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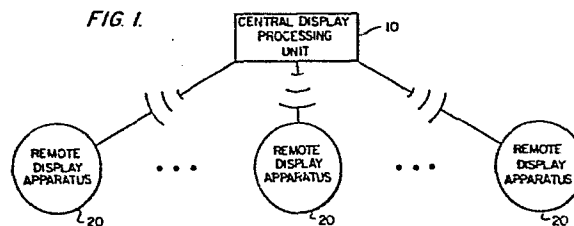
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54 **Programmable electronic vehicular display system.**

57 A programmable electronic vehicular display system having a central display processing unit for selectively programming and radio-transmitting information to remote vehicular display apparatus which display this information in the form of messages, advertisements, news, pictures or the like to the public in proximity to the vehicle. Each remote vehicular display apparatus can be automatically and individually programmed by the control display processor without driver intervention and can also be locally programmed by the driver of the vehicle to display such information as the vehicle destination. The remote display apparatus includes a matrix display panel mounted on the roof of the vehicle and having a plurality of display elements selected from one of light emitting diodes, gas discharge display elements or liquid crystal display elements. Thus, many different types of information can be displayed quickly and can be perceived readily by persons in proximity to the vehicle.

FIG. 1.



PROGRAMMABLE ELECTRONIC VEHICULAR DISPLAY SYSTEM

BACKGROUND OF THE INVENTION

The present invention is directed to an electronic display system for vehicles, especially commercial vehicles such as taxi cabs. In particular, the present invention relates to a system having a central display processor for selectively programming and radio transmitting information to remote vehicular display apparatus which display this information in the form of messages, advertisements, news, pictures or the like to the public in proximity to the vehicle.

The system enables each vehicle of a fleet of vehicles to be utilized as a communication media for instantaneously informing the public of the latest news or for displaying advertisements to the public relating to the locale of each vehicle. Since each remote display apparatus can be automatically and individually programmed by the central display processor without driver intervention, it can be reprogrammed as the vehicle travels to display information pertinent to the new location of the vehicle. Thus, taxis traveling in the business district of a city could display the latest business news, while other taxis could display certain advertisements related to the particular area in which such taxis are travelling. Furthermore, each remote vehicular display apparatus can also be locally programmed by the driver of the vehicle to display such information as the vehicle destination.

The principle disadvantage of conventional vehicle display systems is the inability to electronically, selectively and quickly display many different types of information on one or more vehicles for viewing by the public in proximity to those vehicles.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a programmable electronic display system for selectively displaying information on respective groups of remote vehicular display apparatus.

A further object of the present invention is to provide a programmable electronic display system capable of displaying many different types of information, such as messages, advertisements and graphics, on respective groups of remote vehicular display apparatus.

Another object of the present invention is to provide a programmable electronic display system capable of selectively displaying different information on respective groups of remote vehicular display apparatus, under the automatic control and direction of a central display processing unit.

Still another object of the present invention is to provide a programmable electronic display system having the aforesaid features and which is further capable of selectively displaying information on a remote vehicular display apparatus in accordance with manual inputs to the remote display apparatus.

Yet a further object of the present invention is to provide a programmable electronic display system having the aforesaid features and which is suitable for commercial display of many different types of information easily visible to the public in proximity to the vehicle.

Additional objects and advantages of the invention will be set forth in part in the description which follows, and in part will be obvious from the description, or may be learned by the practice of the invention. The objects and advantages of the invention may be realized and obtained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

To achieve the foregoing objects and in accordance with the purpose of the invention, the programmable electronic vehicular display system of the present invention comprises: (1) a plurality of remote vehicular display apparatus, each including (a) receiving means for receiving information to be displayed, and for providing first signals indicative of the received information, (b) local processing means, operatively connected to the receiving means and operatively connected to receive manual inputs, for receiving the first signals, for receiving the manual inputs, and for providing display signals indicative of the first signals and the manual inputs, and (c) display means, operatively connected to the local processing means, for displaying information responsive to the display signals; and (2) central display processing means for selecting desired ones of the remote display apparatus and radio transmitting to the receiving means control information, including the information to be displayed.

