PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 :		(11) International Publication Number: WO 90/14630
G06F 15/16	A1	(43) International Publication Date: 29 November 1990 (29.11.90)

(21) International Application Number: PCT/US90/02708

(22) International Filing Date: 16 May 1990 (16.05.90)

(30) Priority data:
352,553 16 May 1989 (16.05.89) US
427,896 24 October 1989 (24.10.89) US

(60) Parent Application or Grant
(63) Related by Continuation
US 352,553 (CIP)
Filed on 16 May 1989 (16.05.89)

(71) Applicant *(for all designated States except US)*: REST MANUFACTURING, INC. [US/US]; 701 Palomar Airport Road, Suite 125, Carlsbad, CA 92009 (US).

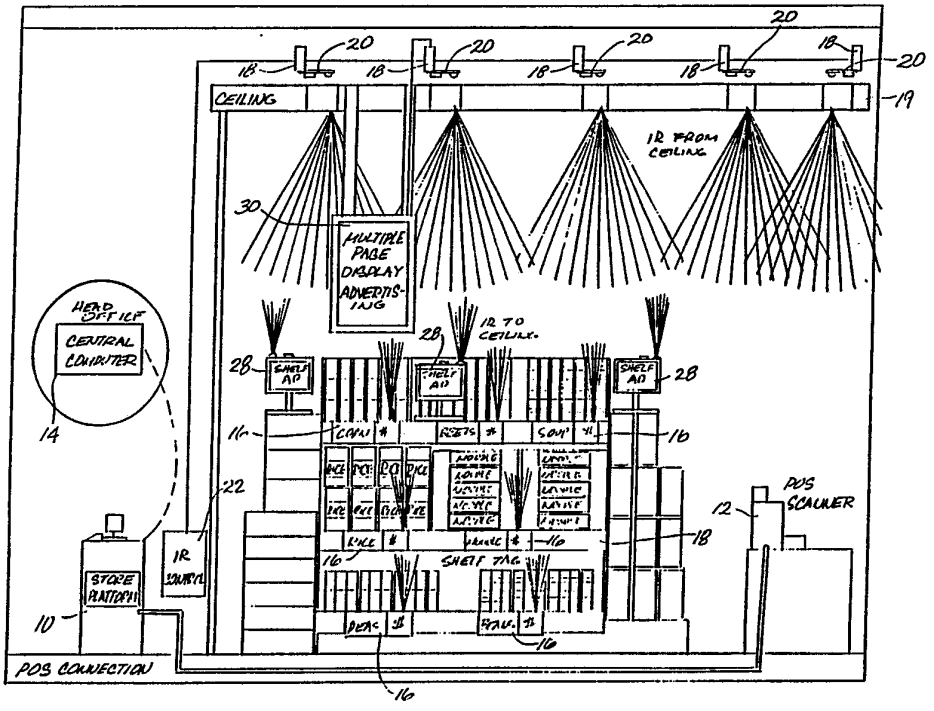
(72) Inventors; and
(75) Inventors/Applicants *(for US only)* : DeTEMPLE, William, C. [US/US]; 10681 Foothill Boulevard, Suite 325, Rancho Cucamonga, CA 91730 (US). ABEL, Peter [US/US]; 4040 Palos Verdes Drive N, #204, Rolling Hills Estates, CA 90274 (US). BIRD, E., Frederick [US/US]; 3795 La Crescenta Avenue, Verdugo City, CA 91046 (US). GOFF, Milton, L. [US/US]; 701 Palomar Airport Road, Carlsbad, CA 92009 (US).

(74) Agents: RAHN, LeRoy, T. et al.; Christie, Parker & Hale, P.O. Box 7068, Pasadena, CA 91109-7068 (US).

(81) Designated States: AT, AT (European patent), AU, BB, BE (European patent), BF (OAPI patent), BG, BJ (OAPI patent), BR, CA, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CM (OAPI patent), DE*, DE (European patent)*, DK, DK (European patent), ES (European patent), FI, FR (European patent), GA (OAPI patent), GB, GB (European patent), HU, IT (European patent), JP, KP, KR, LK, LU, LU (European patent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL, NL (European patent), NO, RO, SD, SE, SE (European patent), SN (OAPI patent), SU, TD (OAPI patent), TG (OAPI patent), US.

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: REMOTE ELECTRONIC INFORMATION DISPLAY SYSTEM



(57) Abstract

An electronic information display system uses a digital computer (14) to control the transmission and reception of pricing and advertising information from a central grid (18-20) of IR transceivers to and from remote locations where the transmitted information is visually displayed (16, 18, 28, 30).

* See back of page

DESIGNATIONS OF "DE"

Until further notice, any designation of "DE" in any international application whose international filing date is prior to October 3, 1990, shall have effect in the territory of the Federal Republic of Germany with the exception of the territory of the former German Democratic Republic.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	**ES**	Spain	**MC**	Monaco
AU	Australia	**FI**	Finland	**MG**	Madagascar
BB	Barbados	**FR**	France	**ML**	Mali
BE	Belgium	**GA**	Gabon	**MR**	Mauritania
BF	Burkina Fasso	**GB**	United Kingdom	**MW**	Malawi
BG	Bulgaria	**GR**	Greece	**NL**	Netherlands
BJ	Benin	**HU**	Hungary	**NO**	Norway
BR	Brazil	**IT**	Italy	**RO**	Romania
CA	Canada	**JP**	Japan	**SD**	Sudan
CF	Central African Republic	**KP**	Democratic People's Republic of Korea	**SE**	Sweden
CG	Congo			**SN**	Senegal
CH	Switzerland	**KR**	Republic of Korea	**SU**	Soviet Union
CM	Cameroon	**LI**	Liechtenstein	**TD**	Chad
DE	Germany, Federal Republic of	**LK**	Sri Lanka	**TG**	Togo
DK	Denmark	**LU**	Luxembourg	**US**	United States of America

REMOTE ELECTRONIC INFORMATION DISPLAY SYSTEM

Field of the Invention

This invention relates generally to an electronic information display system, and, more particularly, to a computer based system for displaying pricing, advertising, and other specialized information at remote display modules which are either optically or electronically connected to a central computer.

