



[54] TIME DOMAIN CAPACITIVE FIELD DETECTOR

[76] Inventor: Harald Philipp, 4812 Scott Rd., Lutz, Fla. 33549

[21] Appl. No.: 578,464

[22] Filed: Dec. 26, 1995

[51] Int. Cl.<sup>6</sup> ..... F16K 31/02; E03C 1/05; G01R 27/26

[52] U.S. Cl. .... 137/1; 251/129.04; 4/623; 239/24; 324/677; 324/678

[58] Field of Search ..... 251/129.04; 4/623; 239/24; 222/52; 324/677, 678; 137/1

[56] References Cited

U.S. PATENT DOCUMENTS

3,333,160	7/1967	Gorski	.....	4/623 X
3,453,535	7/1969	Anglin	.....	324/677
3,551,919	1/1971	Forbes	.....	251/129.04 X
3,575,640	4/1971	Ishikawa	.....	4/623 X
3,588,038	6/1971	Tanaka	.....	4/623 X
3,761,805	9/1973	Dornberger	.....	324/677
4,149,231	4/1979	Bukosky et al.	.....	324/678 X
4,558,274	12/1985	Carusillo	.....	324/677
4,743,837	5/1988	Herzog	.....	324/678 X
4,806,846	2/1989	Kerber	.....	324/678
4,872,485	10/1989	Laverty, Jr.	.....	137/624.11
4,972,070	11/1990	Laverty, Jr.	.....	250/221
5,025,516	6/1991	Wilson	.....	4/623
5,033,508	7/1991	Laverty, Jr.	.....	137/624.11
5,159,276	10/1992	Reddy, III	.....	324/678
5,294,889	3/1994	Heep et al.	.....	324/678
5,329,239	7/1994	Kindermann et al.	.....	324/678
5,461,321	10/1995	Sanders	.....	324/678
5,570,869	11/1996	Diaz et al.	.....	251/129.04

OTHER PUBLICATIONS

G.J. Teh, I. Dendo, W. H. Ko; "Switched Capacitor Interface Circuit for Capacitive Transducers", Transducers '85. 1985 International Conference on Solid-State Sensors and Actuators. Digest of Technical Papers (Cat. No.85CH2127-9). Philadelphia, PA, USA. pp. 60-63. IEEE. Electrochem. Soc. NBS. US Nat. Inst. Health. et al. 11-14 Jun. 1985.

M. Yamada et al., "A Switched Capacitor Interface for Capacitive Pressure Sensors". IEEE Transactions on Instrumentation & Measurement, vol. 41, No. 1, Feb., 1992, pp. 81-86.

Linear Technology, Inc., Application Note 3, Jul. 1985.

Primary Examiner—John Rivell

Attorney, Agent, or Firm—David Kiewit

[57] ABSTRACT

A capacitive field sensor, which may be used for the control of a water supply valve in a basin or fountain, employs a single coupling plate to detect a change in capacitance to ground. The apparatus comprises a circuit for charging a sensing electrode and a switching element acting to remove charge from the sensing electrode and to transfer it to a charge detection circuit. The time interval employed for the charging and discharging steps can vary widely. Usually at least one of the charge or discharge pulses is on the order of a hundred nanoseconds, and is shorter in duration than a characteristic conduction time for a body of water disposed about the sensing plate. Thus, the sensor can detect the presence of a user near a controlled faucet without being subject to measurement artifacts arising from standing water. In a controller for a water basin, a short charge or discharge pulse duration may be used when the controlled valve is closed, and a longer duration, which allows conduction through the water, may be used when the valve is open. The long duration measurement can detect the continued presence of the user as long as the user's hand remains in the stream of water.