In a preferred embodiment of the display system of the present invention, the display means comprises an elongated matrix display panel mounted on the roof of the vehicle for displaying advertisements, graphics, news, and the like, such that they can be perceived by persons in proximity to the

vehicles. The matrix display panel includes a matrix of light emitting diodes, a gas discharge display, a liquid crystal display, or incandescent lights.

BRIEF DESCRIPTION OF THE DRAWINGS

5 The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate an embodiment of the present invention and, together with the description, serve to explain the principles of the invention.

10 Fig. 1 is a block diagram of the overall vehicular display system of the present invention, wherein the central display processing unit transmits information to the remote display apparatus;

Fig. 2 is a block diagram of the remote vehicular display apparatus of the present invention;

15 Fig. 3 illustrates the general logic flow of the central display processing unit; and

Fig. 4 illustrates the general logic flow of the local processing unit associated with each remote vehicular display apparatus.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

20 Reference will now be made in detail to the present preferred embodiments of the invention, examples of which are illustrated in the accompanying drawings. In the following description, similar elements are labeled with like reference numerals in each of the figures.

25 Referring to Fig. 1, the overall electronic vehicular display system includes a plurality of remote vehicular display apparatus 20 and a central display processing means 10 for

vehicular display apparatus 20. Each remote vehicular display apparatus 20 can be separately addressed by the central display processing means 10. Thus, the central display processing means 10 can broadcast information to all of the remote vehicular display apparatus 20 or transmit individual messages to selected ones of the remote vehicular display apparatus 20. Since, in accordance with the present invention, the remote vehicular display apparatus 20 is associated with a vehicle 40, as illustrated in Fig. 2, selectively transmitting information to respective ones of the remote vehicular display apparatus 20 provides an efficient means for distributing information pertinent to the varying location of each of the remote vehicular display apparatus 20. Thus, the remote vehicular display apparatus 20 constitute a message distribution system, wherein each node of the system (i.e., remote vehicular display apparatus 20) is operationally controlled by the central display processing means 10 without intervention by the driver of the vehicle. The system also provides for the remote vehicular display apparatus 20 to be locally programmed by the vehicular driver.

Fig. 2 illustrates an arrangement for the remote vehicular display apparatus 20. As shown, the remote vehicular display apparatus 20 is associated with vehicle 40, such as a taxicab. The remote vehicular display apparatus 20 includes receiver means 25 for receiving information to be displayed from the central display processing means 10 and for providing first signals indicative of the received information. A local processing means 30 is operatively connected to the receiving means 25 and operatively connected to receive manual inputs from local manual unit 50. The local processing means 30 receives first signals from the receiving means 25 and manual inputs from the vehicular

signals and the manual inputs. The remote display apparatus 20 further includes display means 35 operatively connected to the local processing means 30 for displaying information in accordance with either the manual inputs or the information received from the central display processing means 10 via receiving means 25.

The receiving means 25 illustrated in Fig. 2 can comprise a conventional radio receiver for receiving the information transmitted by the central display processing means 10. The information can be radio transmitted by the central processing means 10 in any conventional manner, such as amplitude modulation, frequency modulation, pulse code modulation or pulse-width modulation. Additionally, to provide a degree of security for the message distribution system, the transmitted information can be encoded or include a security code to prevent unauthorized reception and display of the transmitted information.

Fig. 4 shows the general logic for the local processing means 30. The processing means 30 can comprise a conventional microprocessor unit. Essentially, the display processing task of the local processing unit 30 includes the following steps. In step 1, the local processing unit detects if a message is being received. On detecting that a message is being received, the local processing unit then decides, in step 2, whether the message originated from the local manual inputs of the vehicular driver /or from the central display processing unit 10. If the message is from the central display processing unit, the local processing unit, in step 3, receives the information to be displayed. In step 4, the message received from either the local manual inputs or the central display processing unit is displayed on the display means 35. Following step 4, the processing of the

message. The local processing unit 30 can include further processing to refresh display means 35; thus, reducing the hardware requirements for display means 35.

