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United States Patent [19]

Pommier et al.

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[45] Date of Patent: Mar. 2, 1993

[54] **METHOD FOR BROADCASTING OF DIGITAL DATA, NOTABLY FOR RADIO BROADCASTING AT HIGH THROUGHPUT RATE TOWARDS MOBILE RECEIVERS, WITH TIME FREQUENCY INTERLACING AND ANALOG SYNCHRONIZATION**

[75] Inventors: **Daniel Pommier**, Breal Sur Montfort; **Bernard LeFloch**, Rennes, both of France

[73] Assignees: **Etat Francais and Telediffusion de France S.A.**, France; **Etat Francais and Telediffusion de France S.A.**, France

[21] Appl. No.: **777,463**

[22] Filed: **Oct. 17, 1991**

[30] **Foreign Application Priority Data**

Nov. 18, 1988 [FR] France 88 15216

[51] **Int. Cl.**[5] **H04J 11/00**; H04L 27/28

[52] **U.S. Cl.** **370/18**; 370/21; 370/50; 370/69.1; 370/70; 375/38; 375/58; 455/59

[58] **Field of Search** 370/18, 19, 21, 23, 370/50, 69.1, 70, 100.1, 101, 105.4, 105.5, 111; 375/38, 40, 58, 60, 99, 101, 107, 108, 111, 112, 113; 455/50, 54, 59, 63; 358/12, 142, 143; 381/2, 13, 14; 371/43, 46

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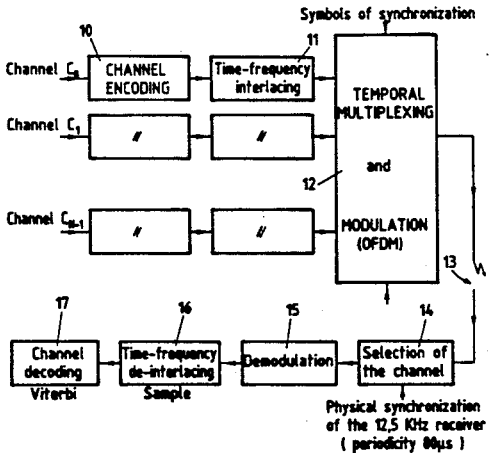
Primary Examiner—Benedict V. Safourek
Assistant Examiner—Alpus H. Hsu

[57] **ABSTRACT**

A method for the diffusion of digital data designed to be received notably by mobile receivers moving in an urban environment, that is, in the presence of stray signals and jamming, and in conditions of multiple propagation (Rayleigh process) Providing an optimized mode of setting up the frame structure of the broadcast signal, so as to derive the maximum benefit from the resistance of the system to pulsed stray signals and to jamming. The header of each frame has a first empty synchronization symbol and eventually a second, unmodulated wobbled signal forming a two-stage analog synchronization system. So, the recovery of synchronization is achieved in an analog way, without prior extraction of a clock signal at the binary level. The constitution of the sequence of the useful symbols in the frame results from temporal and sequential interlacing operations, combined to obtain an implicit de-interlacing at the receiver. The empty symbol may be further used for the extraction of the jamming affecting the transmission channel.