63 Claims, 7 Drawing Sheets

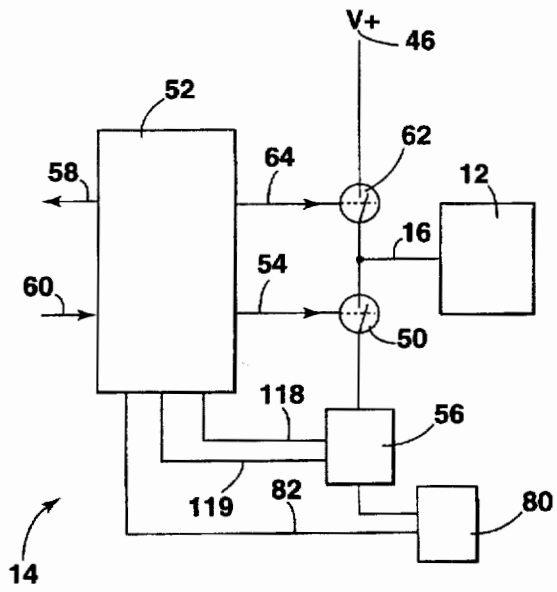


Figure 1

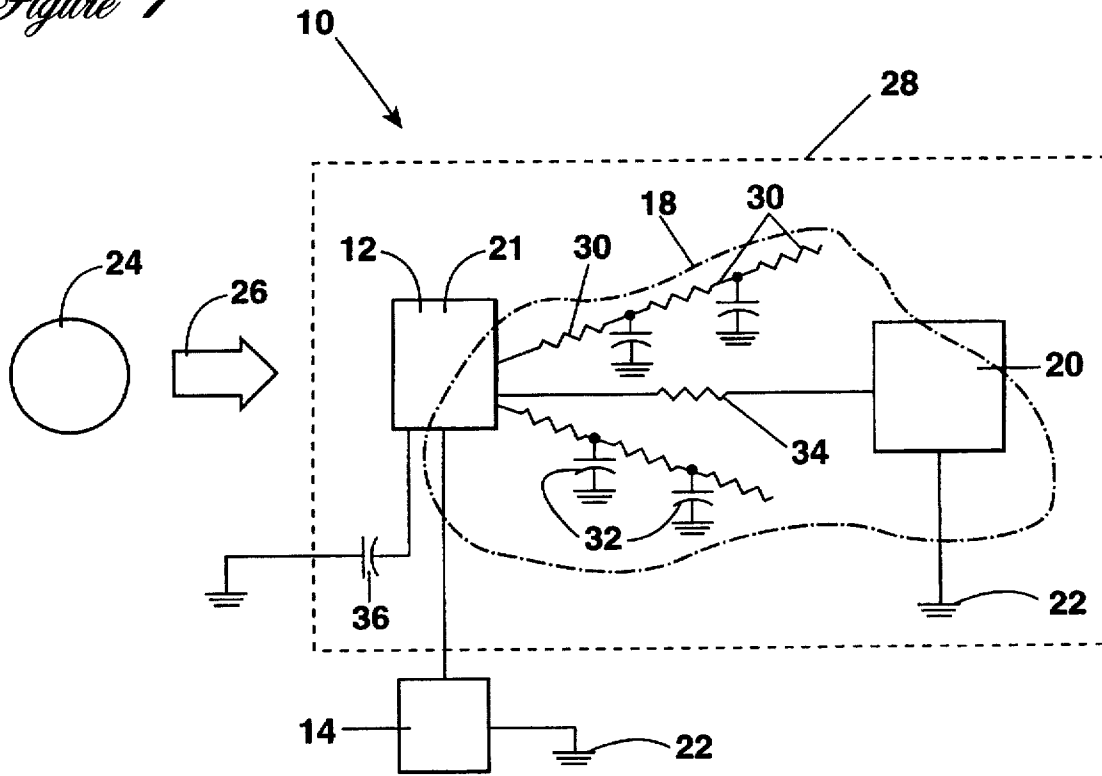


Figure 2

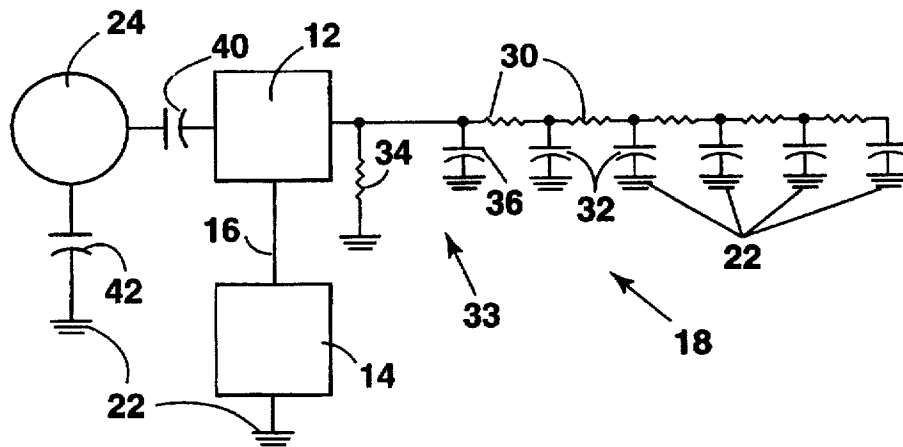


Figure 3

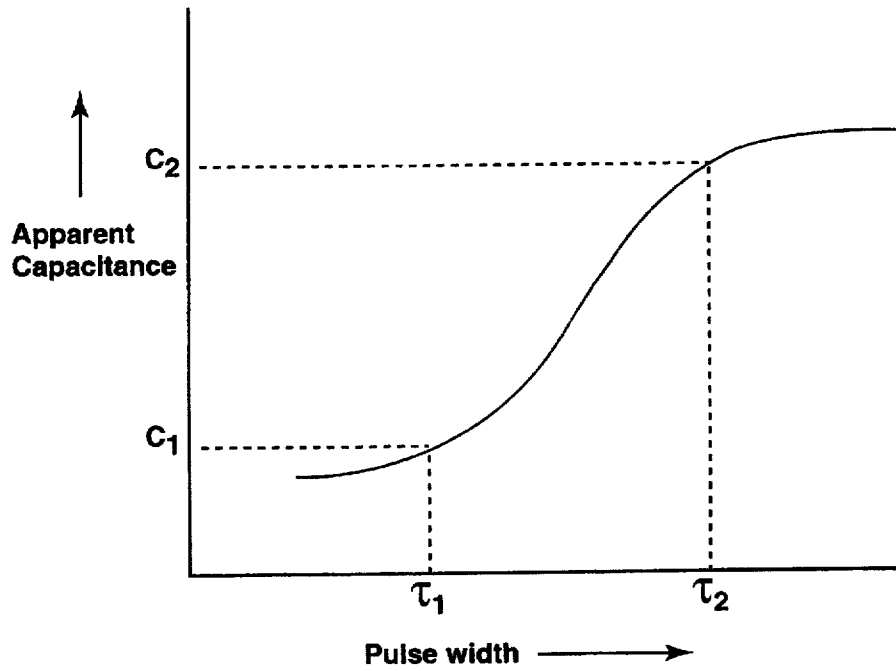