Display means 35, as embodied herein and shown in Fig. 2, comprises an elongated matrix display unit mounted on the roof of the vehicle and includes a matrix of small elements enabling both messages and graphics to be displayed. The matrix display elements of display unit 35 preferably comprise light emitting diodes, elements of a gas discharge display, or elements of a liquid crystal display. The displayed information can be under the control of the local processing unit or conventional matrix display unit drive hardware. The control of the matrix display unit 35 enables the displayed information to be normally on, flash or roll across the display matrix. With the foregoing arrangement of the matrix display unit 35 operatively controlled by the local processing means 30 via receiving means 25, information of all different types can be selectively and instantaneously displayed to persons in proximity to the vehicle 40.

Fig. 3 illustrates the general logic flow for the central display processing means 10. The remote vehicular display apparatus processing of the central display processing unit 10 comprises the following steps. In step 1, the remote vehicular display apparatus processing includes waiting for a message to be radio transmitted to the remote vehicular display apparatus 20. Upon detecting that a message should be transmitted, the processing, in step 2, determines whether or not the message should be transmitted to all of the remote vehicular display apparatus, or to a selected one or ones of the apparatus. If the message is to be transmitted to all the remote vehicular display apparatus, then in step 3. the message is transmitted to all of

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the remote vehicular display apparatus, after which the processing returns to step 1 to await a new message. If, however, the message is to be transmitted only to specific remote vehicular display apparatus, then in step 4, the central display processing unit addresses those remote vehicular display apparatus that are to receive the message. Next, the central display processing unit, in step 5, transmits the message to the addressed remote vehicular display apparatus. Following the transmission of the message, the processing returns to step 1, to await a new message. With the foregoing automatic and selective message processing by the central display processing means 10, information can be selectively displayed to particular segments of the public in various locations of a city who are in proximity to the remote display apparatus of the vehicles in those city locations.

In accordance with the invention, the central display processing means 10 could be incorporated as an element or subsystem into a vehicle communication, tracking and identification system, such as for commercial taxicabs. Such a vehicular communication, tracking and identification system is disclosed in the commonly-assigned U.S. patent No. 4,414,661

filed July 2, 1981 entitled "Apparatus for Communicating With A Fleet of Vehicles" and U.S. patent application Serial No. 384,641 filed June 3, 1982 entitled "Vehicle Locating System", and the system disclosure is incorporated by reference herein.

In such a system, the vehicle is capable of identifying itself to a central based station including the display processing unit 10, and the receiving means 25 is adapted to receive information from the central station. The communication between the vehicle and the central station is based upon time division multiplexing.

Initially, a vehicle transmits its identification code to the central station. The central station responds by transmitting the identification code of the central station and a clock synchronizing signal to synchronize communications between the central station and the vehicle. Thereafter, the central station transmits information such as text to the vehicle.

Furthermore, this system can be adapted to include an automatic vehicle locating system. To locate vehicles, traffic detectors including, for example, induction loops, are positioned in streets throughout the operating area of the vehicles employed in the programmable electronic vehicular display system. Each traffic detection circuit is adapted to transmit a position code to a vehicle. The position code identifies the position of the detector. The receiving means 25 of each vehicle is adapted to receive this position code and this position code is then transmitted to the central station. Based on this position code, the central station determines the position of the vehicle. One use of the position code by the central station is to supply the code to the central display processing unit 10 which can automatically update messages displayed on the vehicles as the vehicles move from region to region.

It will be apparent to those skilled in the art that modifications and variations could be made to the above programmable electronic vehicular display system in accordance with the teachings of the invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention within the scope to the appended claims and their equivalents.

CLAIMS

WHAT IS CLAIMED IS:

1. A programmable electronic vehicular display system comprising:

(a) a plurality of remote vehicular display apparatus, each including--

(i) receiving means for receiving information to be displayed, and for providing first signals indicative of said received information,

(ii) local processing means, operatively connected to said receiving means and operatively connected to receive manual inputs, for receiving said first signals, for receiving said manual inputs, and for providing display signals indicative of said first signals and said manual inputs, and

(iii) display means, operatively connected to said local processing means, for displaying information responsive to said display signals; and

(b) central display processing means for selecting desired ones of said remote display apparatus and radio

transmitting to said receiving means control information, including said information to be displayed.