Background of the Invention

Most modern retail stores implement some form of computer technology in their operations. This typically consists of using point of sale (POS) systems for automating the checkout procedures. A POS system generally has one or more automated check-out terminals which is capable of sensing and interpreting the Universal Product Code (UPC) printed on each item of merchandise to be checked out. Each of these terminals is connected to a computer which processes the UPC information. The computer's data base includes a list of items of merchandise on sale, a UPC for each of these items, and various types of information, including pricing and inventory information, associated with each UPC. When a customer is ready to make a purchase, the store clerk simply uses an automated terminal to sense the UPC markings on each of the customer's selections. The computer interprets the

UPC, looks up the price for each item, and keeps a running total of the purchase. For a chain of retail stores, each of the store platform computers are often linked to a central computer. This allows the data base of each store to be modified by changing only the date base of the central computer.

In a store, merchandise offered for sale is typically displayed in some way, usually by placing the merchandise on a shelf. Plastic or paper pricing indicators are commonly mounted in proximity to the merchandise to notify customers of its price. Pricing indicators often include information such as size, weight, unit price and other identifying information.

When a change in price is made to one or more of the merchandise items, two things must occur. First, the computer's data base must be modified to reflect the price change. As soon as this change occurs, the new price will automatically be charged to customers at the check-out terminal. Second, the price indicator for each of the affected items must be changed. It is desirable to change the data base and the indicated price at the same time so that there are no discrepancies.

There are many disadvantages with this type of set-up, the main one being that whenever any of the indicator information has to be changed, it must be done so manually. This requires that new pricing tags must be ordered, printed and delivered to the store and then manually placed on the store shelves. Associated with this procedure is the cost of printing and delivering indicators and the labor cost to replace out of date pricing indicators. This is especially disadvantageous where price changes occur often.

Many stores also use alternative means to convey pricing and other information about merchandise to its customers. Some stores use handwritten or pre-printed displays that are somewhat larger than the tags that

are used on the shelves. These displays may be self-standing and portable or may be fixed to a shelf or a ceiling. With each of these methods, however, the store is faced with the cost of printing and installing the displays each time they are changed.

U.S. Pat. No. 4,002,886 to Ronald M. Sundelin dated Jan. 11, 1977 discloses an electronic price read out system in which preprinted price indicators are replaced by electronic price indicator units. The information displayed by these units can be changed at will by changing the electrical stimulus at the input of each unit. Each of the electronic price indicator units is connected to the same computer that supplies prices to the POS terminals. This way the system assures that whenever the price of an item is changed in the computer's data base, both the price displayed and the price charged at the check-out terminal are automatically changed to the new price. The Sundelin patent discloses that the computer is connected to the price indicator units using four conductors or wires. This feature makes the system difficult to implement as it requires wires to be routed throughout the store. In order for the computer to differentiate between the many price indicator units, each unit is assigned a unique address. Correlation in the computer database between the price indicator unit address and the price to be displayed is achieved either by manually entering the information into the computer via its keyboard or by using a remote unit connected to the store computer, the keyboard of the computer that is capable of reading the address of the price indicator unit, and the UPC on the merchandise.

U.S. Pat. No. 4,766,295 to Malcolm H. Davis discloses a similar system; however, the store computer is connected to the price indicator units via an infra red communications link. One disadvantage to the system disclosed in the Davis patent is that there is

only a one way communication between the computer and the price indicator unit. That is, the system only allows for information to be transmitted from the computer to the price indicator unit.

Summary of the Invention

The present invention provides an integrated pricing and advertising system for displaying current pricing information as well as advertising information on remote display terminals throughout a store. The system has a store platform computer which provides a data base for pricing and advertising information within each store. The store platform computer is connectable to a central computer which may be located off-site. A plurality of point of sale (POS) terminals are linked to the store platform computer. A plurality of electronic price information display tags are mounted throughout the store at various merchandise locations. Each display tag is battery powered and contains a transceiver for communication with the store platform computer. Communication between the store platform computer and the display tags is facilitated with an IR controller and an IR transceiver grid. The IR transceiver grid is comprised of a plurality of individual transceivers placed throughout the store and it is optically linked to the transceivers resident in each of the electronic display tags. The IR controller is a microcomputer-based terminal which is hardwired to both the store platform computer and the IR transceiver. The IR controller regulates the transmission and reception of data to and from the IR transceiver. A portable terminal which is coupled to and can communicate with both the store platform computer and the electronic display tags is used to initialize display tag addresses. Included in the system are portable electronic display terminals with transceivers for communication with the store platform

computer as well as display terminals that are hard wired to the IR transceiver.

