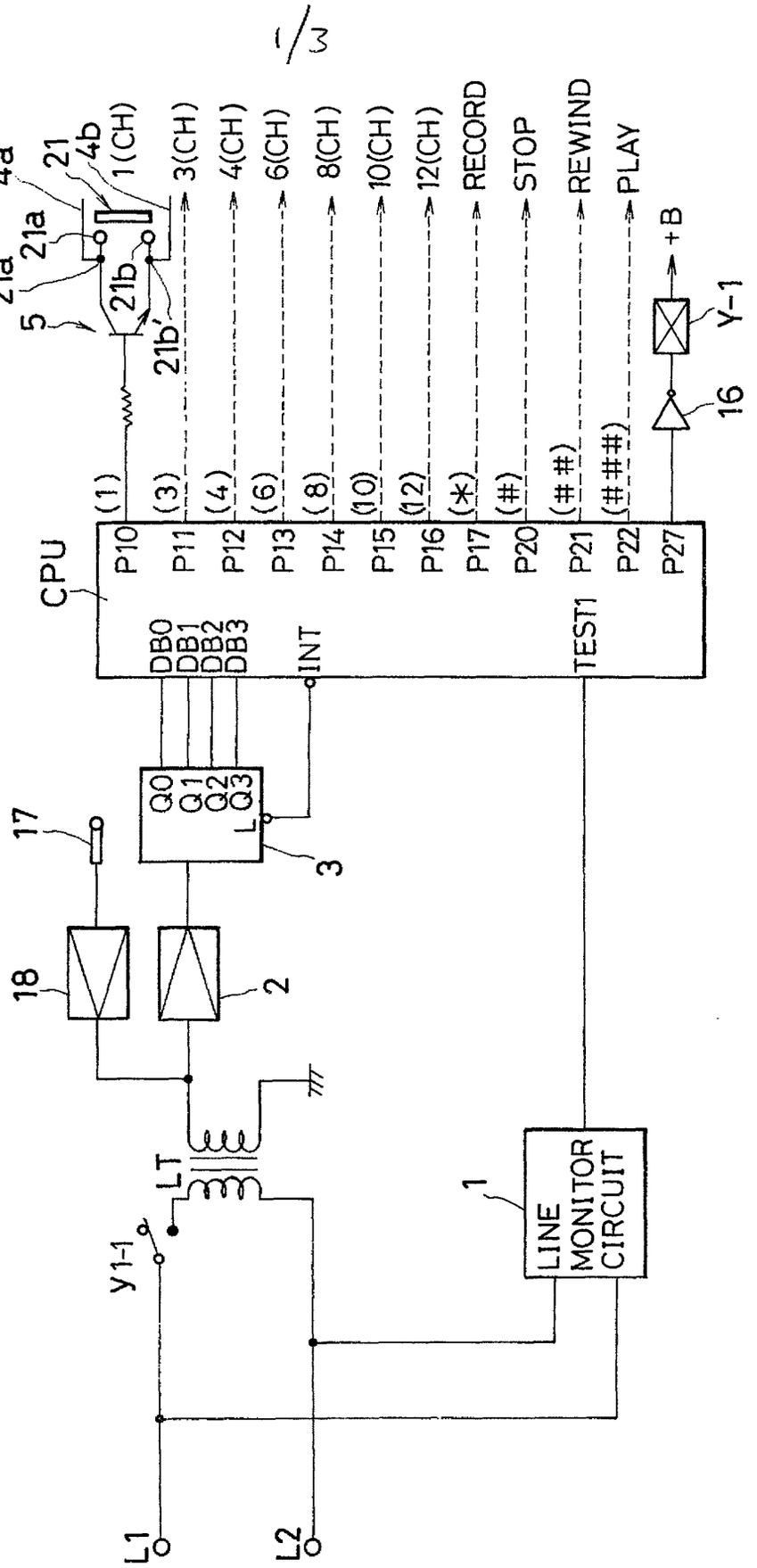

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FIG.2

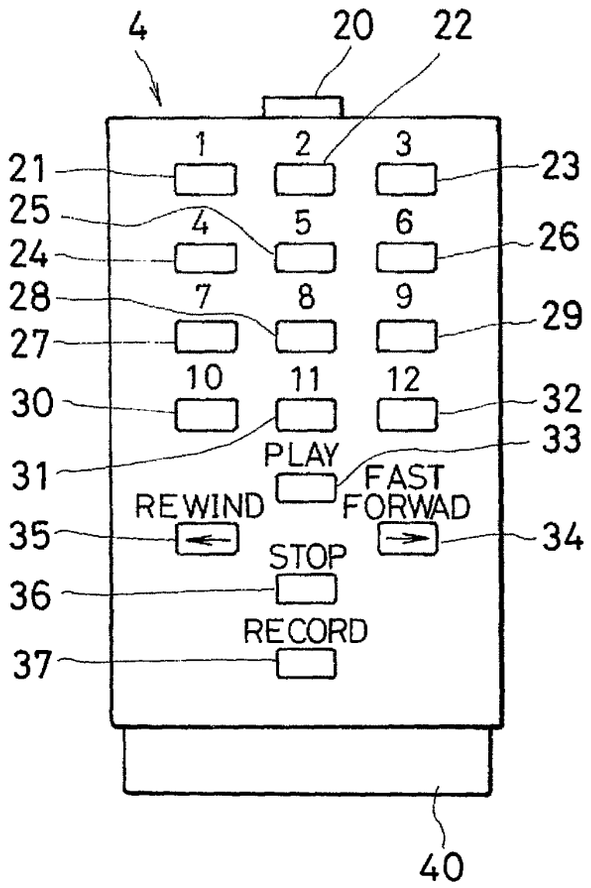
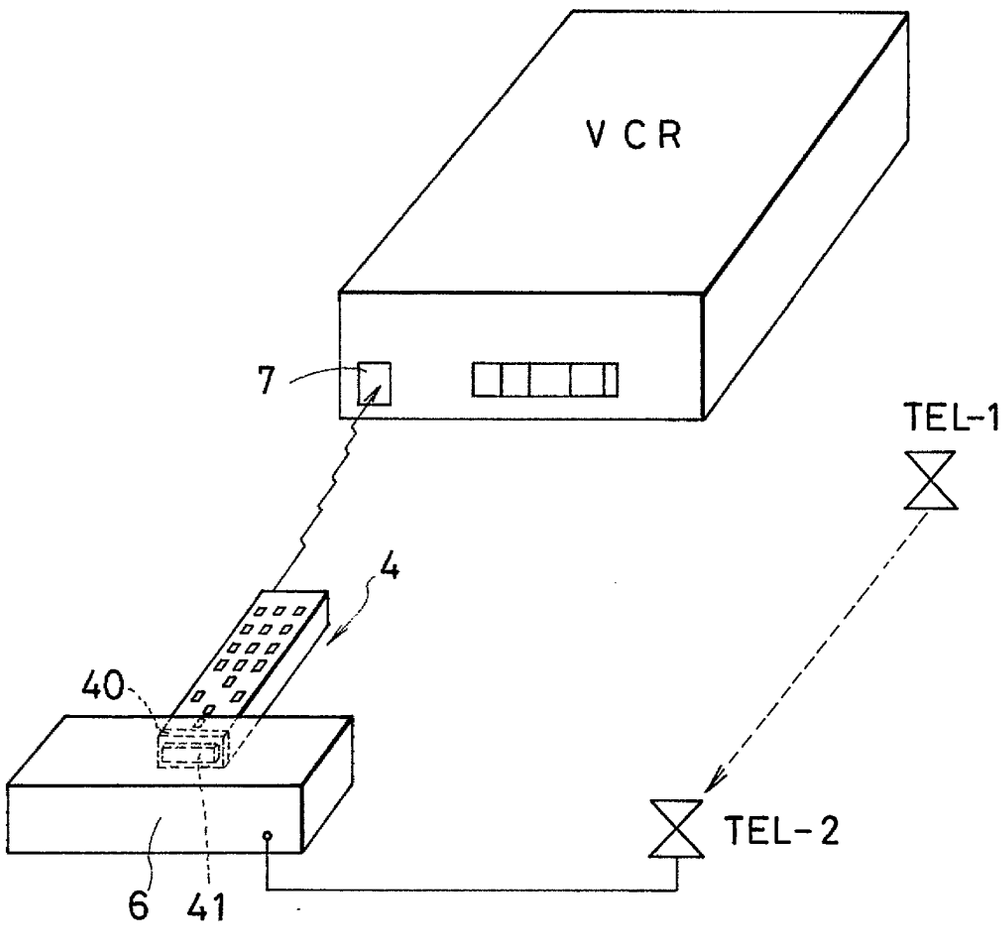


FIG.3



SPECIFICATION

Remote control adapter of electric equipment using telephone lines

The present invention relates to a remote control adapter for electrical equipment using telephone lines.

A conventional remote control means for controlling electric equipment such as a video tape recorder or a television set (to be referred to as a VCR or TV hereinafter) by using telephone lines has been previously disclosed by the present applicant in U.S.P. No. 4,540,851. However, to use such a remote control means, a VCR or TV proper should be modified for interface problem. It is therefore not practical to use such a remote control means for operating a home VCR telephone line from outside.

The present invention seeks to provide a remote control adapter for controlling conventional electric equipment, wherein operation of the remote control adapter is controlled through telephone lines without modifying the electric equipment itself.

According to the present invention, there is provided a remote control adapter which comprises adapting means for a conventional remote control device and engaging means for automatically engaging and disengaging the telephone line. A remote control signal sent through the telephone lines after engagement of the telephone line is decoded by a tone decoder to a code signal, and code signal switching means controls each of selective functions of the remote control device, thereby controlling the electric equipment. Thereafter, the calling party's hang-up state is detected by a disengaging means to disengage the telephone lines from the remote control adapter.

Thus it is possible to control for example a TV set or a VCR through telephone lines without modifying the VCR or TV set.

The invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a circuit diagram showing the main part of the remote control adapter according to an embodiment of the present invention;

Figure 2 is a plan view of a conventional remote control box to be incorporated with the adapter shown in Figure 1; and

Figure 3 is a perspective view showing a total system wherein the remote control adapter of Figure 1 is being used.

Referring to Figure 1, reference symbols L1 and L2 denote telephone lines, respectively; and LT, a line transformer. Reference numeral 1 denotes a line monitor circuit having both a ringing signal detection function and an on-hook detection function; 2, an amplifier for detecting a tone as a remote control signal sent from a pushphone of a calling party; and 3, a tone decoder for detecting the tone from the pushphone and converting it to a corresponding code signal. Reference symbol CPU denotes a microprocessor (to be referred to as a CPU hereinafter) as a control means. In this embodiment, the CPU comprises, for example, a CPU 8748 available from Intel Corp., U.S.A. Reference symbols DB0 to DB3 denote input ports, respectively; and P10 to P17 and P20 to P27, output ports, respectively. Reference numeral 5 denotes a switching transistor, the base of which is connected to the output port P10. The collector and emitter of the transistor 5 are respectively connected to terminals 21a and 21b of a 1CH (channel) selection pushbutton switch 21 on an infrared remote control box 4 of Figure 2. The transistor 5 is turned on in response to the output from the output port P10, so that the terminal 21a is electrically connected to the terminal 21b. An infrared generator (not shown) in the remote control box 4 is connected to the terminals 21a and 21b of the 1CH selection button switch 21 through lead wires 4a and 4b. When the transistor 5 is turned on to operate the pushbutton switch 21, the infrared generator is started, so that a coded 1CH selection infrared ray is emitted from an infrared emission surface 20. Although the same arrangement for 1CH as described above is arranged for other channels and an illustration thereof is omitted, switching transistors are respectively arranged between both terminals of each of switches 22 to 32 for other channels and switches 33 to 37 for PLAY, FF (fast forward), REW (rewind), STOP and REC (record) pushbutton switches of a video tape recorder (to be referred to as a VCR hereinafter) as electric equipment. At the same time, the terminals of the switches 22 to 37 are connected to the infrared generator. Upon operation of the respective switching transistors and hence of the corresponding switches, coded infrared rays are emitted from the infrared emission surface 20. The switching transistor (only one transistor 5 is illustrated) are electrically connected to the pushbutton switches at contacts 21a' and 21b' (Figure 1) by inserting the remote control box 4 into the remote control adapter 6 incorporating the line monitor circuit 1 and the microprocessor CPU, as shown in Figure 3.

Reference symbol TEL-1 denotes a calling party's telephone set; and TEL-2, a telephone set connected to the remote control adapter 6 of this embodiment.

Reference numeral 16 denotes a driver. Reference symbol Y-1 denotes a looping relay with a contact y1-1. Reference numeral 17 denotes a plug jack inserted in an earphone jack of the VCR. The plug jack 17 is connected to the secondary coil of the line transformer LT through an amplifier 18 so as to allow the calling party to monitor a voice signal in the REC or PLAY mode of the VCR.

The operation of the remote control adapter 6 having the arrangement described above will be described hereinafter. The user or owner inserts the remote control box 4 into the adapter 6 and directs the infrared emission surface of the remote control box 4 at a light-receiving portion 7 (Figure 3) of the VCR before he leaves home. Assume that the owner calls the remote control adapter 6 from an external pay telephone (pushphone). When the ringing signal is supplied to a test terminal TEST1 of the CPU through the line monitor circuit 1, the

output port P27 is set at logic "1" in accordance with the program prestored in the CPU. The elements 1 and 16, the CPU and the relay Y-1 as an engaging means are held operative through the driver 16. The control program for this operation is known to those skilled in the art and a description thereof will be omitted. The telephone lines are engaged with the remote control adapter 6 through the contact y1-1 of the relay y-1, thereby interrupting the ringing signal.