2. A display system according to claim 1, wherein said display means displays said information such that the information can be perceived by persons in proximity to the vehicle.

3. A display system according to claim 2, wherein said display means comprises matrix display means having a plurality of display elements selected from one of light emitting diodes, gas discharge display elements and liquid crystal display elements.

4. A display system according to claim 2, wherein said matrix display element comprises an elongated matrix display panel mounted on the roof of the vehicle.

5. A display system according to claim 2, wherein each of said remote display apparatus has an address, and said control information further includes address information corresponding to the addresses of said desired ones of said remote remote display apparatus, and wherein said receiving means includes means for receiving and recognizing the address information corresponding to the address associated with said remote display apparatus.

6. A display system according to claim 2, wherein said display means can display different types of information in the form of advertisements, graphics and news.

7. A display system according to claim 1, wherein each of said remote display apparatus has an address, and said controlled information further includes address information corresponding to the addresses of said desired ones of said remote vehicular display apparatus, and wherein said receiving means includes means for receiving and recognizing the address information corresponding to the address associated with said remote display

8. A display system according to claim 5, wherein said control information further includes security code information, and wherein said receiving means further includes means for receiving and recognizing the security code information, and for enabling the display of the information to be displayed in response to recognizing said security code information.

9. A display system according to claim 7, wherein said control information further includes security code information, and wherein said receiving means further includes means for receiving and recognizing the security code information, and for enabling the display of the information to be displayed in response to recognizing said security code information.

10. A display system according to claim 5, wherein at least part of said control information is encoded, and said receiving means further includes means to decode said encoded control information.

11. A display system according to claim 7, wherein at least part of said control information is encoded, and said receiving means further includes means to decode said encoded control information.

12. A display system according to claim 2, wherein said control information includes vehicle identification information and destination information, and said vehicular display system further comprises-- means for transmitting the location of the vehicle to the central display processing means; vehicle display means for displaying said vehicle destination information, and wherein said receiving means includes means for receiving said vehicle identification information and destination information, operatively connected to said display means.

FIG. 1.

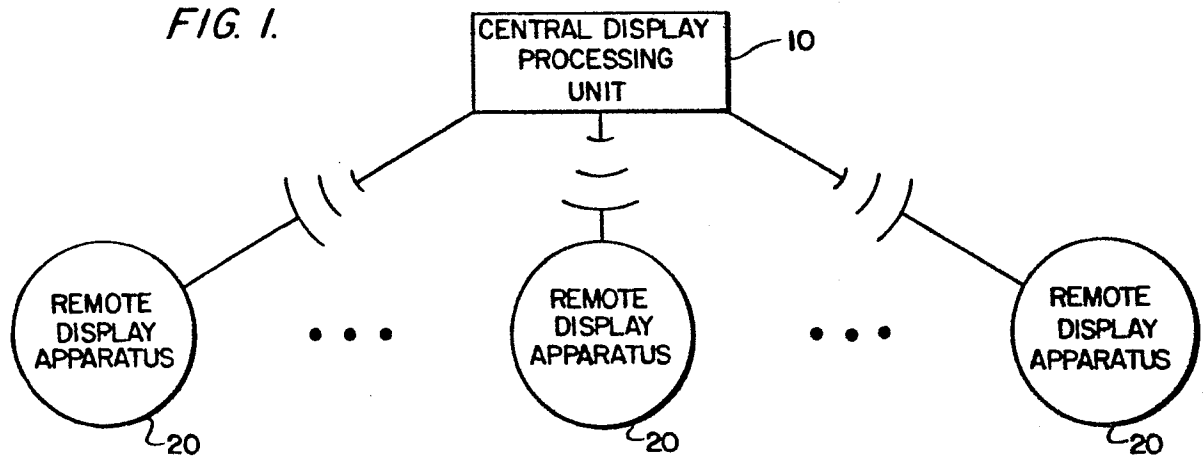
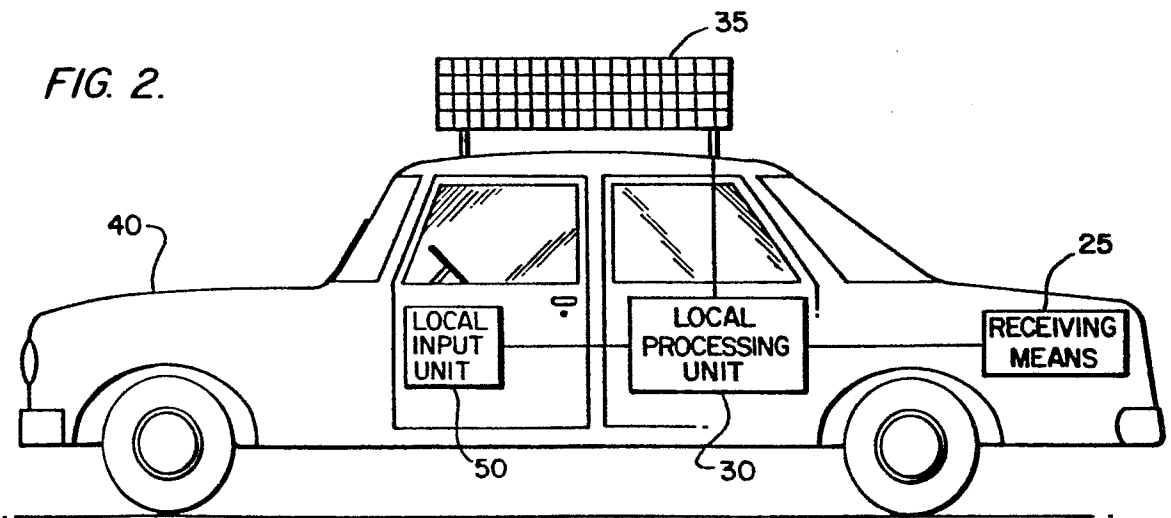