According to a feature of the invention, the IR transceivers and the display tags are both individually addressable. As a result of this double level of addressability, only the IR transceiver or transceivers actually communicating with the display tags are addressed and transmit IR signals. Thus, when the display tags are configured to have a low gain standby mode and to switch to a high gain mode only when receiving IR signals, battery power for the display tags is conserved because only those display tags in the vicinity of the display tag to be addressed are switched to the power consuming, high gain mode.

According to another feature of the invention, two-way communication is established between the IR transceiver and the display tags so that the price data to be displayed by the display tags or an error check signal can be transmitted back to the IR controller to verify that the correct price data has been received by the display tag.

Brief Description of the Drawings

These and other features and advantages of the present invention will be better understood by reference to the following detailed description when considered in conjunction with the accompanying drawings, wherein:

FIG. 1 is a block diagram of the information display system;

FIG. 2 is a block diagram of the specific elements of the electronic information display system shown in their operative relationship with each other;

FIG. 3 is a schematic diagram of the IR controller, the IR transceiver grid, and the display tags; and

FIG. 4 is a diagram of the message words transmitted between the IR controller and the display tags via the IR transceiver grid and the timing of such message words.

Detailed Description of the Invention

Referring to FIG. 1, a block diagram of the information display system is shown. The store platform computer 10 provides a data base for all of the merchandise in the store. The data base associates each item of merchandise with, among other things, the price of the item, and its (UPC). The store platform computer 10 is electrically connected to a plurality of point of sale (POS) terminals 12. The POS terminals are used to sense the UPC code on the items of merchandise, the UPC is interpreted by the POS terminal, and the UPC is sent to the store platform computer. The data base in the store platform computer is referenced and the price associated with that particular UPC code is found and added to the running total of the purchase.

Price changes may be made in the data base at the store platform level; however, if the store platform computer is linked to another computer 14, one that serves as a central computer to a plurality of store platform computers, then price changes can be made at the central computer 14 and downloaded to each of the store platform computers 10.

The store platform computer also supplies data, in addition to providing data to the POS terminals, to a plurality of electronic display tags 16. Display tags are used to convey pricing and other information about the particular item of merchandise the tag is associated with.

The display tags have the ability to store and then display information as a function of time. This ability allows price changes and other information to be displayed at a specific time and day without the need of communication with the tag at that specific time and day. This feature makes it possible for relatively instantaneous changes to all tags even though the system may have slow data communication

rates. In addition, power consumption of the tag is reduced since the largest power consumption exists when communication is taking place. One communication can program many changes in displayed information.

The information display system is integrated into the POS system by adding to the described POS system an IR controller as well as communications software both within the IR controller and the Store Platform computer. The assembly language listing of the application code for the IR controller is attached under Appendix A and is hereby incorporated by reference. The application program listing for the store platform computer is attached in Appendix B and is hereby incorporated by reference.

In an exemplary embodiment, merchandise is placed on shelving 18 within the store and an electronic display tag is mounted on the shelf adjacent to each item of merchandise. Each of the display tags may indicate various information relating to that particular item, such as the total cost, the cost per unit, the size or weight, etc.

Each of the electronic display tags contain an infra-red (IR) emitter for transmitting data and an IR sensor for receiving data. Each tag is uniquely identified by a binary address which is stored in random access memory RAM within the tag. This allows the address of the tag to be changed from time to time. The electronic display tags are powered by a battery which operates the IR sensor in two modes. To reduce battery power consumption, the IR sensor amplifier is normally maintained in a low gain mode. When an IR signal is radiated toward the display tag, the IR sensor amplifier is switched to a high gain mode. By way of example, a high gain mode could be enabled or energized periodically to detect when an IR signal is present. If during an enabled period an IR signal is received, the IR sensor receiver is maintained in the

high gain mode for a predetermined time period after the IR signal ceases.

The electronic display tags communicate with a grid of IR transceivers 18 which, in an exemplary embodiment, are housed in the ceiling of the store. Only one of the IR transceivers is illustrated in FIG. 1. The IR transceiver grid is made of an array of IR emitters and IR sensors 20 which are positioned at selected positions in the ceiling 19. It is not necessary to have a direct line of sight between the transceivers in the display tags and the transceivers in the ceiling since infrared signals may be reflected. The number and location of the IR emitters and IR sensors in the IR transceiver grid depends on the number and location of the electronic display tags. In any case, each IR transceiver 18 communicates with only a relatively small number of the total number of display tags 16 in the store. For example, if the store has 20,000 display tags, there could be 300 IR transceivers each communicating with about 50 to 75 display tags in its vicinity, the grid of IR transceivers being spaced apart two to four feet and overlapping somewhat the display tags with which they communicate.

The IR transceiver grid 18 is connected to the IR controller 22 which is in turn connected to the store platform computer 10. The IR controller is a microcomputer-cased terminal that controls transmission from and reception of the IR transceiver grid. The IR controller provides two basic functions. It converts parallel binary data into a serial stream of coded data for transmission from the IR transceivers. The IR controller also converts coded serial data from the IR transceivers to parallel binary data.

The IR transceiver grid and electronic display tags are also capable of communicating with the hand held unit 24. The hand held unit has an IR emitter and

an IR sensor for communicating with other transceivers, a keypad for entering information, and scanning means for sensing and interpreting UPC markings on items of merchandise.