When the owner wishes to record a 1CH television program in the VCR, he depresses the "1" button in the pushpone. The "1" tone from the pushpone is detected by the tone decoder 3 through the line transformer LT and the amplifier 2. Bits Q0, Q1, Q2 and Q3 of an output from the 4-bit decoder 3 are set at logic "1", "0", "0" and "0", so that a corresponding code signal is set to be "1000". The code signal is received by the CPU through the input ports DB0 to DB3. In this case, a signal of logic "1" appears at the output port P10. The switching transistor 5 is turned on, and the terminals 21a and 21b of the 1CH switch 21 of the remote control box 4 (Figure 2) and the lead wires 4a and 4b connected to the terminals 21a and 21b are electrically connected to each other. In this case, the infrared emission surface 2 of the accessory remote control box 4 of the VCR emits the coded infrared ray to select the 1CH (Channel 1). The coded infrared ray is received by the light-receiving portion 7 of the VCR, so that the VCR is set in the 1CH operation mode. The audio signal in the 1CH is sent onto the telephone lines through the plug 17 inserted in the earphone jack of the VCR, the amplifier 18 and the line transformer LT. Therefore, the calling party (i.e., the owner) can confirm that he has selected the right channel. It should be noted that the output from the output port P10 is reset to logic "0" within 1 to 2 seconds in accordance with the control program. When the calling party depresses the asterisk (*) button, a tone signal therefrom is decoded by the tone decoder 3. The code signal corresponding to the tone signal causes the output port P17 of the CPU to be set at logic "1". The switching transistor (not shown) is connected to an REC button of the remote control box 4 of Figure 2. Therefore, the VCR starts recording for 1CH. The control program of the CPU is given such that predetermined pushbuttons (e.g., 1 and 0) are sequentially depressed within a predetermined period of time (1 to 2 seconds) for a two-digit channel (e.g., 10CH), that the "#" button is depressed once to stop the VCR, and that the REW and PLAY modes are set upon depression of the "#" button twice and three times, respectively.

When the calling party finishes the above remote control operation, he hangs up the phone. An on-hook signal is detected by the line monitor circuit 1. The CPU operated as the disengaging means together with the circuit 1 generates an output of logic "0" from the output port P27 for deenergizing the relay Y-1, thereby resetting the remote control adapter 6 in the standby mode. In this manner, the calling party can arbitrarily operate the remote control box 4 of the VCR through the remote control adapter by using the buttons of the pushpone. Furthermore, as disclosed in U.S.P. No. 4,540,851, a reservation timer function can be included in the remote control adapter to perform channel reservation operation.

The use of the remote control adapter will be described with reference to the Figure 3. Referring to Figure 3, the remote control box 4 used as a separate unit in the conventional apparatus can be plugged into the remote control adapter 6. The connectors at the coupling portions of the remote control box 4 and the remote control adapter 6 must have a structure suitable for frequent detachment/attachment. One end of the remote control box 4 has a female or male structure 40, and the corresponding adapter side has a male or female structure 41. When the remote control box 4 is used as a unit separate from the remote control adapter 6 for indoor use, the remote control box 4 is detached from the remote control adapter 6 and is used in a conventional manner. When the user is going out, he simply couples the remote control box 4 to the remote control adapter 6. Then, he can call the telephone set TEL-2 from the telephone set TEL-1 and arbitrarily control at the telephone set TEL-1 the television set or the VCR connected to the telephone set TEL-2.

The above embodiment exemplifies the case wherein the accessory remote control box of the VCR is remote controlled from a pushphone to selectively perform REC, PLAY, STOP, REW and so on of the VCR for each channel. However, the present invention is not limited to a remote control adapter for a VCR, but can be extended to other remote control adapters for equivalent equipment.

CLAIMS

1. A remote control adapter for adapting a remote control device of conventional electric equipment, comprising:

adapting means for adapting the remote control device arranged in use in a suitable direction for remote control of said electric equipment;

engaging means for automatically detecting a telephone ringing signal and for engaging a telephone line;

a tone decoder for converting a remote control signal transmitted by calling party through said telephone line;

switching means operated by said tone decoder for switching one of selection switches arranged in said remote control device; and

disengaging means for detecting an on-hook signal and disengaging said telephone line from said remote control adapter.

2. A remote control adapter according to claim 1, wherein said electric equipment is controlled by optical ultra ray which is generated in said remote control device.

3. A remote control adapter according to claim 1 or claim 2, wherein the adapter is selectively connectible with and disconnectible from the remote control device.

4. A remote control adapter according to any

one of the preceding claims, in combination with electric equipment in the form of video tape recorder.

5. A remote control adapter according to any one of the preceding claims, in combination with electric equipment in the form of a television.

6. A remote control adapter according to any one of the preceding claims, wherein said electric equipment is operable in any selection mode, and said remote control adapter includes audio monitoring means for sending an audio signal onto said telephone line according to said selection mode of said electric equipment.

7. A remote control adapter according to any one of the preceding claims, wherein the remote control signal is receivable from a pushphone operated by a remote user.

8. A remote control adapter substantially as hereinbefore described with reference to the accompanying drawings.

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H04N 5/782

(52) UK CL (Edition J)
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(56) Documents cited
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(54) Controlling a video recorder by a coded broadcast signal

(57) A control system for a video recorder involves the transmission of numerical codes associated with different programmes and the generation of control signals for turning the video recorder on and off in response to detection of predetermined numbers in the received television signal, whereby predetermined television programmes may be recorded without the need for setting into the video recorder the date and time at which the programmes are expected to be received. The decoder unit includes an infrared transmitter which transmits the received numbers to a remote control unit which compares the received numbers with prestored numbers representing the programme to be recorded and transmits a start instruction, by infrared, to a video recorder when the received and prestored numbers match. The remote unit is programmable to render it compatible with different video recorders. The apparatus may include a decoder unit which has means for descrambling encrypted television signals and means for extracting the programme numbers from the received signal.

FIG.1

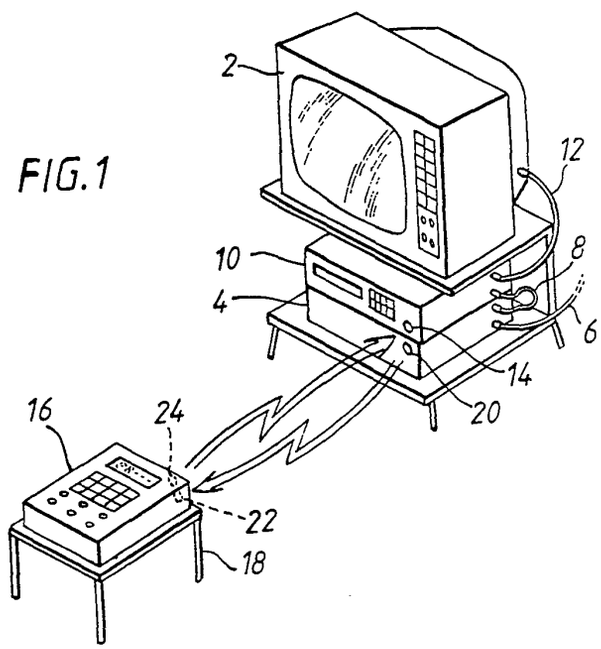

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FIG.1

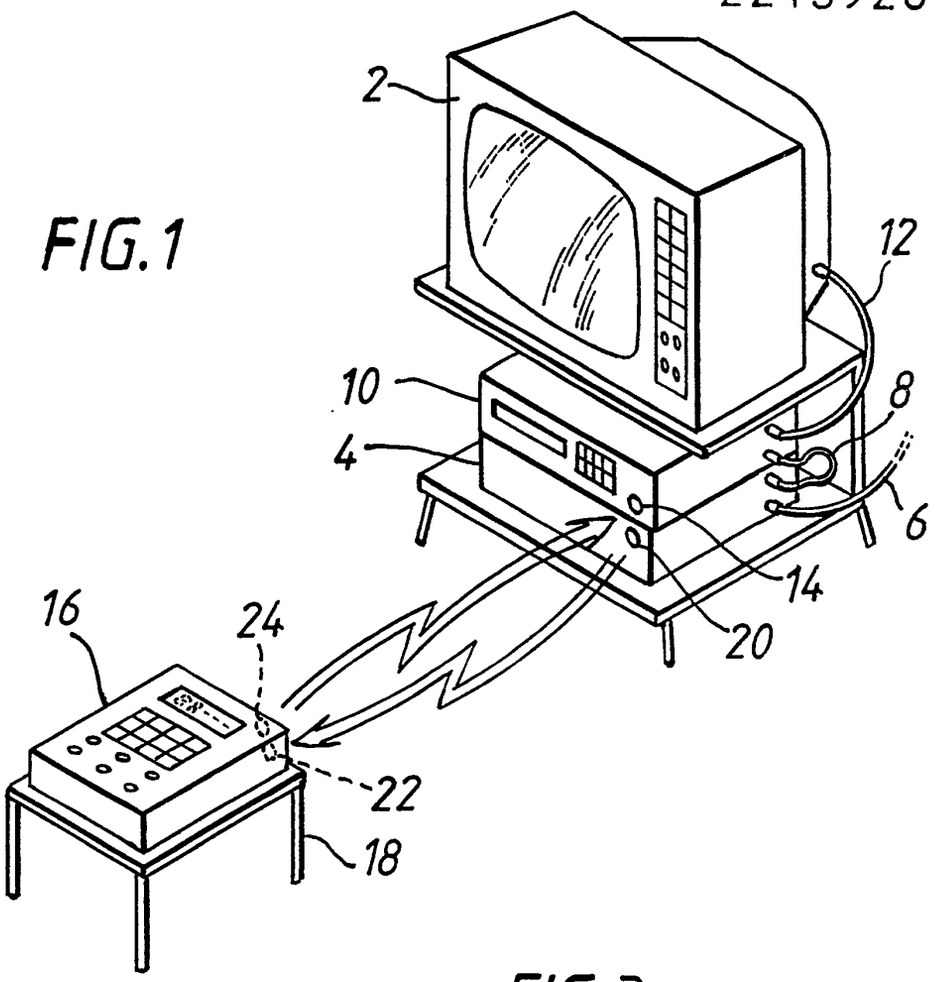


FIG.3

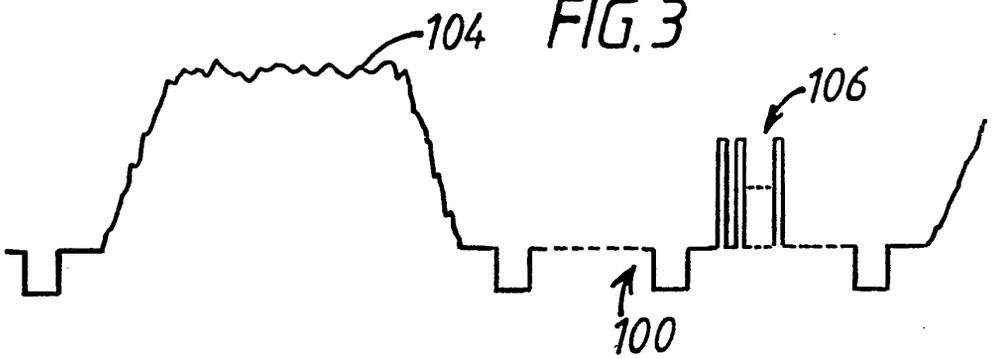
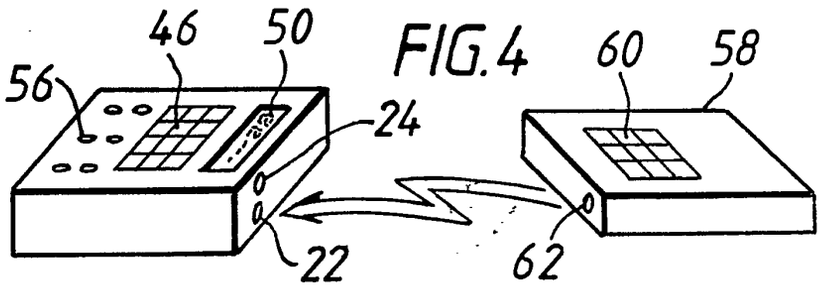