13 Claims, 5 Drawing Sheets



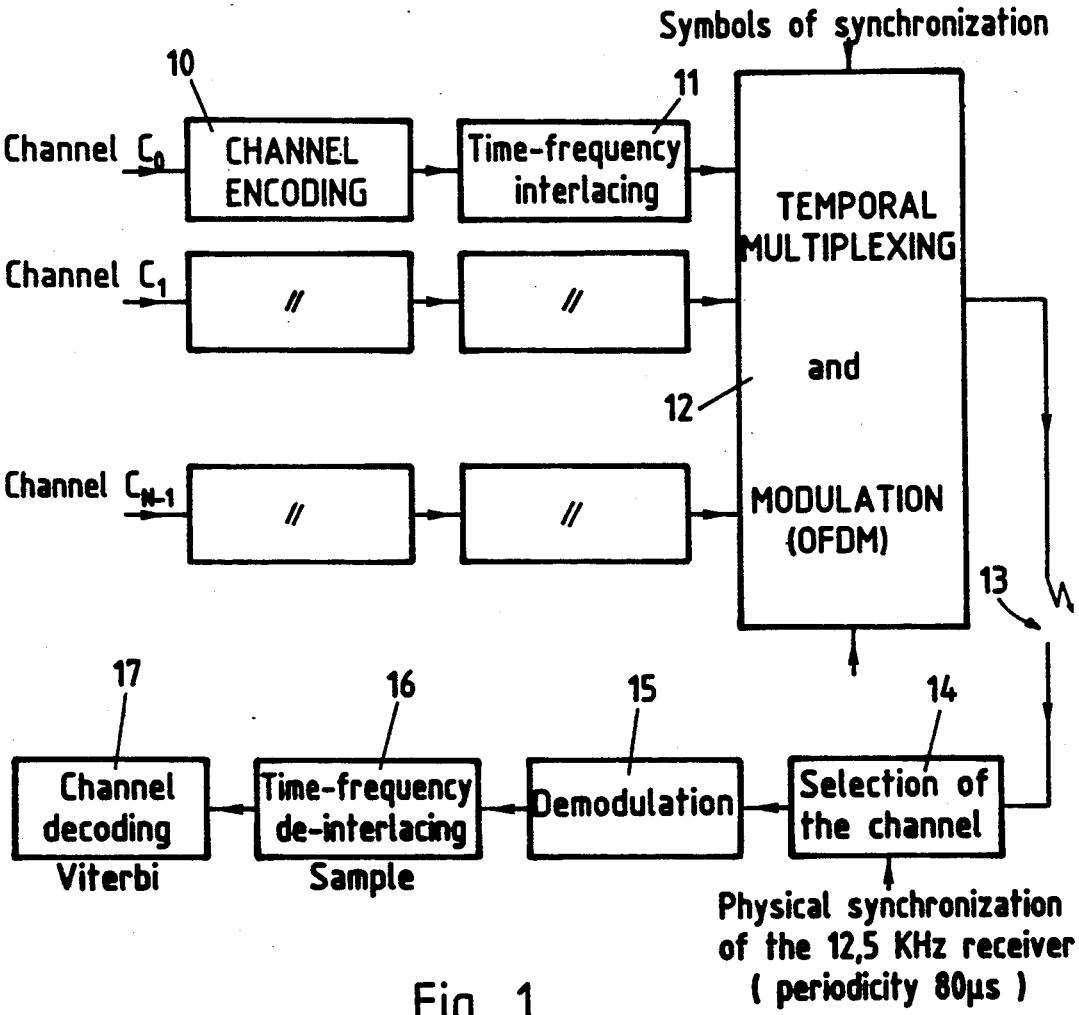


Fig. 1

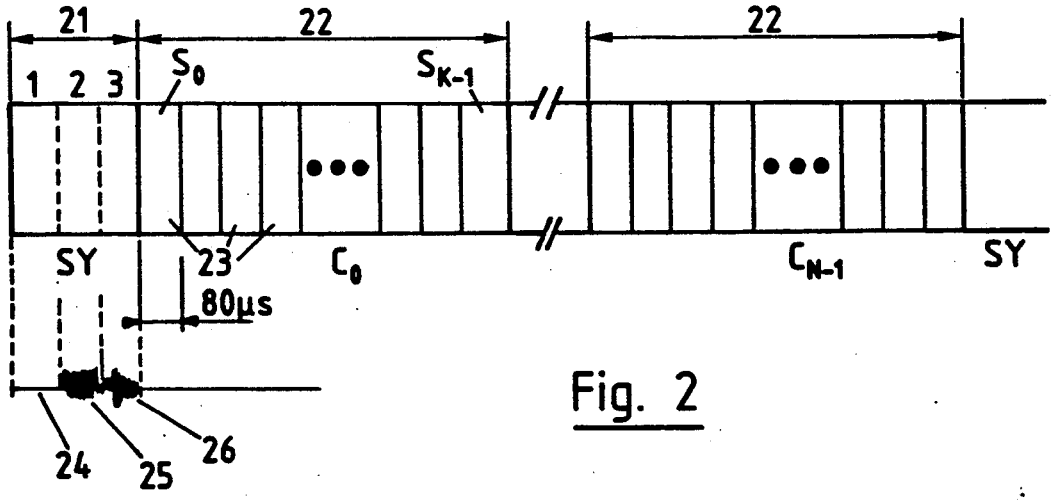


Fig. 2

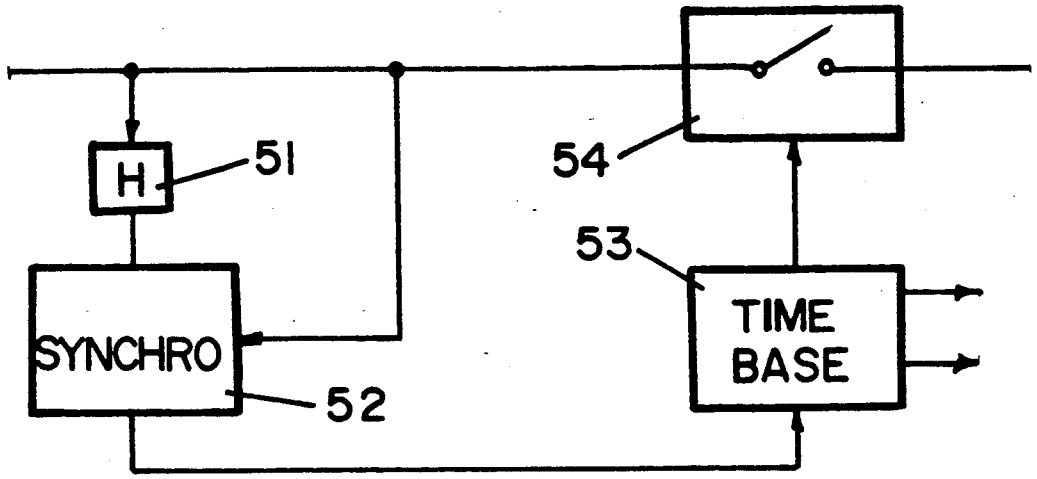


FIG. 3a (Prior Art)