When a new item is added to the store's inventory, the hand held tag is used by an operator to initialize the electronic display tag so that the tag will display information pertaining to only that item of merchandise. First, the clerk uses the hand held unit to scan the UPC marking on the new item. The UPC is then transmitted from the hand held unit to the store platform computer via the IR link between the hand held unit and the applicable IR transceiver. The computer processes the UPC and assigns a product identification code to that item and the product identification code is transmitted back to the hand held unit via the IR link. The operator then uses the hand held unit to inject the code into the electronic display tag. This is done optically via the wireless link between the IR emitter in the hand held unit and the IR sensor in the electronic display tag. In order to avoid miscommunication with a nearby display tag, the hand held unit must be held in close proximity to the display tag. The hand held unit then advises the store platform computer that the download is complete. Once complete, the tag is able to communicate to the store platform computer via its own transceiver.

During this initialization process, additional information may be supplied to the data base. For example, the operator may use the hand held unit to tell the store platform computer where the item is located in the store.

The information supplied to the electronic display tag remains intact until it is changed on command by the store platform computer. For example, when the price of an item changes, the price change is entered into the store platform computer by an operator. Once

the data base changes, the new price is available for the POS terminals. The operator will also instruct the store platform computer to update the price on the electronic display tag which is associated with that item. The store platform computer will send a message containing the price change over the IR transceiver addressed to the appropriate electronic display tags.

In the preferred embodiment, there are two levels of addressability. IR transceivers 18 are each assigned unique addresses and display tags 16 are each assigned unique addresses. A particular IR transceiver will only transmit an IR signal to the display tags in its vicinity if it first receives a message word having an address that matches the address assigned to the IR transceiver. Thus, fewer than all the IR transceivers usually transmit IR signals and only those display tags in the vicinity of such IR transceivers are switched to the high gain mode. As a result, battery power is conserved. As described above, only the display tag assigned the address that matches the address of the IR signal responds to the display tag data carrier by such IR signal.

As illustrated in FIG. 3, display tags 16 transmit to and receive IR signals from IR transceivers 18 in their vicinity. Some price tags may receive IR signals from more than one transceiver, but, nevertheless, in the preferred embodiment, fewer than all of them to conserve battery power. An instruction field determines what such display tag does with the display tag data field, e.g. changes the displayed price. Two-way IR transmission takes place between the IR transceivers and the display tags. Message words having the display tag address and the display tag data are transmitted from the IR transceivers to the display tags, and signals to verify receipt of correct display tag data are transmitted from the display tags to the IR transceivers. Preferably, the verifying signal is

a simple data-valid signal comprising a unique code word of several binary bits, which is sent by a display tag when the display tag data it receives satisfies a parity check. Alternatively, although it would consume more battery power, the verifying signal could comprise a retransmission of the display tag data to the IR transceiver for comparison with the data it had sent. In either case, the display tag data is retransmitted by the controller if the verifying signal is not received by the IR transceiver.

As shown in FIG. 4, when new display tag data is to be sent to a display tag, the controller transmits an acquisition signal to all the IR transceivers at a time T1. The acquisition signal has an IR transceiver address field and a check sum field that carries parity bits to verify that the correct acquisition signal has been received by the IR transceivers. At a time T2, the addressed IR transceiver transmits a send data signal to the controller if parity checks. Then, at a time T3, a display tag signal is transmitted by the controller. Only the addressed IR transceiver, i.e. the transceiver that transmitted the send data signal, responds to the display tag signal. The display tag signal has a display tag address field, a check sum field that carries parity bits to verify that the correct display tag address has been received, a display tag instruction field that defines the function to be performed, a display tag data field that defines the price or other data to be displayed by the tag, and a check sum field that carries parity bits to verify that the correct display tag data has been received. The instruction field could identify the type of data in the display tag data field and how it is to be used by the display tag. At a time T4, the addressed IR transceiver transmits a data valid signal to the controller if parity checks. At a time T5, the addressed transceiver transmits to the display tags in

its vicinity an IR signal modulated with the display tag signal. At a time T6, the addressed display tag transmits a data valid signal to the IR transceiver. The data valid signal is one binary value if parity checks and another binary value if parity does not check. At a time T7, the addressed transceiver transmits a message completed signal to the controller. The message completed signal has a data valid field that carries the binary value transmitted at time T6, a display tag address field, and a check sum field that carries parity bits to verify that the correct message completed signal is transmitted to the controller. If the data valid field of the message completed signal received by the controller indicates that parity does not check, i.e. that the display tag data received by the display tag is incorrect, the controller repeats the described sequence until the data valid field does indicate a parity check. If the send data signal at %2 or the data valid signal at T4 is not received by the controller or the message completed signal at T7 received by the controller does not satisfy the parity check, the controller also repeats the described sequence. If desired, an alarm could be actuated after the sequence is repeated unsuccessfully a given number of times, e.g. ten times.

In an exemplary embodiment, all of the IR emitters in the IR transceiver concurrently transmit the same information. Accordingly, each of the electronic display tags receive the same information; however, the only tag that responds to the information by changing its display is the tag that has an address which matches the transmitted address.

In the described embodiment, each of the electronic display tags have a separate transceiver. In an alternate embodiment of the present invention, a group of electronic display tags, each having their own unique address, are connected to one regional

transceiver. Each of these regional transceivers has associated with it, control circuitry to de-multiplex the incoming information to the appropriate electronic display tag. For example, a regional transceiver is located at each isle of shelving. That transceiver receives and transmits all of the information related to the display tags mounted on that particular isle.

