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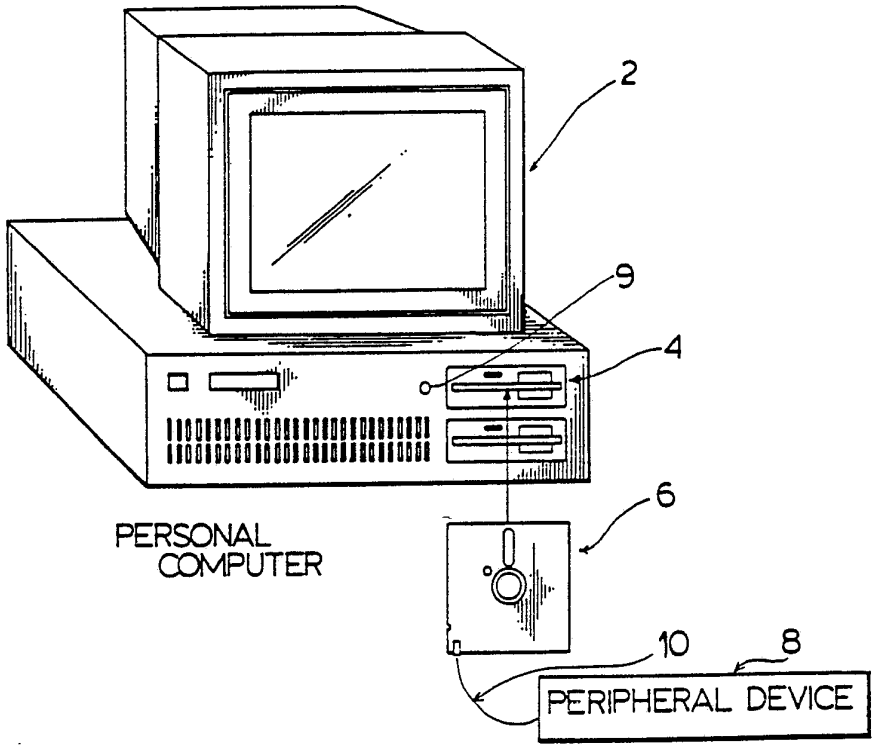
(54) Title: COMPUTER COMMUNICATION INTERFACE

(57) Abstract

A coupler (6) of the present invention advantageously renders the read/write head (30) of a diskette drive (4) of a computer (2), a data transfer port, and preferably an input/output port suitable for connection with a peripheral device (8). The coupler includes a data transfer element (28), preferably a read/write element (28) for transferring data by coupling with the read/write head (30) of the diskette drive (4). The coupler (2) includes a suitable arrangement for connecting the data transfer element (28) with a peripheral device (8), thus expanding the applications of the diskette drive. The coupler (2) is sized for receipt in the diskette drive (4) and preferably places the stationary data transfer element (28) in a position relative to the read/write head (30) of the diskette drive (4) to allow data transfer therebetween when activated and said coupler (2) is received in the diskette drive (4).



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TITLE: COMPUTER COMMUNICATION INTERFACE

BACKGROUND OF THE INVENTION

The present invention relates to the transfer of information between a computer and a peripheral device. In particular, the invention relates to a new method and apparatus which renders the diskette drive of a computer an input, an output, or an input/output port whereby a communication channel is established between the personal computer and the peripheral device or peripheral devices.

Personal computers contain a number of ports through which they communicate with peripheral devices such as keyboards, printers, modems, local area networks, scanners, compact disk drives and other peripherals which are not resident within the computer itself. Unfortunately, the ports provided on the computer may not be suitable or available for the peripheral for which connection is desired. If additional ports are to be added, the computer has to be partially disassembled to install an appropriate circuit board and port. This installation is often difficult and in many cases is not undertaken by the user.

There remains a need to allow an effective method and apparatus for providing a communication channel between a personal computer and an exterior peripheral.

SUMMARY OF THE INVENTION

A coupler, according to the present invention, is proposed which is receivable within the diskette drive of a computer and is adapted for rendering the read/write head of the diskette drive a port suitable for connection with peripheral device other than a conventional diskette. Most personal computers include at least one diskette drive and the invention recognizes that the read/write head of the diskette drive can be advantageously used as a port and preferably an input/output port. To render the system convenient to the user, the coupler is dimensioned for

insertion in the diskette drive to position a means for coupling, provided on the coupler, in a manner to facilitate communication with the read/write head of the diskette drive. Data is transferred between the computer and a peripheral device via the coupler.

According to an aspect of the invention, the means for coupling includes a coil read/write element which is positioned for coupling to the read/write head of the diskette drive by means of electromagnetic induction.

According to an aspect of the invention, the means for coupling includes a stationary read/write element suitable for providing a capacitive coupling with the read/write head of the diskette drive.

According to a further aspect of the invention, the coupler has exterior dimensions of a standard diskette and is inserted within the diskette drive in the conventinal manner. Such insertion aligns the read/write element of the coupler for transferring data to and from the read/write head of the diskette drive.