FIG.4



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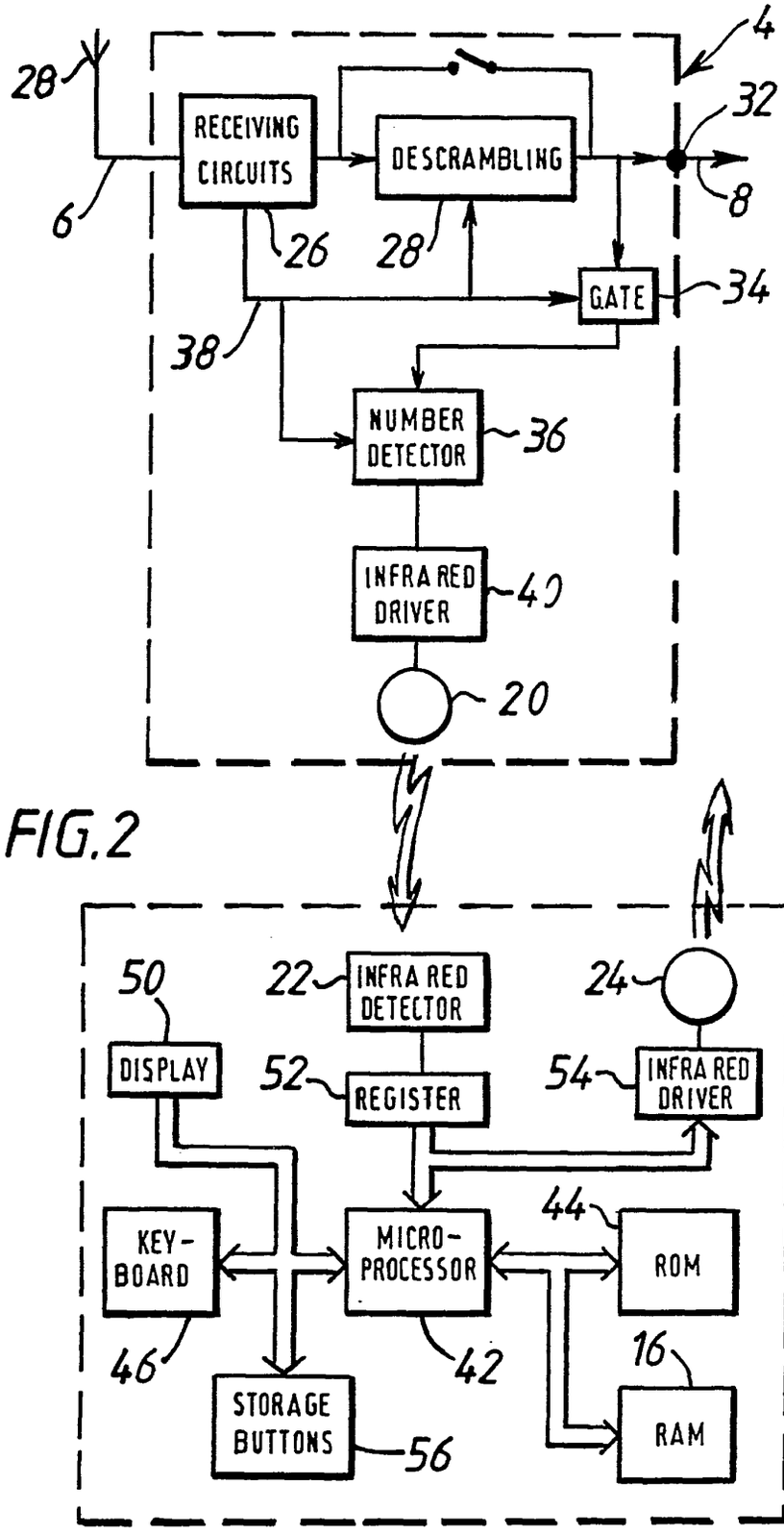

FIG.2

METHOD AND APPARATUS FOR CONTROLLING A VIDEO RECORDER

This invention relates to a method and apparatus for controlling a video recorder and is particularly, but not exclusively, applicable to the recording on a home video recorder of programmes transmitted in a pay TV system.

Video recorders are well known having a control system which enables them to be set into the record mode at predetermined times on predetermined days so that predetermined broadcast television programmes may be recorded in the absence of the owner of the video recorder.

One problem with such recorders is that the preprogramming operation is relatively complex and many users experience difficulties, to a greater or lesser degree, in carrying out this operation. A further problem is that, from time to time, broadcast programmes are not transmitted at the scheduled time and as a result the preprogrammed recorder may fail to record the whole or part of the required programme.

One aspect of the invention aims to solve these problems.

The invention is described further, by way of example, with reference to the accompanying drawings in which:

Fig. 1 illustrates diagrammatically apparatus in accordance with a preferred embodiment of the invention in operative relationship with a domestic television receiver and video recorder;

Fig. 2 is a block diagram illustrating the preferred embodiment of the invention;

Fig. 3 illustrates diagrammatically a portion of a television signal utilised by the preferred embodiment of the invention; and

Fig. 4 is a diagram showing part of the apparatus of Fig. 2 arranged for the performance of a setting up operation in association with a remote control device of a video recorder.

With reference to Fig. 1 a domestic TV receiver 2 is arranged for receiving both signals from a public broadcast television system, such as the BBC and ITV, and signals from a pay television system for which purpose a decoder 4 is provided. The decoder 4 receives broadcast signals intended for the receiver 2 from coaxial cable 6 and is connected via coaxial cable 8, a video recorder 10 and further coaxial cable 12 to the receiver 2.

The recorder 10 includes an infrared receiver 14 for receiving control signals, such as for turning it on and off, from a remote control unit 16 which is shown supported on a suitable piece of domestic furniture such as stool 18. The decoder 4 includes an infrared transmitter 20 for transmitting infrared signals to the remote control unit 16 which accordingly has an infrared receiver 22. Unit 16 also has an infrared transmitter 24 and includes circuitry, to be described in detail below, which causes the transmitter 24 to transmit appropriate control signals to the recorder 10, such as to turn it on or off, in dependence upon the infrared signals received by the receiver 22.

With reference to Fig. 2, the decoder 4 includes receiving circuitry 26 which is coupled to a suitable aerial system 28 via the coaxial cable 6, de-scrambling circuitry 28, a by-pass switch 30 for the descrambling circuitry and an output terminal 32 which is connected to the coaxial cable 8 and may receive signals from the receiving circuitry 26 either through the descrambling circuitry 28 or via the by-pass switch 30. As is well known, it is necessary that signals transmitted in a pay television system should in some way be scrambled or encoded to prevent unauthorised users from viewing the transmitted programmes. Various scrambling or encoding systems are known and form no part of the present invention. Thus, the scrambling method used for the signals 104 may be conventional and will not be described further.

In accordance with a preferred aspect of the invention, each transmitted programme is assigned a unique number and this number is transmitted, in encoded form, in the interval indicated diagramatically at 100 in Fig. 3 between successive fields. The encoded number is indicated diagrammatically at 106 in Fig. 3 and 104 indicate scrambled video. Thus, the unique number identifying the programme is transmitted once every field.

Alternatively, it would be possible to transmit at other intervals such as once each frame. Preferably, the number identifying the programme has a value between 0 and 999. The programme numbers may be changed every month and published along with the programme schedules of the television system so that subscribers will know the numbers assigned to the various programmes to be transmitted.

In accordance with a further preferred aspect of the invention, the number of the programme received by the decoder 4 is extracted and utilised to control the video recorder 10 via the remote control unit 16. For this purpose, the output of the descrambling circuitry 28 is applied via a gate 34 to a number detector 36. The gate 34 is controlled by synchronising signals, derived from the input circuitry 26, and applied to the gate 34 via line 38, which is also connected to the descrambling circuitry 28 for controlling the timing of operations therein. The gate 34 is accordingly opened during the frame blanking pulses so that the transmitted programme numbers may be supplied to the number detector 36. The number detector 36 controls a driver 40 which causes the infrared transmitter 20 to transmit the number detected by number detector 36 to infrared receiver 22 of remote

control unit 16. Number detector 36 is also connected to line 38 so as to be reset to zero after transmission of the number. In this way, the programme number is transmitted by transmitter 20 once each frame.

The remote control unit 16 comprises a microprocessor 42 controlled by programs stored in a ROM 44, and a keyboard 46 for inputting numerical data to the microprocessor 42, which data is stored by the microprocessor 42 in a non-volatile RAM 48 and is also displayed on a display 50. Numbers received by the infrared detector 22 are stored in a register 52 which may in practice be part of microprocessor 42. An infrared driver 54 which is connected to the microprocessor 42 for control thereby drives the infrared transmitter 24 for sending control signals to the infrared receiver 14 of the video recorder 10. The remote control unit 16 also includes a set of storage instruction buttons 56 which are to be used in setting up the control unit 16 for operation. Buttons 56 are preferably located in small recesses for actuation by the tip of a ball-point pen or the like.

Commercially available video recorders are normally

sold with a hand-held remote control unit such as indicated at 58 in Fig. 3. Such remote control units are used to send numerical signals for controlling the operation of the video recorder 10. Thus, the hand-held remote control unit 58 includes a keyboard 60 having a number of different keys (not individually shown) each for instructing transmission, via infrared transmitter 62, of a different instruction to the infrared receiver 14 of the recorder 10. Such instructions may comprise instructions for start, stop, fast rewind, fast forward etc. Each instruction normally comprises a number unique to that instruction, which number is transmitted by the transmitter 62. However, there is no agreed standard between different manufacturers as regards these numbers and accordingly the numbers required by the video recorder in order to carry out the various functions will differ according to manufacturer and/or according to model. Thus, in order for unit 16 to control the recorder 10 satisfactorily, it is necessary to ensure that the instructions it transmits are compatible with the recorder 10.

In accordance with a preferred aspect of the invention, unit 16 is programmable to render it compatible with different video recorders. In the

illustrated preferred embodiment, this is achieved by causing the unit 16 to read the various instruction signals from the remote control unit 58 of the recorder 10. Thus, in order to set up the unit 16 in preparation for use, it is positioned initially as shown in Fig. 3 so that its infrared detector 22 may receive signals transmitted by the infrared detector 62 of the unit 58. With the two units in this position, one of the keys on pad 60 is pressed, for example that key which instructs the video recorder 10 to record. The transmitter 62 thus transmits the number which the recorder 10 interprets as a "start to record" instruction. This number is thereby received by the detector 22 and stored in the register 52. Each of the buttons 56 is associated with a different control function, in particular the functions start, stop, rewind etc. After transmission of the "start instruction" signal from the transmitter 62, the "start instruction" button of the set of buttons 56 is depressed and the microprocessor 42, in response to this, reads the number in register 52 and stores it in RAM 48 in an address location reserved for the number representing the "start to record" instruction.

Next, another of the buttons in pad 60 is pressed, such as the "stop" button and the number transmitted by transmitter 62 in response thereto is thereby stored in register 52 in unit 16. The corresponding button of the set of buttons 56 is then depressed and the microprocessor 42 is caused to store the number in register 52 in RAM 46 in a further address location reserved for the number representing the "stop" instruction. This process is continued using different buttons of the pad 60 and corresponding buttons of the set 56 in order to record in RAM 48 the numbers required by the recorder 10 for performing any other required functions, such as rewind. In this way, the unit 16 is rendered compatible with the recorder 10.

Thereafter, in order to cause the recorder 10 to record selected programmes to be transmitted in the pay television system, all that is needed is to enter the numbers of these programmes into unit 16. This is achieved utilising keyboard 46 in response to operation of which the number is firstly displayed on display 50 and, once the user is satisfied that it is the correct number, it may be transferred to RAM 48 for storage therein in response to depression of another one of the buttons 56. The numbers of several programmes may be simultaneously retained in RAM 48.

The apparatus may thereafter be left arranged as shown in Fig. 1 with the unit 16 positioned so that its detector 22 may receive infrared signals from the transmitter 20 of the decoder 4 and so that its transmitter 24 may transmit signals to the detector 14 of the recorder 10. Thus, at any given time, the register 52 will store the number of the programme being transmitted over the pay television system. The microprocessor 42 continuously compares this number with the programme numbers which have been stored in RAM 48. At some point, a match will be detected and, in response thereto, the microprocessor 42 accesses from the RAM 48 the number representing the start instruction of the video recorder 10 and causes transmitter 24 to transmit this number to the receiver 14, in response to which the video recorder 10 will begin to record. Preferably, the microprocessor 42 is programmed to transmit the start instruction to the video recorder 10 a number of times with a view to ensuring that the instruction is received and acted upon and thereafter to cease transmission of the start instructions even though a match continues to be obtained between the stored programme number and the number which is received by the register 52 each frame.

When the programme has finished, transmission of that particular programme number ceases. This is recognised by the microprocessor 42 when carrying out the next comparison of the number stored in register 52 with the programme number stored in RAM 46 since, assuming that the next programme is not to be recorded, no match will be detected. In response to the no match situation, the microprocessor obtains from RAM 48 the number representing the stop instruction for the recorder 10 and causes this to be transmitted by transmitter 24, in response to which recording is stopped. Preferably the stop instruction is transmitted a number of times to ensure that it is received by the recorder 10 and acted upon, and thereafter transmission of the stop instruction terminated. Recording will be started again next time the microprocessor determines that the programme number received into register 52 corresponds to one of the programme numbers stored in RAM 46.

Various modifications are possible within the scope of the invention. For example, users of video recorders sometimes forget to rewind the video tape. If desired, a rewind instruction could be transmitted periodically, for example say once every few frames, which would cause the unit 16 to transmit a rewind

instruction to recorder 10. The rewind instruction would be disabled by microprocessor 42 once it has been executed following the entering of programme numbers via the keyboard 46 since otherwise repeated rewinding would take place.

Although the invention has been described in connection with TV systems in which programmes are numbered and the programme number transmitted along with the signal containing the programme, whereby the unit 16 may recognise the programme being transmitted, this is not essential. For example, other means for recognising that a particular programme is being, or is about to be, transmitted could be provided.

Further, although the programmable unit 16 has been provided separately from the decoder 4, it could alternatively be embodied in the decoder 4 provided that provision is made for transferring the required control instructions to the recorder 10, for example by a direct or indirect infrared link or otherwise.

Although in the embodiment described with reference to the drawings it has been assumed that the programme number has been transmitted with each frame or field blanking pulse of the signals associated with the

programme to be recorded, and has been continued throughout the programme, alternatives are possible. For example, the programme number could be transmitted shortly in advance of the programme with which it is associated. Thus, for example, programme numbers might be transmitted only for a short period between programmes, in which case the unit 16 would be arranged to operate accordingly. Further, although in the embodiment shown in the drawings, the programme number has been transmitted in the intervals between fields or frames, it could, alternatively or in addition, be transmitted at other times, for example during the line blanking pulses or even during the video signal in which case care may be taken to ensure that it does not interfere unduly with the reproduced picture. In the latter connection, it will be appreciated that the "number" transmitted will be encoded in the form of additional modulation on the transmitted signal, the number being preferably represented in binary form.