In an exemplary embodiment of the present invention, the system also includes display and advertising mechanisms in addition to the display tags. For example, information is displayed on movable display screens 28 which are substantially larger than the display tags. These screens operate in substantially the same way as the display tags, being programmable and having a self contained transceiver for communication with the hand held unit and the store platform computer. Additional screens 30 may be hardwired to the IR transceiver for direct communication with the store platform computer. Further, the display screens may either be battery powered or connected to a facility power source.

The preceding description has been presented with reference to the presently preferred embodiment to the invention shown in the drawings. Workers skilled in the art and technology to which this invention pertains will appreciate that alterations and changes in the described structures can be practiced without departing from the spirit, principles, and scope of this invention.

WHAT IS CLAIMED IS:

1. An electronic merchandise advertising, management and display system for a retail store having rows of merchandise display (POP) locations, the system comprising:

an electronic price information display tag mounted at each location;

a central computer for coordinating price, product, and location data at the store;

a plurality of POS terminals linked to the computer;

wireless communication links between the tags and the computer;

an electronic display terminal in proximity to each row of locations; and

means for linking the display terminals to the computer to display information about the merchandise at a plurality of locations in such row.

2. The system of claim 1, in which the linking means is wireless.

3. The system of claim 1, in which the linking means is hard wired.

4. The system of claim 1, in which the display terminals are self-powered.

5. The system of claim 1, in which the display terminals are connected to a facility power source.

6. The system of claim 2, in which the wireless links comprise transceivers at each display tag, a grid of conductors connecting the computer to a plurality of points each uniformly spaced from a group of the display tags, and a transceiver at each point connected to the grid.

7. An electronic merchandise advertising, management and display system for a retail store having rows of merchandise display (POP) locations, the system comprising:

an electronic price information display tag mounted at each location;

a central computer for coordinating price, product, and location data at the store;

a plurality of POS terminals linked to the computer;

wireless communication links between the tags and the computer;

a first group of electronic display terminals fewer in number than the tags in proximity to the respective rows of locations;

a second group of electronic display terminals fewer in number than the first group in proximity to the respective rows of locations;

wireless communication links between the computer and the respective display terminals of the first group; and

hard wire communication links between the computer and the respective display terminals of the second group.

8. The system of claim 7, in which the wireless links comprise transceivers at each display tag, a grid of conductors connecting the computer to a plurality of points each uniformly spaced from a group of the display tags, and a transceiver at each point connected to the grid, the wireless communication links between the computer and the respective display terminals of the first group comprise transceivers at each of the display terminals of the first group adapted to communicate with the transceivers at points connected to the grid and the hard wire communication links comprise hard wire connections from the display terminals of the second group to the central computer directly or indirectly.

9. An electronic merchandise advertising, management and display system for a retail store having rows of merchandise display (POP) locations, the system comprising:

an electronic price information display tag mounted at each location;

a central computer for coordinating price, produce, and location data at the store;

a plurality of POS terminals linked to the computer;

wireless communication links between the tags and the computer;

a first group of electronic display terminals fewer in number than the tags in proximity to the respective rows of locations;

a second group of electronic display terminals fewer in number than the first group in proximity to the respective rows of locations;

the communication links between the computer and the first and second groups of display terminals; and

the first group of terminals being self-powered and the second group being connected to a facility power source.

10. An electronic merchandise display system for a retail store having rows of merchandise display (POP) locations, the system comprising:

an electronic price information display tag mounted at each location;

a central computer for coordinating price, product, and location data at the store;

a plurality of POS terminals linked to the computer;

transceivers at each display tag;

a grid of conductors connecting the computer to a plurality of points each uniformly spaced from a group of the display tags;

a transceiver at each point connected to the grid to establish wireless communication links with the transceivers at the display tags;

wireless communication links between the tags and the computer;

an electronic display terminal in proximity to each row of locations; and

means for linking the display terminals to the computer to display information about the merchandise at a plurality of locations in such row.

11. The system of claim 1 in which the wireless communication links comprise a plurality of transmitters hard wired to the central computer, each transmitter being responsive to a unique transmitter address and a plurality of receivers at the respective display tags responding to unique tag addresses, the central computer transmitting a transmitter address and a tag address when it transmits the data to a display tag.