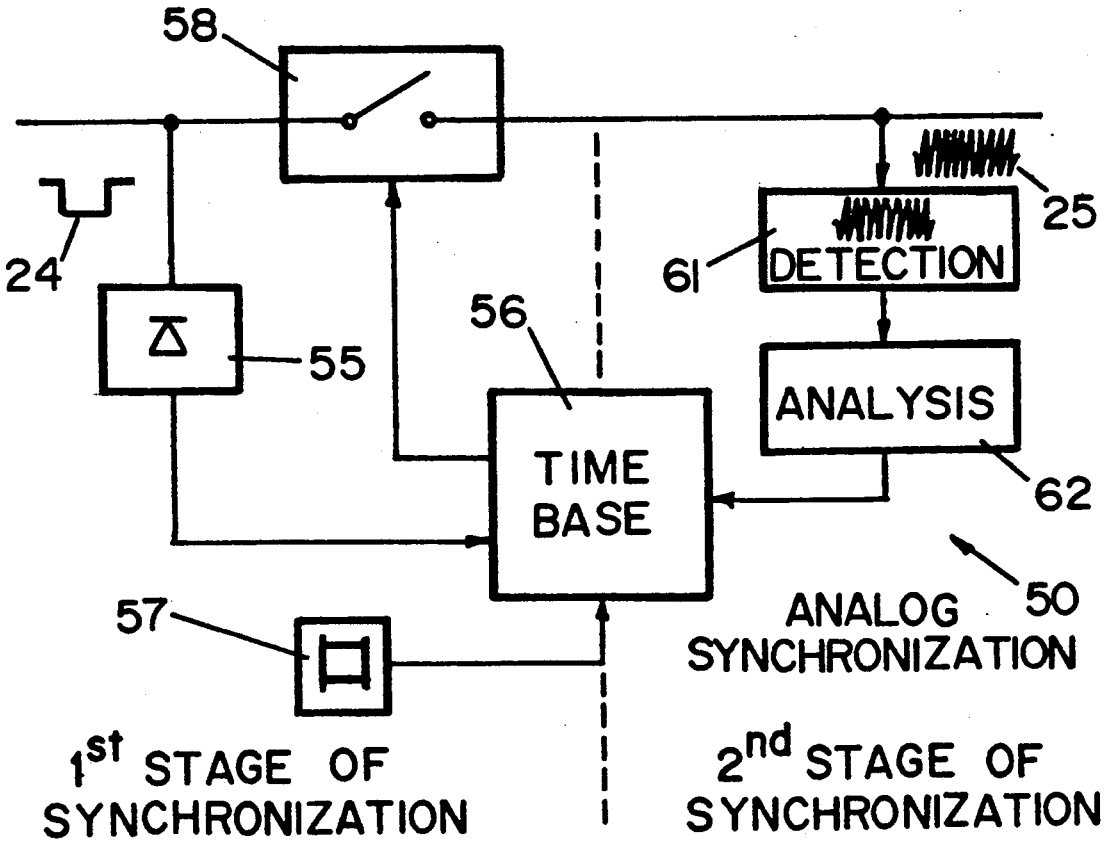


FIG. 3b

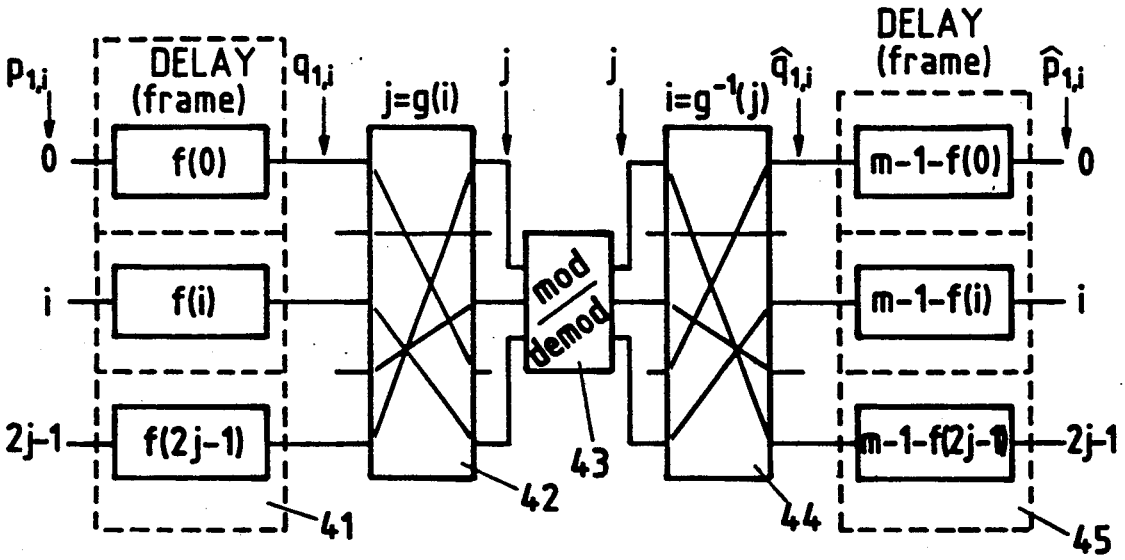


Fig. 4

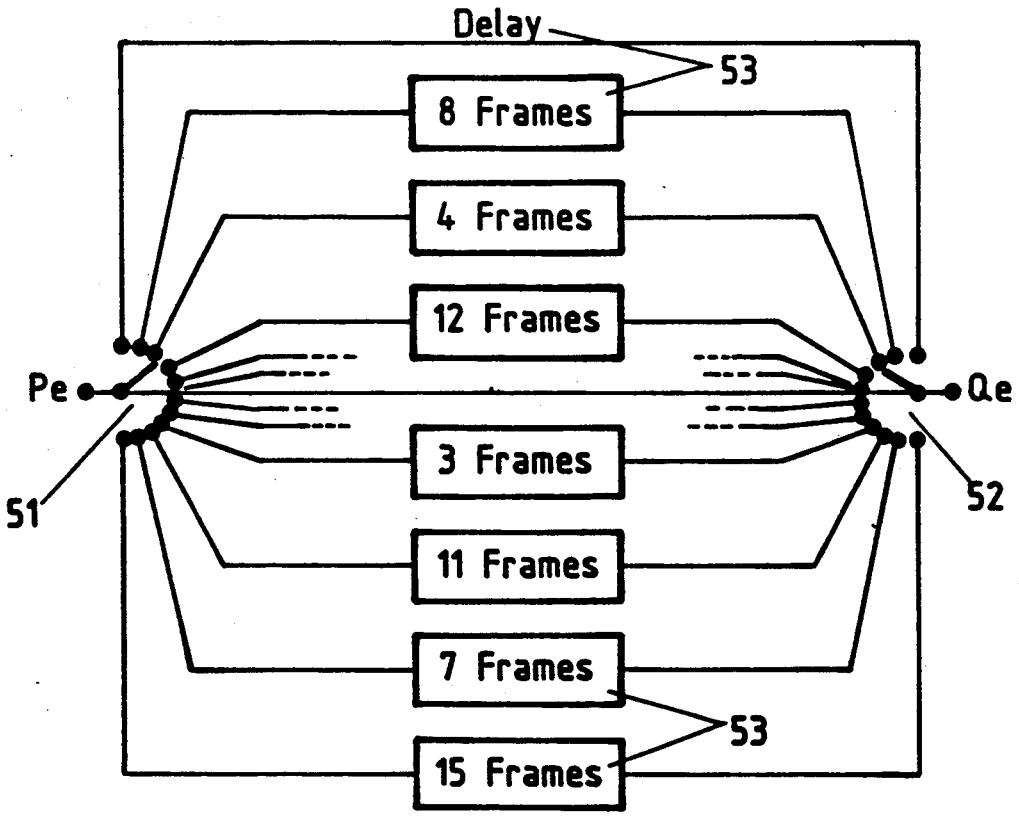


Fig. 5

ĩ	i=F(i)	i
0	0	
1	256	
2	128	0
3	384	1
4	64	2
5	320	3
6	192	4
7	448	5
8	32	6
9	288	7
10	160	8
11	416	9
12	96	10
13	352	11
14	224	12
15	480	13
16	16	
17	272	14
⋮	⋮	⋮
495	495	
496	31	
497	287	434
498	159	435
499	415	436
500	95	437
501	351	438
502	223	439
503	479	440
504	63	441
505	319	442
506	191	443
507	447	444
508	127	445
509	383	446
510	255	447
511	511	

Fig. 6

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