CLAIMS:

1. Apparatus for controlling a video recorder, comprising receiving means for receiving television signals, electronic means for recognising from the signals received by said receiving means that a predetermined programme is being, or is about to be, received, and means responsive to said electronic recognising means for generating control signals for a video recorder for causing the recorder to record the predetermined programme.

2. Apparatus according to claim 1, wherein said electronic means is arranged for recognising a numerical code included in the received signals and identifying the predetermined programme.

3. Apparatus according to claim 2, wherein said electronic means is operable for recognising said numerical codes received in intervals between frames and/or fields of said television signal.

4. Apparatus according to any preceding claim, comprising a first unit containing at least said receiving means and a second unit containing at least said generating means, and including means for linking

said remote control unit both to said first unit and to a video recorder.

5. Apparatus according to any preceding claim, including presetting means permitting the apparatus to be set into different conditions in which it is compatible with respective different video recorders.

6. Apparatus according to claim 5, wherein the presetting means include infrared receiving means for receiving infrared signals from a controller associated with a recorder with which the apparatus is to be used, and storage means for storing representations of said infrared signals, said generating means being operable to generate said control signals in accordance with said stored representations of said infrared signals.

7. Apparatus according to any preceding claim for use in a subscriber or pay television system, wherein said receiving means includes a decoder for decoding television signals transmitted in said subscriber or pay television system.

8. A remote control unit useful with any of a number of different video recorders comprising an infrared transmitter for transmitting control signals for a video recorder, an infrared receiver, means for storing representations of signals received by said infrared receiver and means for causing said infrared transmitter to transmit said control signals in a form dependent upon said stored representations so that said transmitted control signals correspond to said received signals.

9. A unit according to claim 8, including means for storing numbers representing predetermined programmes to be recorded, means for receiving numbers associated with television signals being, or about to be, received, and means for causing said transmitter to transmit a control signal representing a start instruction in response to reception of a said associated number which corresponds to a said stored number.

10. A decoder for a television system comprising means for receiving television signals, means for extracting from said signals numbers representing programmes being or about to be transmitted, and

infrared transmission means for transmitting said numbers to a remote unit.

11. A television system which comprises transmission means arranged for transmitting television signals and different numerical codes associated with respective different transmitted programmes; and receiving means operable for receiving said television signals and having means for generating control signals for a video recorder in response to said numerical codes.

12. A decoder substantially as herein described with reference to the accompanying drawings.

13. A remote control unit substantially as herein described with reference to Fig. 2 of the accompanying drawings.

14. Apparatus for receiving and recording television signals substantially as herein described with reference to the accompanying drawings.

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H04Q 9/00

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U1S S1931 S1970 S2166 S2185

(56) Documents cited
WO 86/06890 A1

(58) Field of search
UK CL (Edition J) **G4H HNEC HRBE HRBH HRBJ HRBK HRBL HRBM HRBS HRE, H4R**
INT CL[4] **H04Q**

(54) Remote control of electrical appliances via the mains supply

(57) A handset IR1 communicates via an infra-red or other electro-magnetic or acoustic link with a terminal 6 which transmits a mains borne data packet to another terminal such as bus controller terminal 10. An electrical appliance such as lamp 1, lamp 3 or heater 4 is controlled by mains borne data packets sent by the controller 10. The system has a modem link 21 to the telephone system and handset IR1 also has a telephone modem so that a single handset can control the appliances within the household via the electro-magnetic or acoustic link or out of the household via the telephone link.

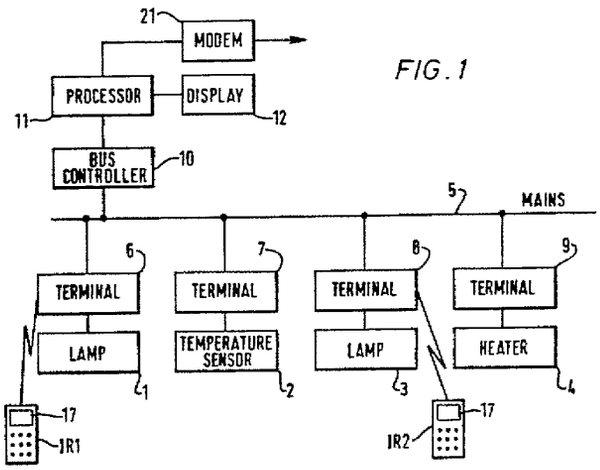

FIG. 1

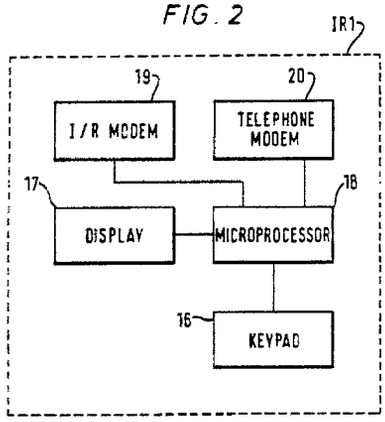

FIG. 2

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

FIG. 1

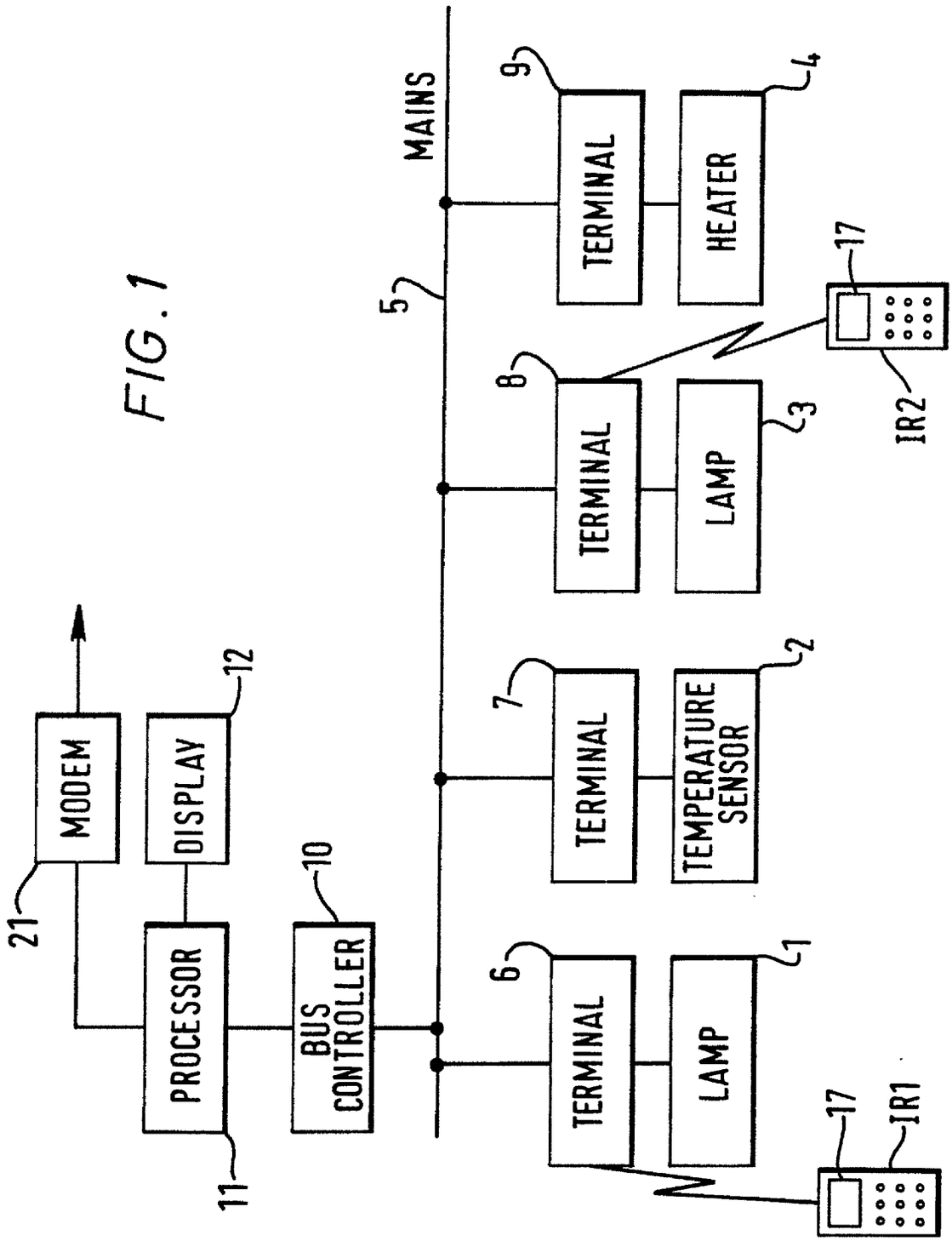
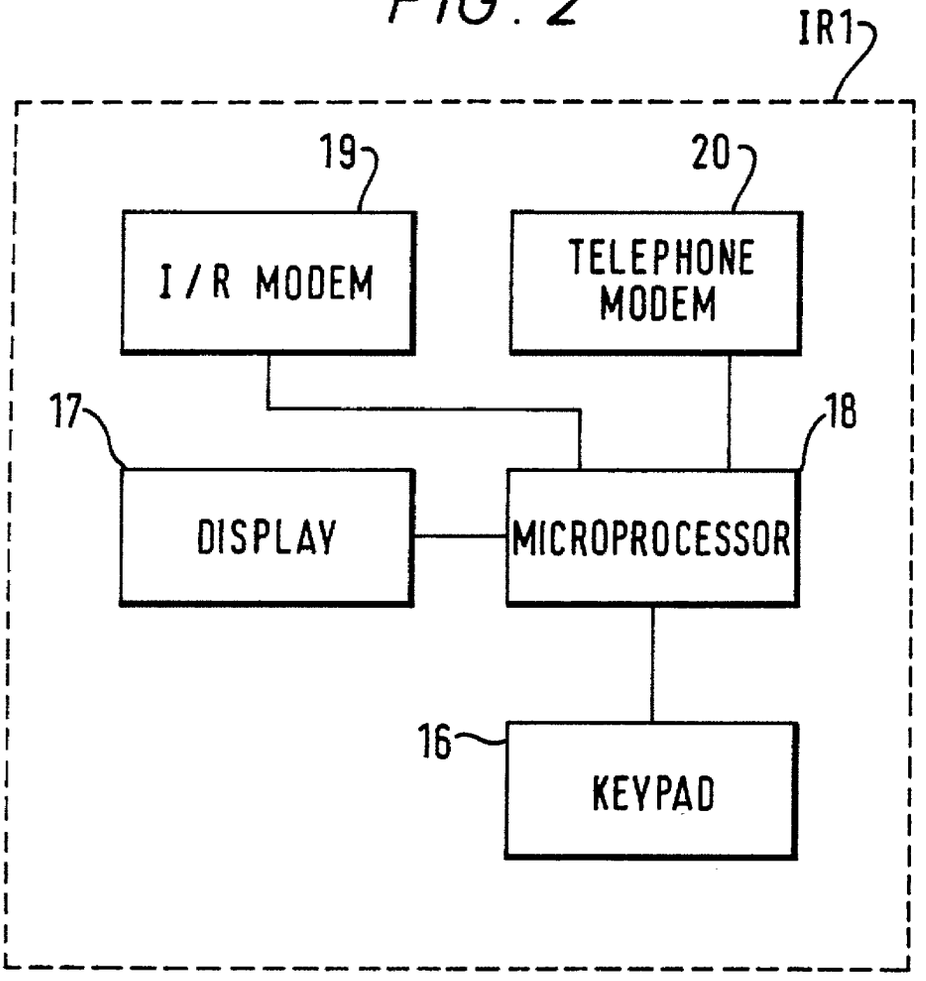


FIG. 2



Controlling Remote Electrical Appliances Via The Mains Supply

This invention relates to remote control of electrical appliances via the mains supply, and especially to a handset for communicating with a terminal for causing a mains borne data packet to be transmitted to control the electrical appliance.

It is known to control electric lights via terminals which receive mains borne signals, wherein a user has a handset which can communicate with a terminal via an infra-red link.

In the applicant's co-pending patent application nos. 89 05082.7 and 89 05083.5 (P/8086/CRE and P/8087/CRE), a controller terminal transmits mains borne data packets and a plurality of remote terminals control the electrical appliances in response to receipt of such data packets. One or more handsets are able to commence transmission of data packets at respective defined times after the end of a message. The controller is driven by a micro-computer, into which messages can be fed from a

touch-sensitive display. It would in principle be possible to communicate with the micro-computer via a modem and a telephone link. This could be done using a further handset, which would need to have a modem to communicate with the telephone system.

The applicants have realised that certain components for such a handset would duplicate those for the infra-red handset for signalling to the terminals in the household having the electrical appliances.

Accordingly, the invention provides a handset for communicating with a terminal for causing a mains borne data packet to be transmitted to another terminal to control an electrical appliance remotely, comprising a display, a key pad, a micro-processor, a modem for communicating with a terminal via electro-magnetic or acoustic waves, and a modem for communicating with a terminal via a telephone link.

Such a handset can be used for communicating with the terminals via an electro-magnetic or acoustic link or via a telephone link. The modem for communicating via a electro-magnetic or acoustic waves could include an ultra-sonic link but preferably includes an infra-red link. The modem for communicating via the telephone link may have a plug or socket for communicating with telephone wires directly, or it may incorporate an acoustic coupler which can be connected to a telephone handset.

The invention also provides a system for the remote control of electrical appliances via the mains supply, comprising a controller terminal for transmitting and receiving mains borne data packets and a plurality of remote terminals for controlling the electrical appliances in response to receipt of data packets from the controller, and a handset for communicating via an electro-magnetic or acoustic link with a terminal to cause transmission of a mains borne data packet to control an appliance, the handset also being capable of communicating with the controller terminal via a telephone system.