The invention is also directed to the method of rendering the read/write head of a computer diskette drive an input/output port.

BRIEF DESCRIPTION OF THE DRAWINGS

The preferred embodiments of the invention are shown in the drawings, wherein:

Figure 1 is a schematic representation of the coupler in combination with a personal computer and an external peripheral device;

Figure 2 is a schematic of the coupler in combination with a personal computer device and an external peripheral device where the coupler is connected to the peripheral device by a wireless transceiver;

Figure 3 is a schematic showing the personal computer and two couplers whereby information may be transferred between separate drives of separate computers;

Figure 4 is a schematic representation showing a coupler which has been integrated with an external peripheral device in combination with a personal computer;

Figure 5 is a schematic representation showing a personal computer and a coupler for coupling the personal computer with a local area network;

Figure 6 is a top view of the coupler; and

Figure 7 is a top view of a modified coupler.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A personal computer 2 having a diskette drive 4 is shown in Figures 1 through 5 and is used in combination with the coupler 6 for connecting the external peripheral device 8 with the personal computer 2. Figure 1 illustrates the coupler 6 having an electrical or optical connection 10 by means of which data is transmitted between the coupler 6 and the external peripheral device 8. The coupler 6 is dimensionally compatible with the removable media diskette drive 4 which typically would receive a 5 1/4" diskette or a 3 1/2" diskette or other standard diskettes. Thus the coupler 6 is inserted into the diskette drive as if it where a standard diskette to render the read/write head of the diskette drive an input/output port by means of which serial data is exchanged between the personal computer 2 and the external peripheral device 8. In some cases it will only be desirable to input or output data and thus the coupler need not necessarily render the read/write head an input/output device.

The term "peripheral device" is used broadly and includes keyboards, printers, modems, memory cartridges, local area networks, facsimile machines, scanners, compact disk drives, memory storage arrangements and other peripherals which are not resident in the computer 2 itself. The term "peripheral device" does not include standard diskettes intended for receipt in the diskette drive.

Details of the coupler 6 are shown in Figure 6 in combination with a read/write head of a diskette drive. The coupler 6 in this embodiment is shown having an exterior periphery 20 corresponding to the shape of a standard 5 1/4" diskette to allow convenient insertion within the diskette drive. In this case the coupler 6 includes a rotating section 22 appropriately configured to create the necessary timing pulse in combination with the timing hole 32. It should be noted that this rotary section is not required in all applications, however some diskette drives require a timing pulse to be received from a spinning diskette in order to determine the number of the sector that is currently at the read/write head. This timing pulse function will be coordinated with the coupler's signal conditioning and control electronics 24 such that both the external device and the diskette controller are synchronized with respect to apparent sector positioning.

In some cases it is desirable to provide a small generator or alternator 23 which is associated with the rotating portion 22 to generate electrical energy as portion 22 is driven by the diskette drive. The power can be provided to the signal conditioning and control circuitry 24 for powering thereof or indirect powering thereof as the generator or alternator 23 powers an onboard battery. Many applications will not require the generator or alternator 23 and even the signal conditioning and control circuitry 24 can be located externally of the coupler 6. Similarly, many applications will not require the onboard battery, the timing pulse, or a rotating element.

In order to effect a coupling between the read/write head 30 found in a diskette drive and an external perpheral device, the head 30 is located at a particular track position of what would be the diskette, however in contrast to a diskette where a rotating medium would be spinning past the head, a data transfer element, in this case a read/write element 28, is provided by means of which

data is transferred to or received from the read/write head 30. This read/write element 28 is stationary and in the case of inductive coupling, the read/write element 28 is in the form of a coil. Read/write element 28 is connected via suitable electrical connection indicated as 36 to the signal conditioning and control circuitry indicated as 24. In many cases the electrical connection 36 will lead directly to an external peripheral device.

When information is transmitted from the external device to the computer 2, a modulated electrical current creates a magnetic field in the read/write element 28. This field causes an electrical current to be induced in the read/write head 30 of the diskette drive which is treated by the downstream electronics of the diskette drive as a stream of bits coming from a spinning diskette. When transmitting data from the computer to the peripheral device 8, the read/write element 28 on the coupler 6 is exposed to the modulated electromagnetic field from the diskette drive read/write head 30 which behaves as if it is writing to an ordinary diskette.

This field induces an electrical current in the coupler read/write element 28 which is then directed to the external device 8. Amplification and conditioning of the signal received from the read/write head 30 via the read/write element 28 can occur either on the coupler 6 or external thereto.

The read/write element 28 on the coupler 6 can be positioned other than directly against the read/write head 30 of the diskette drive as shown in Figure 7. In this case a rotating diskette-like medium indicated as 40 is present and is being driven by the diskette drive. The read/write element 28 when transferring data to the computer 2 will actually write its data onto one or more tracks indicated as 42 of the spinning diskette-like medium 40 as if it were a normal diskette read/write head. When the data thus written is transported to the read/write head 30 of the diskette

drive by the rotation of the diskette-like medium, the read/write head reads the data from the same one or more tracks 42 in the normal manner of reading from a diskette. When the computer is transferring data to the external device, the read/write head of the diskette will write the data onto the diskette-like medium in the normal manner and the read/write element 28 of the coupler 6 will read the data from the diskette-like medium 40 as the data is carried past the read/write element 28 by rotation of the diskette medium 40.