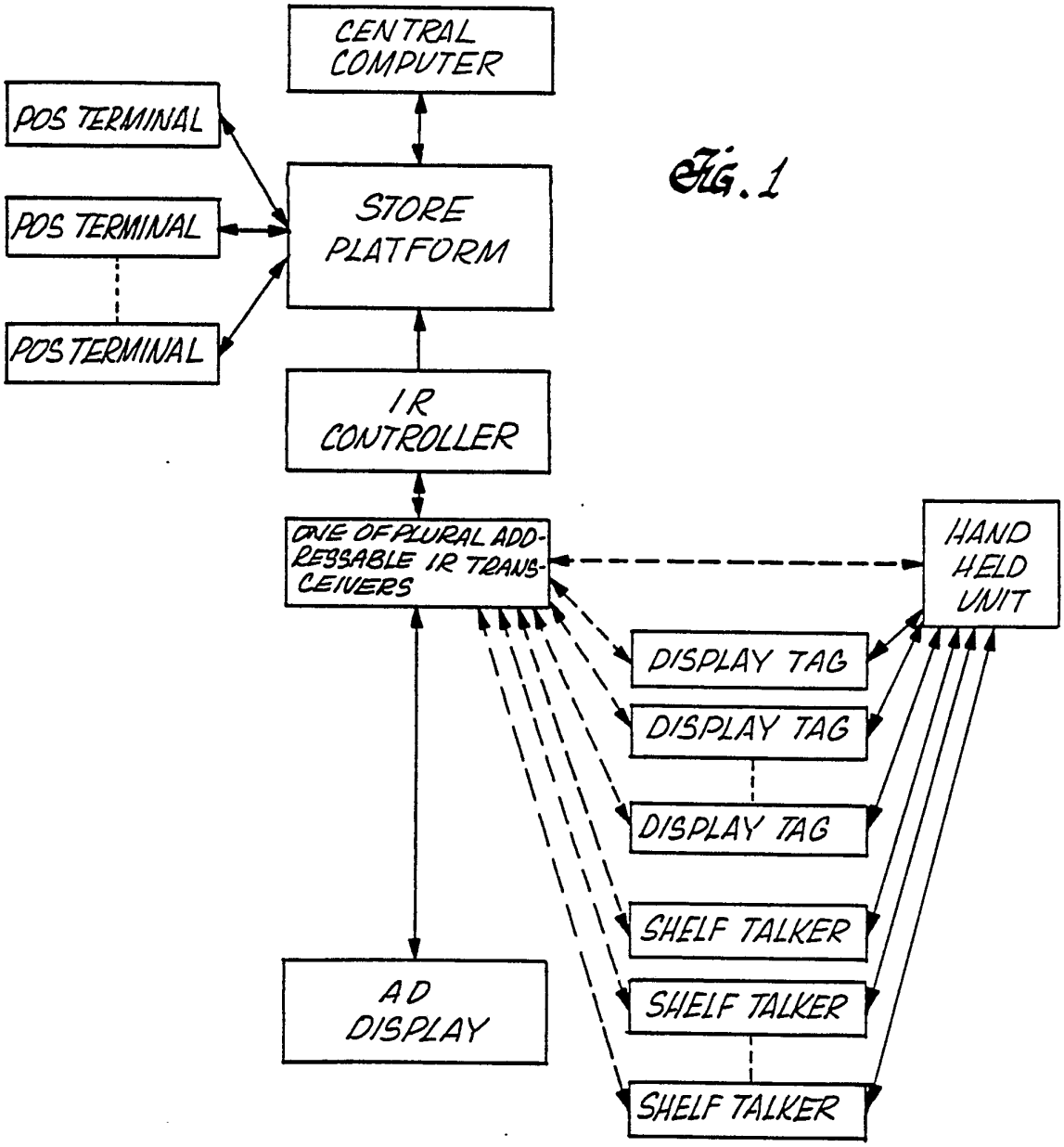

CENTRAL COMPUTER
POS TERMINAL
POS TERMINAL
POS TERMINAL
STORE PLATFORM
IR CONTROLLER
ONE OF PLURAL ADDRESSABLE IR TRANSCEIVERS
HAND HELD UNIT
DISPLAY TAG
DISPLAY TAG
DISPLAY TAG
SHELF TALKER
SHELF TALKER
SHELF TALKER
AD DISPLAY