The invention will now be described in detail with reference to the accompanying drawings, in which:

Figure 1 is a block diagram of apparatus for controlling remote electrical appliances via the mains supply; and

Figure 2 is a block diagram of the main components of the handsets shown in Figure 1.

Referring to Figure 1, a number of electrical appliances such as a lamp 1, a temperature sensor 2, a lamp 3, and a heater 4 are connected to the mains supply via respective terminals 6 to 9. Two of the terminals 6, 8 are provided with infra-red transmitter-receivers (not shown) to communicate with handsets IR1, IR2 also provided with transmitter-receivers. The terminals each include micro-processors which control the electrical appliances in accordance with data packets received from a bus (mains) controller terminal 10 which also includes a micro-processor, and which is in turn controlled by a micro-computer 11, which incorporates a display 12. The handsets IR1, IR2 also incorporate micro-processors, and terminals 6, 8 each include two

micro-processors each, one for processing the infra-red signals communicated between the terminals and the handsets, and the other for receiving signals from and transmitting signals onto the mains. Frequency shift keying (FSK) is used for the mains signalling frequencies being 130 or 134 kHz, and data can be transmitted and received at a rate of up to 2400 bits per second.

In a condition of high bus activity, messages will be transmitted by the controller terminal to respective remote terminals and, after predetermined delays, responses will be sent out by the respective remote terminals, The messages will be queued in the micro-computer 11 and fed to an internal queue in the controller 10 in turn at appropriate intervals. Thus, message 1 could be an instruction to turn lamp 1 on and message 2 could be an instruction to read temperature. In each case, the message duration is 15 bytes (8 bits to a byte) although the message could be up to 43 bytes long. A message specifies where the message is being sent from, the destination to which it is being sent, and the data content representing the operation to be performed. After the message 1 is transmitted by the controller, each terminal receives it and start

decoding it to ascertain if it is intended for that terminal. As soon as its terminal has decoded the signal sufficiently to ascertain that it is not intended for that terminal, it discards the remainder of that message.

When the terminal for which the message is intended confirms that the message is intended for itself, and after the message has itself ended, that terminal transmits, after a delay of 22 bytes from the end of the message, a response to the controller to confirm the message has been received. The response is in the same format as the message i.e. address of originating terminal, address of destination terminal and data content, and also lasts for a duration of 15 bytes (but could be up to 43 bytes long).

The other terminals will also receive the response, and will discard them when they have read its destination address, so that only the controller will make use of the data in it. After a delay of 22 bytes from the end of the response, the next message is sent out, and this could be for example an instruction to read temperature sensor 2.

The regular transmission of messages and receipt of responses only applies of course in a period of high bus activity eg. when the micro-computer 11 and the controller 10 are holding a stack of messages to be sent out. In a situation of low bus activity dummy messages of length 16 bytes are sent out at regular intervals, this time spaced by the longer interval of 87 bytes. The messages preserve the structure of the normal messages but do not result in any operation being performed on any appliance. The purpose of these dummy messages is to maintain synchronisation of the terminals, each of which has its own clock capable of being re-synchronised to incoming messages.

In either case of high or low bus activity, it will be noted that a delay follows each message or dummy message. This is made use of in the following way. Various given times in the delay are allocated to various functions to enable the controller to receive messages in the delay period. Further details of the use of such time slots is given in our co-pending application No. 89 05082.7 (P/8086/CRE). Further details of the synchronisation of the messages with each other is given in our co-pending application No. 89 05083.5 (P/8087/CRE).

Particular time slots are allocated to the various handsets IR1, IR2, and these can communicate with any terminal with infra-red transmitter receiver, and the message will be held in that terminal until the next time that slot appears after the end of a message on the mains.

Referring to Figure 2, the handset comprises a key pad 16 and a display 17 which are controlled by a micro-processor 18. The micro-processor is also connected to an infra-red modem 19 and a telecommunications modem 20.

When the handset is in the vicinity of the terminals 6 to 9, for example, when the handset is in a household, messages can be entered on the key pad and will transmitted to the terminals via the infra-red modem 19 and the infra-red link to the respective terminals.

When the user is out of the household and desires to communicate with the system in the household, the handset is coupled to a telephone handset since the handset has a built-in acoustic coupler, and messages

entered into the key pad 16 are transmitted via the telecom modem 20 which communicates via the telephone system with modem 21 connected to the micro-computer 11.

Thus, it is possible to control electrical appliances in the household from within the household using the infra-red link and from outside the household using the telephone link, and in each case the same handset is used. In practice, a number of handsets would be used in a household eg. IR1, IR2, and one of these would also have the telephone modem enabling it to be used outside in conjunction with a telephone. Apart from the convenience of having one handset instead of two, only one display, key pad and micro-processor are needed instead of two of each of these components if a separate handset was used for infra-red communication and for telephone communication.

CLAIMS

1. A handset for communicating with a terminal for causing a mains borne data packet to be transmitted to another terminal to control an electrical appliance remotely, comprising a display, a key pad, a micro-processor, a modem for communicating with a terminal via electro-magnetic or acoustic waves, and a modem for communicating with a terminal via a telephone link.

2. A handset as claimed in claim 1, in which the modem is arranged to communicate with the terminal via infra-red radiation.

3. A handset as claimed in claim 1 or claim 2, including an acoustic coupler for connection to a telephone handset.

4. A handset substantially as herein described with reference to the accompanying drawings.

5. A system for the remote control of electrical

appliances via the mains supply, comprising a controller terminal for transmitting and receiving mains borne data packets and a plurality of remote terminals for controlling the electrical appliances in response to receipt of data packets from the controller, and a handset for communicating via an electro-magnetic or acoustic link with a terminal to cause transmission of a mains borne data packet to control an appliance, the handset also being capable of communicating with the controller terminal via a telephone system.

6. A system for the remote control of electrical appliances via the mains supply substantially as herein described with reference to the accompanying drawings.

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H04Q 9/00

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U1S S1931 S1970 S2166 S2185 S2188 S2192

(56) Documents cited
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(58) Field of search
UK CL (Edition J) G4H HNEC HNEE HNEM HNF H13F, H4R RTSR RTSU
INT CL[4] H04Q

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(54) Controlling remote electrical appliances via the mains supply

(57) A controller 10 transmits mains-borne data packets to a number of remote terminals 6 to 9 for controlling electrical appliances e.g. lamps 1, 3 and heater 4. After each remote terminal has received a data packet from the controller to control its associated appliance, after a time delay it sends a mains-borne packet back to the controller, this command and response system avoiding collision of messages. To enable more rapid access to the controller than this arrangement would otherwise allow, a terminal such as 6 which may be controlled by an infra-red handset IR1 can commence transmission of a mains-borne data packet at a given time in the time delay period, the response which would normally follow the end of that time delay period being delayed appropriately.

FIG.1

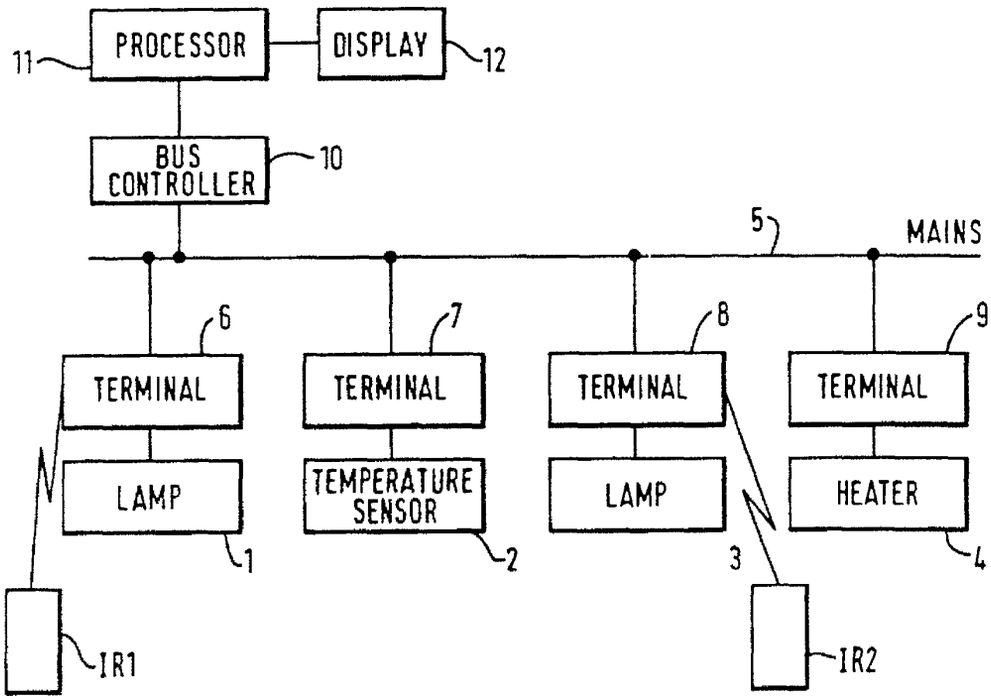

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FIG. 1

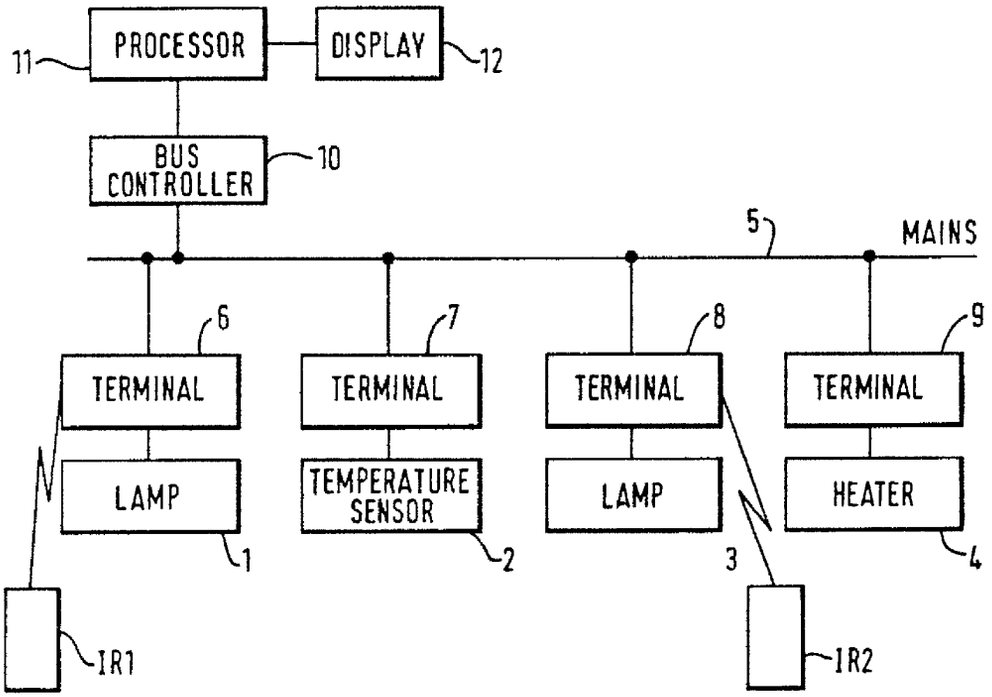
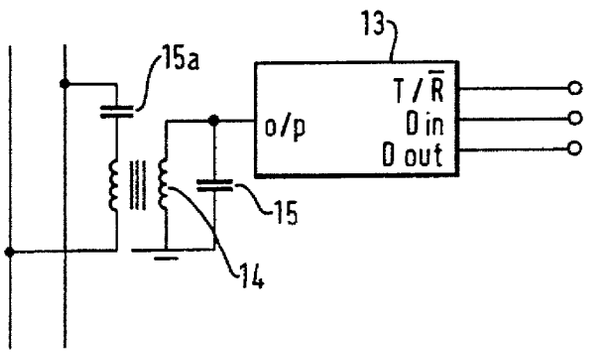


FIG. 2



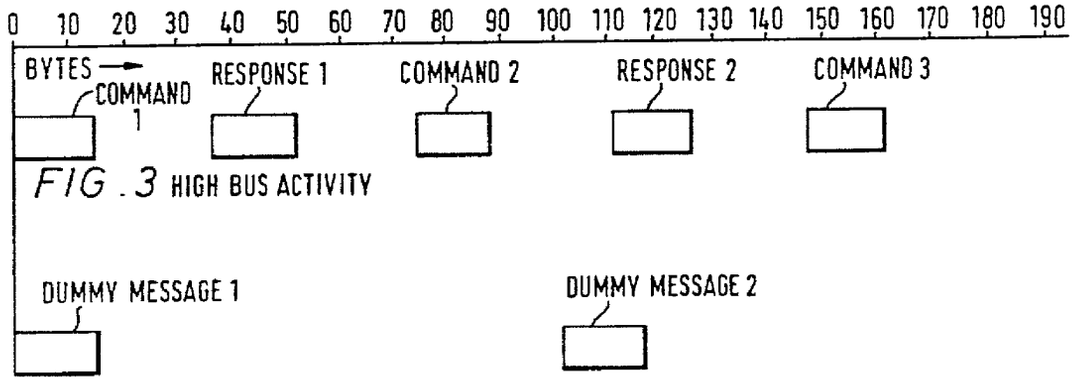


FIG. 3 HIGH BUS ACTIVITY

FIG. 4 LOW BUS ACTIVITY

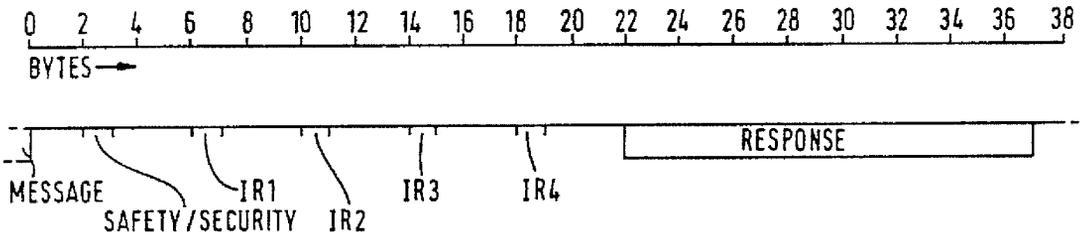


FIG. 5

FIG. 6

FIG. 7

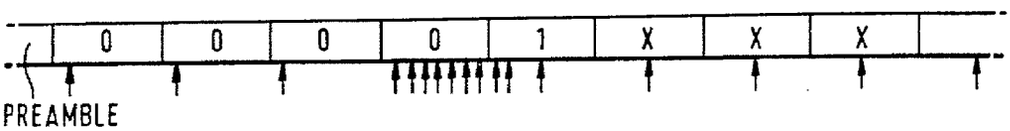


FIG. 8

Controlling Remote Electrical Appliances Via The Mains Supply

This invention relates to controlling remote electrical appliances via the mains supply, and especially to the timing of the mains borne control pulses.