Figure 4

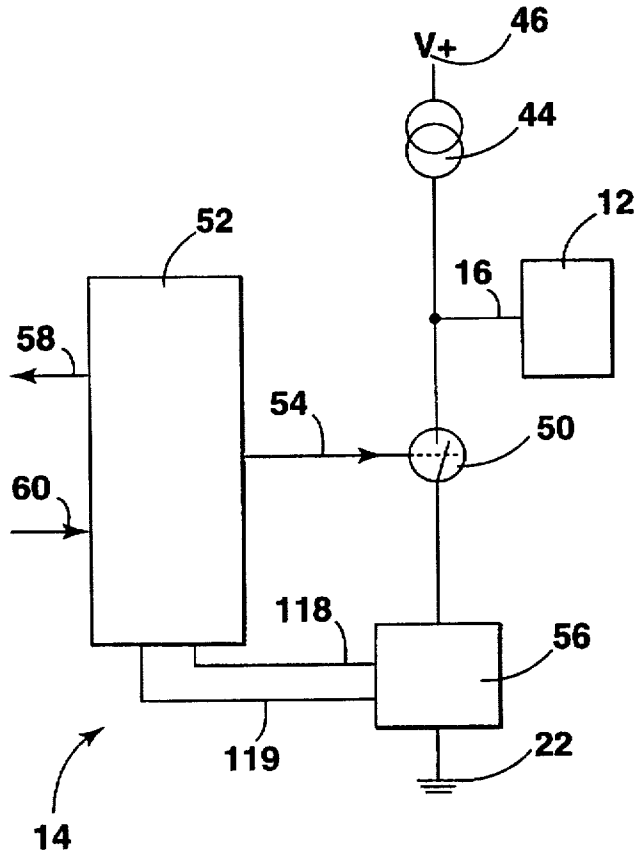


Figure 5

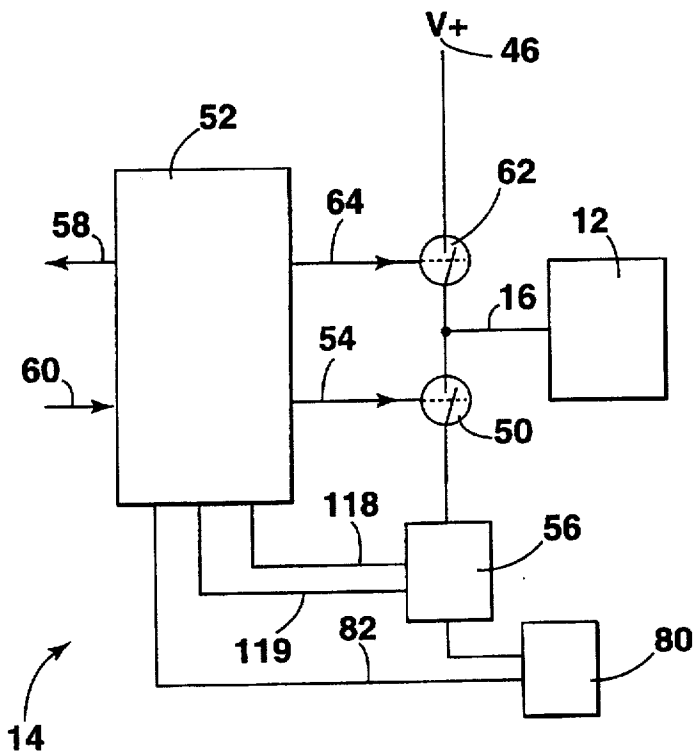


Figure 6

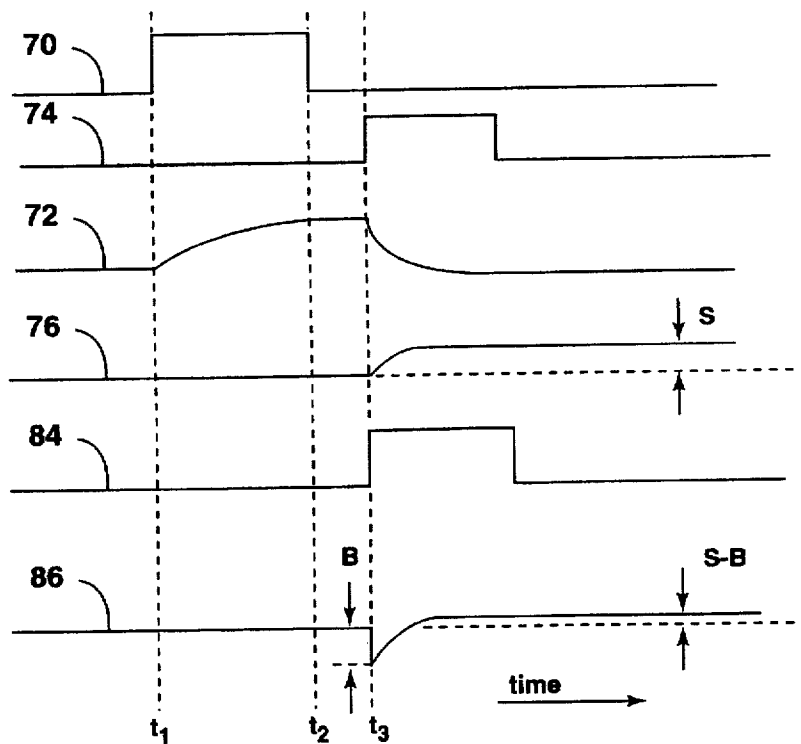
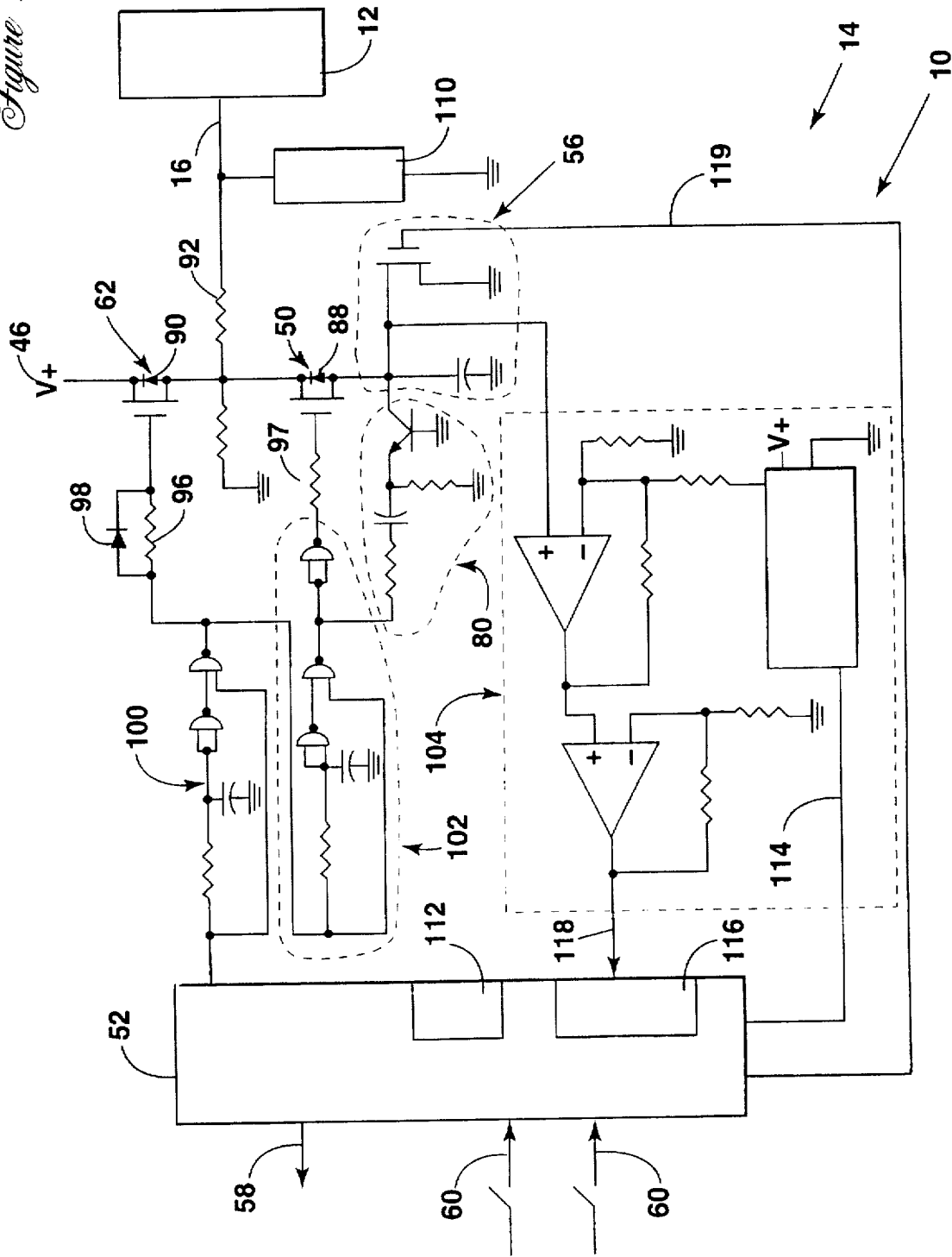


Figure 7



# Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

## Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

## Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

## Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

## API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

## LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

## FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

## E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.