FIG. 2.



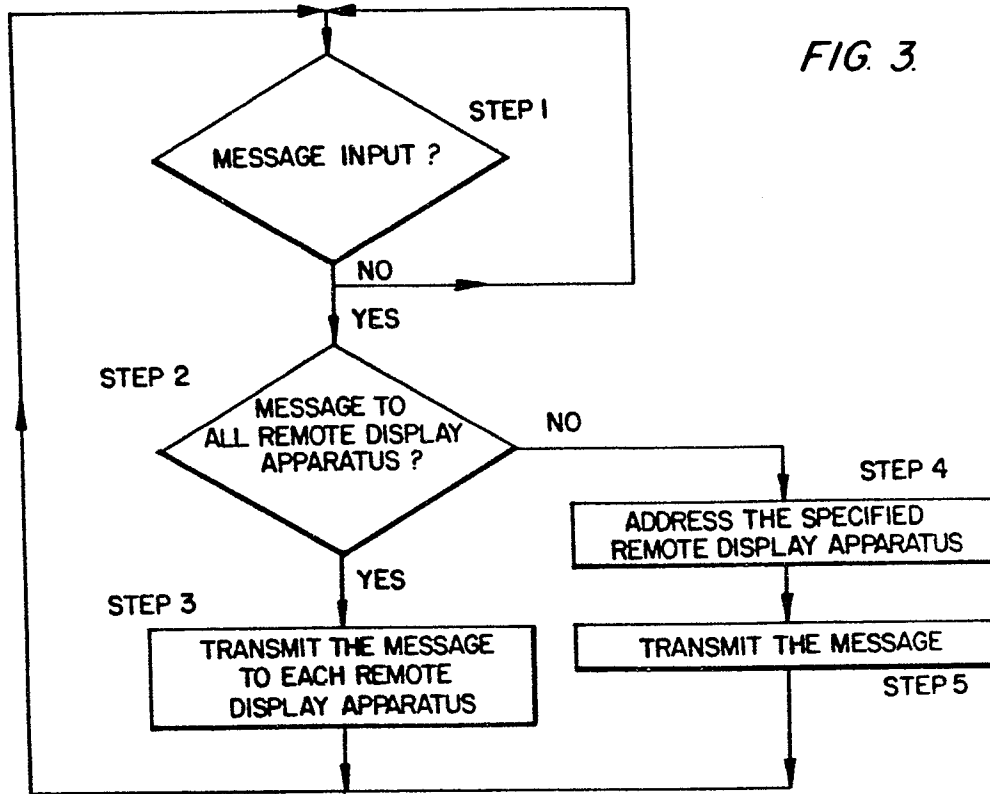
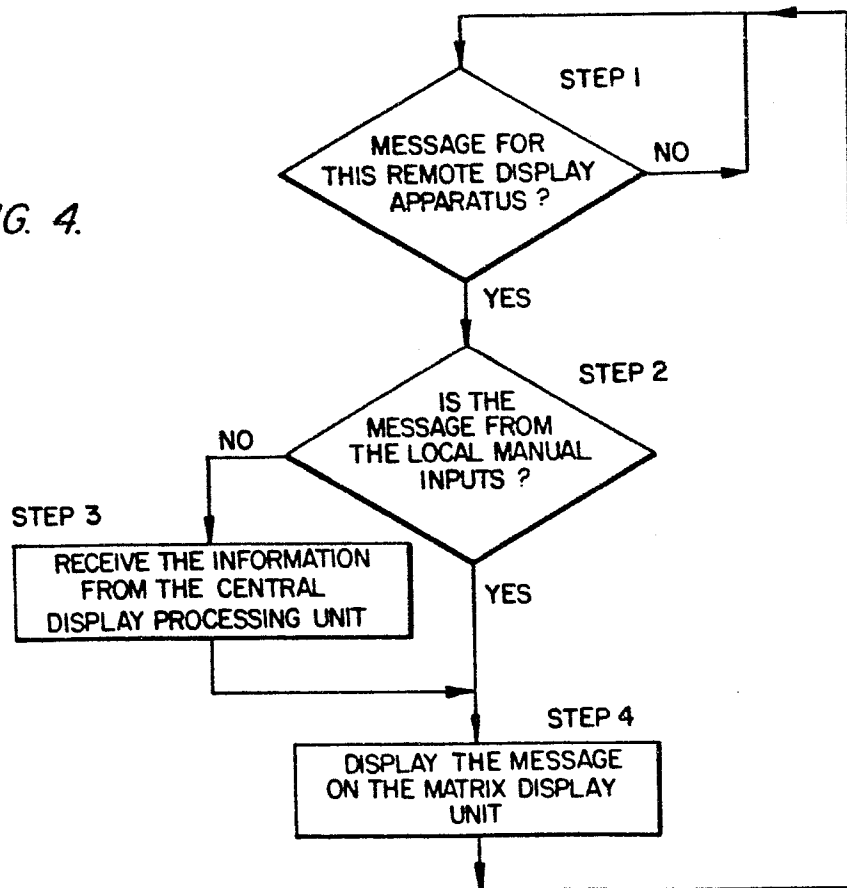


FIG. 4.





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. 3)
X	FR-A-2 373 114 (RAGUSA) * Figures 1,2; page 3, lines 10-22; page 4, lines 8-30 *	1,2,6	G 09 F 21/04
A		3-5,7-12	
X	FR-A-2 242 015 (YEU) * Pages 2-4 *	1	G 09 F
A		2,3,5-12	
X	BE-A- 890 976 (VANDECAN) * Page 1, lines 7-18; page 2, lines 11-25; page 3, lines 15-25; page 4; page 5, lines 1-9 *	1	TECHNICAL FIELDS SEARCHED (Int. Cl. 3)
A		2,3,6,12	G 09 F
P,D	US-A-4 414 661 (TRANCOM AB) * Figure 3; page 4, lines 14-17; page 10, lines 19-25; page 11, lines 7-18; page 13, lines 11-15; page 14; page 17, lines 15-20 * & EP - A - 0 069275 (Cat. A)	1,5,7-12	
--- -/-			
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 02-10-1984	Examiner ALLEN E.F.
CATEGORY OF CITED DOCUMENTS		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	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			



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. ³)
A	FR-A-2 149 193 (BOULARD DE POUQUEVILLE) -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 02-10-1984	Examiner ALLEN E.F.
CATEGORY OF CITED DOCUMENTS		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	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		& : member of the same patent family, corresponding document	