It is known in an industrial environment to control an electric light via terminals which receive mains borne signals. To enable a user to control the system, the user has an infra-red handset which can signal to one or more terminals to cause the mains borne signal to be sent.

It has been proposed to apply the technique of collision avoidance to such a system i.e. before a terminal transmits, it checks whether any other terminal is already transmitting.

One way of doing this would be for the terminals to sense whether the carrier frequency of the mains signalling is present. However, it has been discovered that this gives unreliable results when switch mode power supplies eg. a power supply for a micro-computer, are used, since these produce a constant stream of high frequency bursts of noise on the mains due to the switching circuits inside

them. These bursts can be mistaken for mains signalling.

The problem has led the applicants to consider using a collision avoidance system using a bus (mains) controller terminal in conjunction with remote terminals which will not signal unless commanded to do so by the controller. However, in conjunction with infra-red handsets which communicate with the terminals to produce mains signalling to operate the appliances, such a command and response system would have the disadvantage of a long response time where a large number of terminals was involved, unless very frequent poling was employed which would be an inefficient use of bus time.

This invention provides apparatus for controlling remote control electrical appliances via the mains supply comprising a controller terminal for transmitting mains borne data packets and a plurality of remote terminals controlling the electrical appliances in response to receipt of such data packets, each remote terminal being arranged to transmit, after a time delay, a mains borne data packet for the controller in response to receipt of a data packet from the controller for controlling an appliance associated with that terminal, in which there is provided a terminal capable of transmitting a mains borne

data packet commencing in the time delay.

The invention also provides a method of controlling remote electrical appliances via the mains supply comprising transmitting mains borne data packets from a controller terminal to a plurality of remote terminals to control electrical appliances, each remote terminal transmitting, after a time delay, a mains borne data packet to the controller in response to receipt of a data packet from the controller to control an appliance associated with that terminal, and a terminal being provided which transmits a mains borne data packet commencing in the time delay.

The provision of access by the terminal in the delay between command and response provides the facility for rapidly transmitting signals onto the mains while retaining the collision avoidance advantages of a bus controller.

Advantageously, the other terminals are arranged to refrain from transmitting mains borne data packets on detection of a mains borne data packet commencing in the time delay. The terminal capable of transmitting commencing in the time delay is preferably arranged to commence transmission of a given time in the delay.

The terminal capable of commencing transmission at a given time in the delay may be capable of communicating with a handset by electro-magnetic eg. infra-red or acoustic eg. ultrasonic waves. The terminal may be capable of commencing transmission at a second given time in the time delay in response to communication with a different handset. The terminal capable of commencing transmission in the time delay may be one of the remote terminals for controlling an electrical appliance, but it could if desired just communicate with the handset and with the mains bus and not control an appliance. More than one such terminal could be provided, each commencing transmission at the same given times. The interval between the given times must be sufficient to enable the terminals to recognise a data packet commencing at the first given time before the second given time so that any other terminals attempting to commence transmission at the second given time are inhibited. A terminal, for example, a remote terminal, may be capable of commencing transmission at a given time in the time delay to transmit safety or security or failure information. Thus, various given times in the period following a message may be allocated to communication from different handsets via various terminals and to safety or security messages from respective

terminals or failure messages from any terminal.

The terminals are preferably arranged to commence sampling the mains for data packets only at the various given times in order to reduce the chances of confusing mains noise with the commencement of a data packet.

All terminals are perferably synchronised with each other for the purposes of timing within a time delay period at the end of a message. This re-timing applies not only to commands and responses but also to acknowledgements of failures or data packets which may be sent by the controller when there are no messages to send for the purposes of synchronising clocks in micro-processors in the terminals.

Apparatus for and a method of controlling remote electric appliances via the mains supply will now be described, by way of example, with reference to the accompanying drawings in which:

Figure 1 is a block diagram of the apparatus;

Figure 2 shows the interface between a terminal and

the mains supply;

Figure 3 shows schematically an example of signals which could be present on the mains in a condition of high bus activity;

Figure 4 shows schematically an example of signals which could be present on the mains in a condition of low bus activity;

Figure 5 is an enlarged view of part of Figure 3;

Figure 6 shows an example of different signals which could be present on the bus, to the same scale as Figure 5;

Figure 7 shows the arrangement of bytes in the start of the messages and responses shown in Figures 3 and 4; and

Figure 8 shows a part of the synchronisation code on an enlarged scale.

Referring to Figure 1, a number of electrical appliances such as a lamp 1, a temperature sensor 2, a lamp 3, and a heater 4 are connected to the mains supply via respective terminals 6 to 9. Two of the terminals 6, 8

(gateway terminals) are provided with infra-red transmitter-receivers (not shown) to communicate with handsets IR1, IR2 also provided with transmitter-receivers. The terminals each include micro-processors which control the electrical appliances in accordance with data packets received from a bus (mains) controller terminal 10 which also includes a micro-processor, and which is in turn controlled by a micro-computer 11, which incorporates a display 12. The handsets IR1, IR2 also incorporate micro-processors, and terminals 6, 8 each include two micro-processors each, one for processing the infra-red signals communicated between the terminals and the handsets, and the other for receiving signals from and transmitting signals onto the mains.

Each terminal 6 to 9 and the controller 10 each include a transceiver chip 13 (Figure 2) which is controlled by the respective micro-processor of that unit. In particular, each chip includes three connections Din (data in), Dout (data out), and $T/\overline{R}$ connected to the respective micro-processor. When the connection $T/\overline{R}$ is high, the chip transmits data from the micro-processor to the mains, and when it is low, the chip receives data from the mains. In the former situation, the output connection o/p transmits a carrier wave of approximately 15 volts peak

to peak to the winding on one side of transformer 14, which forms a tuned circuit with capacitor 15. A blocking capacitor 15a connects the other winding to the mains. The transformer is 3:1 step-down transformer so that approximately a 5 volts peak to peak carrier wave is impressed on the mains voltage. In the case of a system for use within a household, a filter is provided at the fuse box to prevent the data packets being transmitted onto the mains outside the household, as well as to attenuate noise already on the mains that is being fed in. The chip uses frequency shift keying (FSK) the carrier frequencies being 130 or 134 kHz, and data can be transmitted and received at the rate of 2400 bits/second.

Referring to Figures 3 and 4, in a condition of high bus activity, messages will be transmitted by the controller terminal to respective remote terminals and, after predetermined delays, responses will be sent out by the respective remote terminals. The messages will be queued in the micro-computer 11 and fed to an internal queue in the controller 10 in turn at appropriate intervals. Thus, message 1 could be an instruction to turn lamp 1 on and message 2 could be an instruction to read temperature. In each case, the message duration is 15 bytes (8 bits to a byte) although the message could be up

to 43 bytes long. A message specifies where the message is being sent from, the destination to which it is being sent, and the data content representing the operation to be performed. After the message 1 is transmitted by the controller, each terminal receives it and start decoding it to ascertain if it is intended for that terminal. As soon as it terminal has decoded the signal sufficiently to ascertain that it is not intended for that terminal, it discards the remainder of that message.

When the terminal for which the message is intended confirms that the message is intended for itself, and after the message has itself ended, that terminal transmits, after a delay of 22 bytes from the end of the message, a response to the controller to confirm the message has been received. The response is in the same format as the message i.e. address of originating terminal, address of destination terminal and data content, and also lasts for a duration of 15 bytes (but could be up to 43 bytes).

The other terminals will also receive the response, and will discard them when they have read its destination address, so that only the controller will respond to the data in it. After a delay of 22 bytes from the end of the response, the next message is sent out, and this could be

for example an instruction to read temperature sensor 2.

The regular transmission of messages and receipt of responses only applies of course in a period of high bus activity eg. when the micro-computer is holding a stack of messages to be sent out. In a situation of low bus activity dummy messages of length 16 bytes are sent out at regular intervals, this time spaced by the longer interval of 87 bytes. The messages preserve the structure of the normal messages but do not result in any operation being preformed on any appliance. The purpose of these dummy messages is to maintain synchronisation of the terminals, each of which has its own clock. This will be explained hereinafter in detail with reference to Figures 7 and 8.

In either case of high or low bus activity, it will be noted that a delay follows each message or dummy message. This is made use of (Figure 5 and Figure 6) in the following way. Various given times in the delay are allocated to various functions to enable the controller to receive messages in the delay period.

Thus, safety/security or failure notification messages from the terminals commence at the second byte, IR1 handset messages commence at the sixth byte, IR2

handset messages commence at the tenth byte, and there is provision for the fourteenth and the eighteenth bytes to be allocated to additional IR handsets. There are three bytes between those in which transmission can commence, to enable terminals to recognise that a data packet is being transmitted and hence inhibit transmission.

In a conventional bus communication system where a controller is provided, no terminal would be able to transmit onto the bus unless it had first received a message from the controller. It would in theory be possible to adapt this to the use of handsets in the sense that a handset would signal to a terminal that it wished to pass a message to the controller and the controller could periodically poll the terminals to ascertain if any messages were waiting. In practice, however, it would lead to an unacceptably long delay before the message had been communicated to the controller and a response had been received at the handset, unless very rapid poling was employed, which would be extremely inefficient on the bus time.

The allocated byte slots circumvent this problem without substantially increasing the risk of collision.

Thus, IR1 can signal to terminal 6, or to any other gateway terminal able to receive and transmit infra-red radiation and, after sending an acknowledgement to the handset to confirm receipt of the message, the gateway terminal is ready to send a message to the controller. In the sixth byte slot after the end of a message, or a response to a message, or a dummy message, the terminal transmits its gateway message onto the mains.

The other remote terminals read this message and, since it is not addressed to them, discard it. However, where the last data packet on the mains was a message to a particular remote terminal, that terminal refrains from sending the response it was going to send. The controller receives the message and sends out an acknowledgement of duration 7 bytes to confirm detection of the message. At this point, the terminal that was due to send its response, having detected the acknowledgement now transmits its response. The controller then generates the appropriate message to fulfill the instruction given by the handset. This is followed by a response in the usual way.

Each terminal, that is controller or remote terminals, has to count the "byte" slots in order to insert or look for a message at the appropriate time.

Consequently, at the end of each message, or response, or gateway message or acknowledgement or dummy message, all terminals re-set so that the first byte following thereafter is counted as number one by all terminals. Similarly, IR2 and the two further possible handsets can have rapid access to the bus without destroying the collision avoidance arrangement.

The second byte slot is allocated to a safety/security and failure notification messages which need very rapid access to the bus for obvious reasons and, since they are transmitted in the second byte, this gives them priority of over all other messages. For example, one terminal could be connected to a smoke detector or another to a infra-red proximity detector focussed on an area outside the household using the system. Equally, a lamp could fail and its terminal would need to signal this. Thus, any remote terminal might need to send a message to the controller. Consequently, in the second byte, any such terminal can signal to the controller, which responds after a delay at the end of that message with a special acknowledgement to verify detection of the message. A suitable warning could be activated in the household. For example, in the case of a proximity detector focussed on an area outside the front door, an image of any person outside

could be inset on a television being viewed.

Such messages will not arise often, so the fact that collision is possible here will not cause a problem. In the event of two remote terminals attempting to transmit at the same time, the message will be garbled and the controller will not be able to detect any message. Thus, if the messages do not receive an acknowledgement, they each try to re-transmit in the second byte slot after a pseudo-random number of frames i.e. message-gap-response periods.

Referring to Figures 7 and 8, the method of synchronisation of the clocks in each of the terminals will now be described. The first two bytes of each message, response, dummy message or acknowledgement are respectively, a preamble and synchronisation code. The preamble is in the form of alternate 1 bits and 0 bits. All terminals are designed to synchronise to the carrier frequency, detect such a pattern, and set any automatic gain controls. The next byte of each data packet is a synchronisation code consisting of four 0 bits followed by 1 bit: the following three bits can each be either 0 or 1.

Each terminal samples the mains at the rate of once

per bit. The need for the synchronisation code arises because each terminal has a separate clock which could drift relative to the others, perhaps only be a few hundereds of micro-seconds, between messages. While this might not matter if multiple samples, say, 2 or 4 per bit were employed, which carries the penalty of a resultant loss of background processing time, it does matter in the case where a single sample per bit is taken, because the sampling may then take place at a non-optimum point in a bit interval (i.e. not at the centre of the bit, the optimum point) causing the message to be decoded erroneously.