FIG. 1

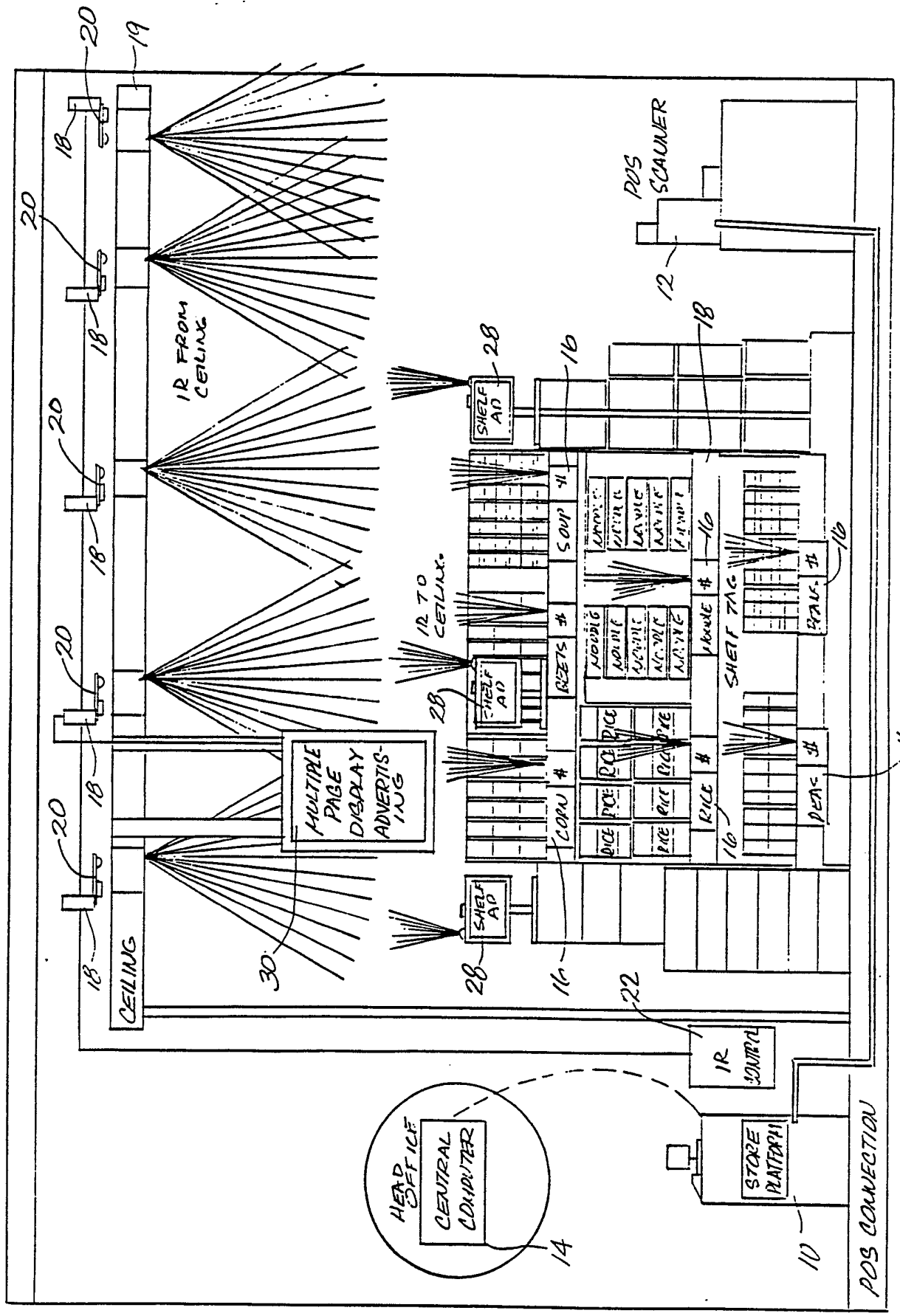
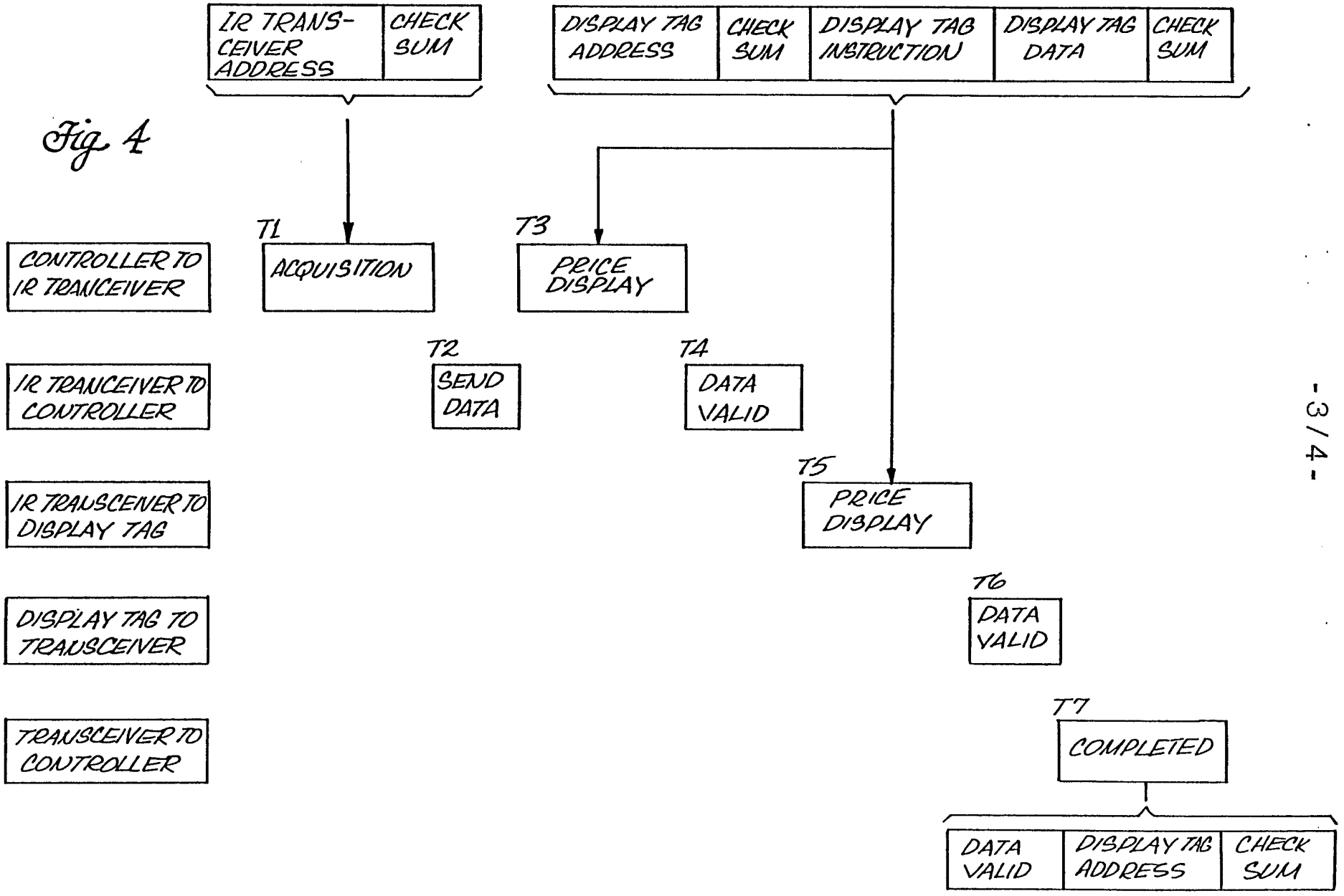

CEILING
IR FROM CEILING
IR TO CEILING
MULTIPLE PAGE DISPLAY ADVERTISING
SHELF AD
SHELF TAG
POS SCANNER
IR SOURCE
STORE PLATFORM
POS CONNECTION
HEAD OFFICE CENTRAL COMPUTER
10
12
14
16
18
19
20
22
28
30

FIG. 2

Fig 4


IR TRANS-CEIVER ADDRESS
CHECK SUM
DISPLAY TAG ADDRESS
CHECK SUM
DISPLAY TAG INSTRUCTION
DISPLAY TAG DATA
CHECK SUM
CONTROLLER TO IR TRANCEIVER
IR TRANCEIVER TO CONTROLLER
IR TRANSCEIVER TO DISPLAY TAG
DISPLAY TAG TO TRANSCEIVER
TRANSCEIVER TO CONTROLLER
T1
ACQUISITION
T2
SEND DATA
T3
PRICE DISPLAY
T4
DATA VALID
T5
PRICE DISPLAY
T6
DATA VALID
T7
COMPLETED
DATA VALID
DISPLAY TAG ADDRESS
CHECK SUM

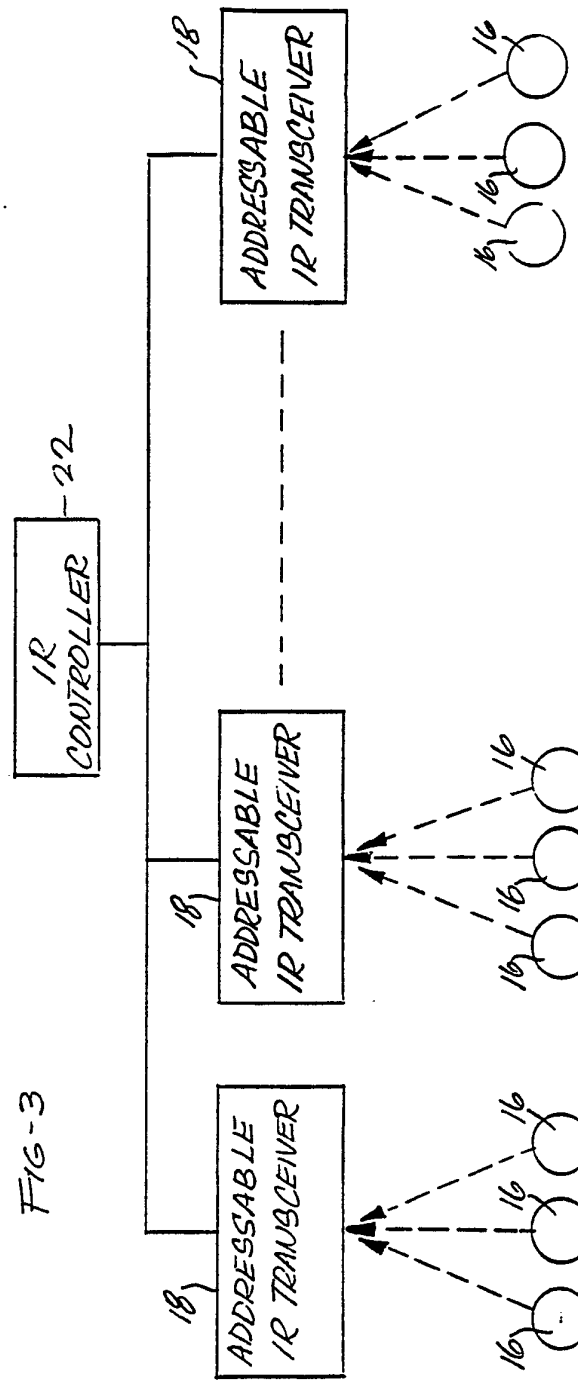


FIG-3

INTERNATIONAL SEARCH REPORT

International Application No PCT/US90/02708

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) 3

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC (5) : G06F 15/16
U.S. Cl : 364/518

II. FIELDS SEARCHED

Minimum Documentation Searched 4

Classification System	Classification Symbols
U.S.	364/518; 340/825.07,825.15; 455/604

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched 5

III. DOCUMENTS CONSIDERED TO BE RELEVANT 14

Category *	Citation of Document, 16 with indication, where appropriate, of the relevant passages 17	Relevant to Claim No. 18
Y	US,A 4,002,886 (SUNDELIN) 11 January 1977 See the entire document.	1-11
Y	US,A 4,139,149 (CREPEAN ET AL) 13 February 1979 See the entire document.	1-11
Y	US,A 4,237,537 (PITCHES ET AL) 02 December 1980 See the entire document.	1-11
Y	US,A 4,500,880 (GOMERSALL ET AL) 19 December 1985 See the entire document.	1-11
Y	US,A 4,421,677 (SARWIN) 04 June 1985 See the entire document.	1-11

(CON'T)

* Special categories of cited documents: 15

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search 2	Date of Mailing of this International Search Report 2
10 AUGUST 1990	4 OCT 1990
International Searching Authority 1	Signature of Authorized Officer 20
ISA/US	DAVID L. CLARK

Form PCT/ISA/210 (second sheet) (May 1986)

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No [18]
Y	US,A 4,766,295 (DAVIS ET AL) 23 Augsut 1988 See the entire document.	1-11
A,P	US,A 4,882,724 (VELA ET AL) 21 November 1989 See the entire document.	1-11
A,P	US,A 4,888,709 (REVESZ ET AL) 19 December 1989 See the entire document.	1-11