Consequently, referring to Figure 8, in the next byte, each terminal samples three 0's, because no matter where the sampling takes place in a time drifted period, three 0's will always be detected. Once three 0's have been detected, the processor of each terminal changes to a higher speed sampling mode (8 times per bit), awaiting the rising edge of the "1" following. If no "1" appears in the next two bit periods, then once per bit sampling is reverted to. This gives the processor of each terminal maximum time for other tasks. In an FSK environment, the data line is very rarely stable in the presence of just noise, so the high speed sampling scheme is called for only

occasionally.

Once a rising edge has been found, each processor waits for half a bit, and then reverts to sampling once per bit. The processors are now sampling at the optimum time in each bit.

The remainder of the synchronisation code is then read in and checked. If it is a valid code, then there is a high probability that a message has just appeared on the mains. If desired, the following byte can be coded to give a further check that the genuine data packet is being received. The message proper could then commence after this following byte.

If three 0's are detected, but a rising edge is not detected (i.e. a further 0 is detected), or if the remiander of the synchronisation code is found to be incorrect, the processors revert to their previous timing.

Of course, instead of looking for four 0's followed by a 1, the synchronisation code could instead use four 1's followed by a 0. These five bits could appear in any position within a byte,. Further, a code consisting of

three 0's and one 1 or three 1's followed by one 0, or consisting of two 0's followed by one 1 or two 1's followed by one 0, could be used instead, the principle of detecting the rising edge at a faster rate being the same.

Of course, various modifications may be made without departing from the scope of the invention thus, different message lengths, gap lengths and acknowledgement lengths as well as dummy message lengths may be employed. Equally, more infra-red slots could be provided in the inter-message gap. Also, all terminals could be provided with a infra-red communicating facility, including the controller, and the display of the controller could be provided with a touch-sensitive screen in order to enable commands to be entered at the controller. Further, although the infra-red communicating gateway terminals have been described as controlling an electrical appliance, they need not do so and could simply act as the interface between the infra-red handsets and the bus. Equally, although it has been stated that infra-red handset messages control the respective electrical appliance via the controller 10 (in the sense that the controller 10 issues the command to the remote terminal controlling the electrical appliance), it would be possible for the gateway message placed on the bus by the gateway terminal to address (and control) the terminal

related to the appliance it is desired to control directly.

CLAIMS

1. Apparatus for controlling remote electrical appliances via the mains supply comprising a controller terminal for transmitting mains borne data packets and a plurality of remote terminals for controlling the electrical appliances in response to receipt of such data packets, each remote terminal being arranged to transmit, after a time delay, a mains borne data packet for the controller in response to receipt of a data packet from the controller for controlling an appliance associated with that terminal, in which there is provided a terminal capable of transmitting a mains borne data packet commencing in the time delay.

2. Apparatus as claimed in claim 1, in which the other terminals are arranged to refrain from transmitting mains borne data packets on detection of a mains borne data packet commencing in the time delay.

3. Apparatus as claimed in claim 1 or claim 2, in

which the terminal capable of commencing transmission of a data packet in the delay is arranged to commence transmission at a given time in the delay.

4. Apparatus as claimed in claim 3, in which the terminal which is capable of commencing transmission at a given time in the delay is capable of communicating with a handset by electro-magnetic or acoustic waves.

5. Apparatus as claimed in claim 4, in which the terminal and the handset are arranged to communicate by infra-red waves.

6. Apparatus as claimed in claim 4 or claim 5, in which the terminal capable of commencing transmission at a given time is also capable of commencing transmission at a second given time in the time delay in response to communication with a different handset.

7. Apparatus as claimed in any one of claims 3 to 6, in which the terminal that is capable of commencing transmission at a given time is capable of transmitting a safety or security message commencing at that time.

8. Apparatus as claimed in claim 7, in which all terminals are capable of commencing transmission at that time to indicate a failure associated with that terminal.

9. Apparatus as claimed in claim 8, in which the terminals are arranged to re-transmit a pseudo-random number of delay periods later in the event of non-receipt of an acknowledgement of the failure message from the the controller terminal.

10. Apparatus as claimed in any one of claims 3 to 9, in which the terminals are arranged to commence sampling the mains for data packets only at the given time in the time delay at which the terminal is capable of commencing transmission.

11. Apparatus as claimed in any one of claims 1 to 10, in which all terminals are arranged to synchronise with each other the timing within the time delay after the end of each data packet.

12. Apparatus as claimed in any one of claims 1 to 11, in which the controller is arranged to transmit

data packets which are not for controlling any appliance when there are no data packets to be transmitted for controlling an appliance, and each sort of data packet has a synchronisation code for synchronising clocks in the processors in each terminal.

13. Apparatus for controlling remote electrical appliances via the mains supply substantially as herein described with reference to the accompanying drawings.

14. A method of controlling remote electrical appliances via the mains supply comprising transmitting mains borne data packets from a controller terminal to a plurality of remote terminals to control electrical appliances, each remote terminal transmitting after a time delay, a mains borne packet to the controller in response to receipt of a data packet from the controller to control an appliance associated with that terminal, and a terminal being provided which transmits a main borne data packet commencing in the time delay.

15. A method for controlling remote electrical appliances via the mains supply substantially as herein described.

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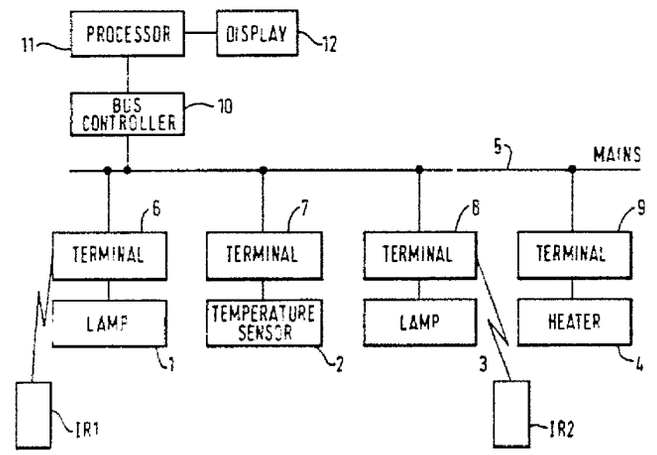
(56) Documents cited
None

(58) Field of search
UK CL (Edition J) **G4H HNEC HNNA HRCC H13F, H4R RTR RTSR RTSU**
INT CL[4] **H04Q**

(54) **Controlling remote electrical appliances via the mains supply**

(57) Remote electrical appliances (e.g. lamp 1, heater 4) are controlled via the mains using a controller terminal 10 for transmitting and receiving mains-borne data packets and a plurality of remote terminals 6 to 9 for controlling the appliances in response. Each terminal has a processor having a clock and the clocks may drift relative to each other. Then when data packets are sampled the bits may not be sampled in the optimum position i.e. the centre of the bit interval. To overcome this, each terminal samples (Fig. 8) at one rate to detect the presence or otherwise of a data packet, and samples at a faster rate, when a synchronisation waveform has been detected, to determine accurately the timing of a particular characteristic such as a rising edge in the synchronisation waveform, to enable the terminals to be synchronised and sampling at the optimum time without very rapid sampling.

FIG.1



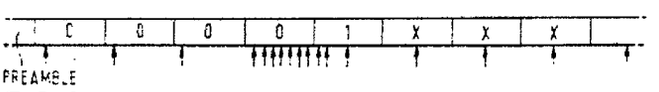


FIG 8

GB 2 229 024 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

FIG. 1

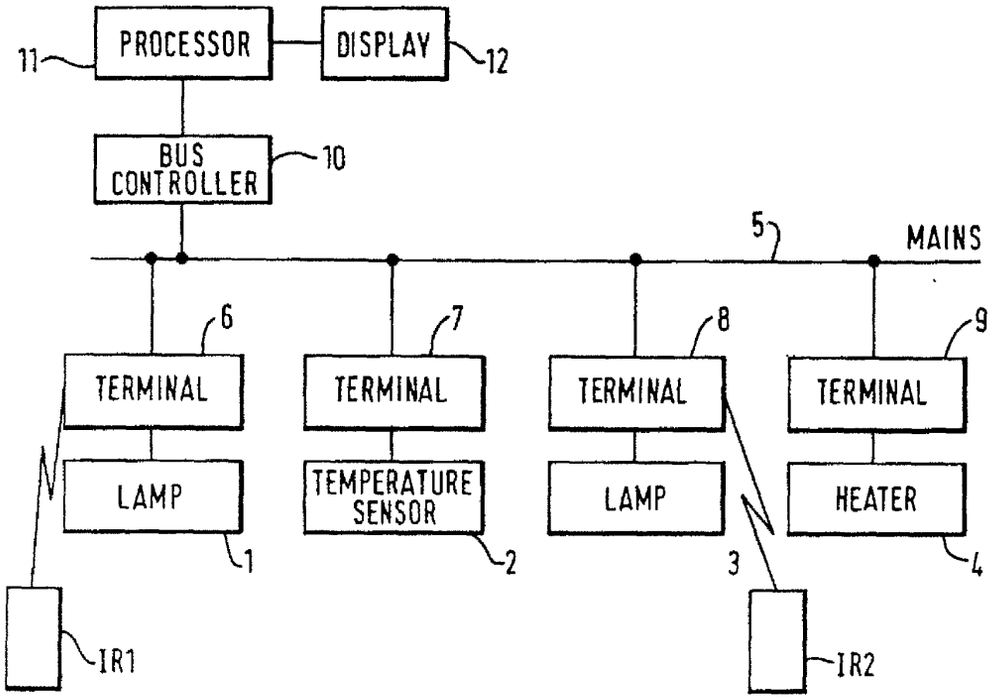
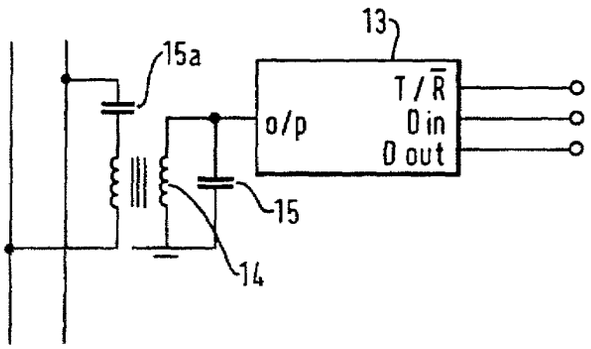


FIG. 2



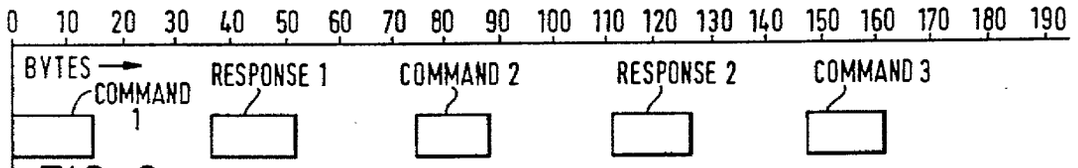


FIG. 3 HIGH BUS ACTIVITY

FIG. 4 LOW BUS ACTIVITY

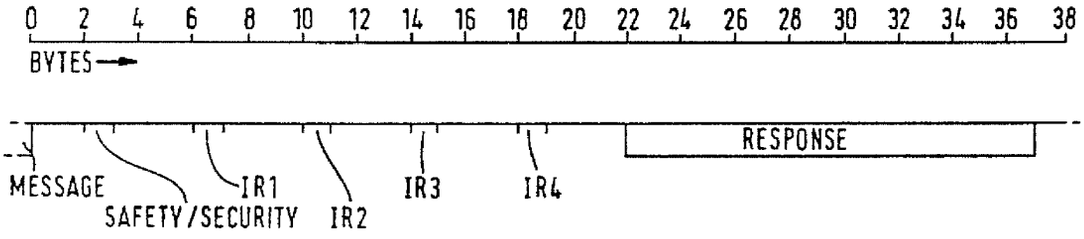


FIG. 5

FIG. 6

FIG. 7

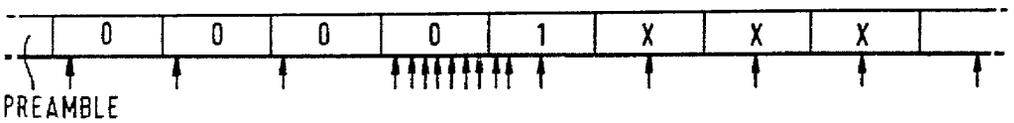


FIG. 8

Controlling Remote Electrical Appliances Via The Mains Supply

This invention relates to controlling remote electrical appliances via the mains supply.

This invention is particularly concerned with an arrangement having a control terminal for transmitting and receiving mains borne data packets and a plurality of remote terminals for controlling the electrical appliances in response to receipt of such data packets. Typically each remote terminal will be arranged to transmit a mains borne data packet for the controller in response to receipt of a data packet from the controller for controlling an appliance associated with that terminal.

Each terminal may have a processor and the clocks of the processors may drift very slightly over a period of time. This may result in some of the terminals sampling the waveforms at a non-optimum point, so that the message may be decoded erroneously, that is, unless very frequent sampling is employed which is itself undesirable.

The invention provides apparatus for controlling

remote electrical appliances via the mains supply, comprising a controller terminal for transmitting mains borne data packets and a plurality of remote terminals for controlling the electrical appliances in response to receipt of such data packets, each terminal being arranged to sample the mains at one rate to detect the presence or otherwise of data packets, and to sample the mains at a faster rate when a synchronisation waveform has been detected in order to determine accurately the timing of a particular characteristic in the synchronisation waveform, to enable the terminals to be synchronised.

The invention provides a method for controlling remote electrical appliances via the mains supply in which a controller terminal transmits and receives mains borne data packets and electrical appliances are controlled in response to receipt of such data packets by a plurality of data terminals, each terminal sampling the mains at one rate to detect the presence or otherwise of a data base packet and sampling the mains at a faster rate when a synchronisation waveform is detected to determine accurately the timing of a particular characteristic in the synchronisation waveform, and synchronising the terminals.

The higher speed sampling mode to detect the particular characteristic enables the terminals to be synchronised enabling all terminals to sample messages at the optimum point without continual very frequent sampling.

The particular characteristic may be a rising or falling edge, and the synchronisation wave form may include three bits of one parity eg. three 0's followed by one bit of the opposite parity eg. a "1", but preferably includes four bits of one parity followed by one bit of the opposite parity. Thus, the terminals may sample at a rate of once per bit of the data packets, and the detectors may be arranged to sample at a faster rate once two (or three in the case of four bits of the same parity) bits of the same parity have been detected. This will enable the rising or falling edge to be accurately detected, so that the terminals can be synchronised and sampling can be carried out at an optimum point in a following bit interval.

Apparatus for and a method of controlling remote electric appliances via the mains supply will now be described, by way of example, with reference to the accompanying drawings in which:

Figure 1 is a block diagram of the apparatus;

Figure 2 shows the interface between a terminal and the mains supply;

Figure 3 shows schematically an example of signals which could be present on the mains in a condition of high bus activity;

Figure 4 shows schematically an example of signals which could be present on the mains in a condition of low bus activity;

Figure 5 is an enlarged view of part of Figure 3;

Figure 6 shows an example of different signals which could be present on the bus, to the same scale as Figure 5;

Figure 7 shows the arrangement of bytes in the start of the messages and responses shown in Figures 3 and 4; and

Figure 8 shows a part of the synchronisation code on an enlarged scale.

Referring to Figure 1, a number of electrical appliances such as a lamp 1, a temperature sensor 2, a lamp

3, and a heater 4 are connected to the mains supply via respective terminals 6 to 9. Two of the terminals 6, 8 (gateway terminals) are provided with infra-red transmitter-receivers (not shown) to communicate with handsets IR1, IR2 also provided with transmitter-receivers. The terminals each include micro-processors which control the electrical appliances in accordance with data packets received from a bus (mains) controller terminal 10 which also includes a micro-processor, and which is in turn controlled by a micro-computer 11, which incorporates a display 12. The handsets IR1, IR2 also incorporate micro-processors, and terminals 6, 8 each include two micro-processors each, one for processing the infra-red signals communicated between the terminals and the handsets, and the other for receiving signals from and transmitting signals onto the mains.

Each terminal 6 to 9 and the controller 10 each include a transceiver chip 13 (Figure 2) which is controlled by the respective micro-processor of that unit. In particular, each chip includes three connections Din (data in), Dout (data out), and T/R connected to the respective micro-processor. When the connection T/R is high, the chip transmits data from the micro-processor to the mains, and when it is low, the chip receives data from

the mains. In the former situation, the output connection o/p transmits a carrier wave of approximately 15 volts peak to peak to the winding on one side of transformer 14, which forms a tuned circuit with capacitor 15. A blocking capacitor 15a connects the other winding to the mains. The transformer is 3:1 step-down transformer so that approximately a 5 volts peak to peak carrier wave is impressed on the mains voltage. In the case of a system for use within a household, a filter is provided at the fuse box to prevent the data packets being transmitted onto the mains outside the household, as well as to attenuate noise already on the mains that is being fed in. The chip uses frequency shift keying (FSK) the carrier frequencies being 130 or 134 kHz, and data can be transmitted and received at the rate of 2400 bits/second.

Referring to Figures 3 and 4, in a condition of high bus activity, messages will be transmitted by the controller terminal to respective remote terminals and, after predetermined delays, responses will be sent out by the respective remote terminals. The messages will be queued in the micro-computer 11 and fed to an internal queue in the controller 10 in turn at appropriate intervals. Thus, message 1 could be an instruction to turn lamp 1 on and message 2 could be an instruction to read

temperature. In each case, the message duration is 15 bytes (8 bits to a byte) although the message could be up to 43 bytes long. A message specifies where the message is being sent from, the destination to which it is being sent, and the data content representing the operation to be performed. After the message 1 is transmitted by the controller, each terminal receives it and start decoding it to ascertain if it is intended for that terminal. As soon as it terminal has decoded the signal sufficiently to ascertain that it is not intended for that terminal, it discards the remainder of that message.

When the terminal for which the message is intended confirms that the message is intended for itself, and after the message has itself ended, that terminal transmits, after a delay of 22 bytes from the end of the message, a response to the controller to confirm the message has been received. The response is in the same format as the message i.e. address of originating terminal, address of destination terminal and data content, and also lasts for a duration of 15 bytes (but could be up to 43 bytes).

The other terminals will also receive the response, and will discard them when they have read its destination address, so that only the controller will respond to the

data in it. After a delay of 22 bytes from the end of the response, the next message is sent out, and this could be for example an instruction to read temperature sensor 2.

The regular transmission of messages and receipt of responses only applies of course in a period of high bus activity eg. when the micro-computer is holding a stack of messages to be sent out. In a situation of low bus activity dummy messages of length 16 bytes are sent out at regular intervals, this time spaced by the longer interval of 87 bytes. The messages preserve the structure of the normal messages but do not result in any operation being preformed on any appliance. The purpose of these dummy messages is to maintain synchronisation of the terminals, each of which has its own clock. This will be explained hereinafter in detail with reference to Figures 7 and 8.

In either case of high or low bus activity, it will be noted that a delay follows each message or dummy message. This is made use of (Figure 5 and Figure 6) in the following way. Various given times in the delay are allocated to various functions to enable the controller to receive messages in the delay period.

Thus, safety/security or failure notification

messages from the terminals commence at the second byte, IR1 handset messages commence at the sixth byte, IR2 handset messages commence at the tenth byte, and there is provision for the fourteenth and the eighteenth bytes to be allocated to additional IR handsets. There are three bytes between those in which transmission can commence, to enable terminals to recognise that a data packet is being transmitted and hence inhibit transmission.

In a conventional bus communication system where a controller is provided, no terminal would be able to transmit onto the bus unless it had first received a message from the controller. It would in theory be possible to adapt this to the use of handsets in the sense that a handset would signal to a terminal that it wished to pass a message to the controller and the controller could periodically poll the terminals to ascertain if any messages were waiting. In practice, however, it would lead to an unacceptably long delay before the message had been communicated to the controller and a response had been received at the handset, unless very rapid poling was employed, which would be extremely inefficient on the bus time.

The allocated byte slots circumvent this problem

without substantially increasing the risk of collision.

Thus, IR1 can signal to terminal 6, or to any other gateway terminal able to receive and transmit infra-red radiation and, after sending an acknowledgement to the handset to confirm receipt of the message, the gateway terminal is ready to send a message to the controller. In the sixth byte slot after the end of a message, or a response to a message, or a dummy message, the terminal transmits its gateway message onto the mains.

The other remote terminals read this message and, since it is not addressed to them, discard it. However, where the last data packet on the mains was a message to a particular remote terminal, that terminal refrains from sending the response it was going to send. The controller receives the message and sends out an acknowledgement of duration 7 bytes to confirm detection of the message. At this point, the terminal that was due to send its response, having detected the acknowledgement now transmits its response. The controller then generates the appropriate message to fulfill the instruction given by the handset. This is followed by a response in the usual way.

Each terminal, that is controller or remote

terminals, has to count the "byte" slots in order to insert or look for a message at the appropriate time. Consequently, at the end of each message, or response, or gateway message or acknowledgement or dummy message, all terminals re-set so that the first byte following thereafter is counted as number one by all terminals. Similarly, IR2 and the two further possible handsets can have rapid access to the bus without destroying the collision avoidance arrangement.

The second byte slot is allocated to a safety/security and failure notification messages which need very rapid access to the bus for obvious reasons and, since they are transmitted in the second byte, this gives them priority of over all other messages. For example, one terminal could be connected to a smoke detector or another to a infra-red proximity detector focussed on an area outside the household using the system. Equally, a lamp could fail and its terminal would need to signal this. Thus, any remote terminal might need to send a message to the controller. Consequently, in the second byte, any such terminal can signal to the controller, which responds after a delay at the end of that message with a special acknowledgement to verify detection of the message. A suitable warning could be activated in the household. For

example, in the case of a proximity detector focussed on an area outside the front door, an image of any person outside could be inset on a television being viewed.

Such messages will not arise often, so the fact that collision is possible here will not cause a problem. In the event of two remote terminals attempting to transmit at the same time, the message will be garbled and the controller will not be able to detect any message. Thus, if the messages do not receive an acknowledgement, they each try to re-transmit in the second byte slot after a pseudo-random number of frames i.e. message-gap-response periods.

Referring to Figures 7 and 8, the method of synchronisation of the clocks in each of the terminals will now be described. The first two bytes of each message, response, dummy message or acknowledgement are respectively, a preamble and synchronisation code. The preamble is in the form of alternate 1 bits and 0 bits. All terminals are designed to synchronise to the carrier frequency, detect such a pattern, and set any automatic gain controls. The next byte of each data packet is a synchronisation code consisting of four 0 bits followed by 1 bit: the following three bits can each be either 0 or 1.

Each terminal samples the mains at the rate of once per bit. The need for the synchronisation code arises because each terminal has a separate clock which could drift relative to the others, perhaps only be a few hundereds of micro-seconds, between messages. While this might not matter if multiple samples, say, 2 or 4 per bit were employed, which carries the penalty of a resultant loss of background processing time, it does matter in the case where a single sample per bit is taken, because the sampling may then take place at a non-optimum point in a bit interval (i.e. not at the centre of the bit, the optimum point) causing the message to be decoded erroneously.

Consequently, referring to Figure 8, in the next byte, each terminal samples three 0's, because no matter where the sampling takes place in a time drifted period, three 0's will always be detected. Once three 0's have been detected, the processor of each terminal changes to a higher speed sampling mode (8 times per bit), awaiting the rising edge of the "1" following. If no "1" appears in the next two bit periods, then once per bit sampling is reverted to. This gives the processor of each terminal maximum time for other tasks. In an FSK environment, the

data line is very rarely stable in the presence of just noise, so the high speed sampling scheme is called for only occasionally.

Once a rising edge has been found, each processor waits for half a bit, and then reverts to sampling once per bit. The processors are now sampling at the optimum time in each bit.

The remainder of the synchronisation code is then read in and checked. If it is a valid code, then there is a high probability that a message has just appeared on the mains. If desired, the following byte can be coded to give a further check that the genuine data packet is being received. The message proper could then commence after this following byte.

If three 0's are detected, but a rising edge is not detected (i.e. a further 0 is detected), or if the remiander of the synchronisation code is found to be incorrect, the processors revert to their previous timing.

Of course, instead of looking for four 0's followed by a 1, the synchronisation code could instead use four 1's

followed by a 0. These five bits could appear in any position within a byte,. Further, a code consisting of three 0's and one 1 or three 1's followed by one 0, or consisting of two 0's followed by one 1 or two 1's followed by one 0, could be used instead, the principle of detecting the rising edge at a faster rate being the same.

Of course, various modifications may be made without departing from the scope of the invention thus, different message lengths, gap lengths and acknowledgement lengths as well as dummy message lengths may be employed. Equally, more infra-red slots could be provided in the inter-message gap. Also, all terminals could be provided with a infra-red communicating facility, including the controller, and the display of the controller could be provided with a touch-sensitive screen in order to enable commands to be entered at the controller. Further, although the infra-red communicating gateway terminals have been described as controlling an electrical appliance, they need not do so and could simply act as the interface between the infra-red handsets and the bus. Equally, although it has been stated that infra-red handset messages control the respective electrical appliance via the controller 10 (in the sense that the controller 10 issues the command to the remote terminal controlling the electrical appliance), it would be

possible for the gateway message placed on the bus by the gateway terminal to address (and control) the terminal related to the appliance it is desired to control directly.

CLAIMS

1. Apparatus for controlling remote electrical appliances via the main supply, comprising a controller terminal for transmitting and receiving mains borne data packets and a plurality of remote terminals for controlling the electrical appliances in response to receipt of such data packets, each terminal being arranged to sample the mains at one rate to detect the presence or otherwise of a data packet, and to sample the mains at a faster rate when a synchronisation waveform has been detected in order to determine accurately the timing of a particular characteristic in the synchronisation wave form, to enable the terminals to be synchronised.

2. Apparatus as claimed in claim 1, in which the synchronisation wave form includes three consecutive bits of the same value and each terminal is arranged to sample at a faster rate once two bits of the same value have been detected.

3. Apparatus as claimed in claim 1 or claim 2, wherein the particular characteristic is a rising or a falling edge.

4. Apparatus as claimed in claim 3, in which the synchronisation waveform includes three consecutive bits of one value followed by one bit of the opposite value.

5. Apparatus as claimed in claim 3 or claim 4, in which each terminal is arranged to delay the sampling for half a bit following detection of the rising or falling edge, and then to re-commence sampling.

6. Apparatus as claimed in any one of claims 1 to 5, in which each terminal is arranged to sample the mains at a rate of once per bit of the data packet before the synchronisation wave form has been detected.

7. Apparatus for controlling remote electrical appliances via the mains supply substantially as herein described with reference to the accompanying drawings.

8. A method for controlling remote electrical

appliances via the mains supply, in which a controller terminal transmits and receives mains borne data packets and electrical appliances are controlled in response to receipt of such data packets by a plurality of data terminals, each terminal sampling the mains at one rate to detect the presence or otherwise of a data base packet and sampling the mains at a faster rate when a synchronisation waveform is detected to determine accurately the timing of a particular characteristic in the synchronisation waveform, and synchronising the terminals.

9. A method for controlling remote electrical appliances substantially as herein described with reference to the accompanying drawings.

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