As previously stated, the signal conditioning and control circuitry 24 need not be on the coupler 6 and need not include its own power generation or battery arrangement. For example, this circuitry can be included in the external oevice and be powered thereby. There are advantages to providing it directly on the coupler as the external device would not be required to supply such functionality.

The coupler in Figures 6 and 7 includes an interface 34 to provide appropriate connection with an external peripheral device. The interface 34 can be an electrical signal for communication by conductive cable or an optical signal for communication by optical fiber.

Returning to Figure 1, the invention will be described with respect to a typical embodiment where the external peripheral device is a hard disk drive which is connected to the computer 2 via the diskette drive already present in the computer. In such an example, the user sacrifices the storage of the diskette and enjoys advantages of the hard disk which would include faster access time and greater data capacity. These advantages are achieved through an installation process which is simple, quick and foolproof and requires no special skills.

When the user first approaches the computer 2, he would, if necessary, remove any diskette that may be in the diskette drive which he wishes to use in coupling his hard

disk drive to the computer 2. He would then insert the coupler 6 into the drive and perform the normal mechanical activation procedure following the loading of a diskette, namely the movement of a lever or the closing of a door on the diskette drive. The electrical connector 10 connects the coupler with the external hard disk drive 10.

The user would then "re-boot" his computer causing the computer 2 to enter a restart mode as if its power switch had just been turned on or the reset button had been pressed. Following a restart or reset, the central processing unit (CPU) of the computer 2 is directed by a program permanently resident in read only memory of the computer to retrieve another program from a specified track and sector of the diskette drive into which the coupler is inserted.

The CPU therefore looks for a "bootstrap" program on a diskette that may be resident in the diskette drive into which the coupler is inserted. The coupler signal conditioning and control circuitry 24, which can include memory capacity, would cause a stream of bits to be sent to the read/write head 30 of the diskette drive in a form that the bits appear to the diskette drive and the CPU to be a "bootstrap" program as being read from a spinning disk. In fact, the "bootstrap" program is really on the external hard disk and the coupler is causing the bit pattern which constitutes that program to be induced through electromagnetic coupling into the read/write head 30 of the diskette drive. Thus, the CPU "thinks" it is loading a normal "bootstrap" program into memory and once it has loaded the normal amount of data, it turns control of the computer over to the "bootstrap" program. In this case, however, the "bootstrap" just loaded from the external hard disk undertakes the tasks necessary to configure the software and hardware of the computer to allow subsequent application programs and operating systems to use the external hard disk drive that is connected by the coupler 6

essentially as if it were a normal disk drive installed in the computer in the normal manner.

Having thus configured the computer via the special "bootstrap" program, the hard disk becomes a resource available to all applications and operating systems which may be executed in the computer usable essentially as a normally installed hard disk.

In the preferred embodiment, data is transferred to and from the diskette drive read/write head 30 to the read/write element 28 of the coupler through electromagnetic induction. When information is transferred from the external device to the computer, a modulated electrical current creates a magnetic field in the read/write element which is in the form of a coil. This field causes an electrical current to be induced in the read/write head 30 of the diskette drive which is treated by the downstream electronics in the diskette drive as a stream of bits coming from a spinning diskette. Other arrangements are possible for forming a data transfer link with the read/write head of the diskette drive, as, for example, a capacitive coupling.

The peripheral device connected via the coupler 6 could be any peripheral device including printers, solid state memory, communication ports, networks, scanners, other computer instrumentation, monitors, plotters, spatial digitizers, control instruments, external audio devices including speech recognition, signal analysis, speech synthesis, sound generator, and digital audio recording/ playback. The peripheral device could be a pointing device such as a mouse, track ball, joy stick, or knob box. It is also noted that a series of peripherals could be attached in the manner now carried out using a single computer port.

The interface 34 could allow connection via a free air radio or optical signal as generally shown in Figure 2 which depicts a wireless transreceiver arrangement which connects the coupler 6 with the peripheral device 8.

The embodiment of Figure 3 illustrates how two couplers 6 can be used to connect two separate personal computers 2 via the diskette drives of the personal computers.

The embodiment of Figure 4 illustrates how the coupler 6 may be integrated with a peripheral device generally indicated as 8a. Thus, the electrical connection between the coupler and the peripheral device is now completed via the integration of the coupler and the external peripheral device.

The embodiment of Figure 5 illustrates how the adapter can be used for coupling a personal computer into a local area network.

All the embodiments of Figures 1 through 5 recognize that the coupler 6 renders the read/write head of the diskette drive an input/output port by means of which the personal computer 2 can effectively communicate with external peripheral devices in many different forms. Depending upon the particular application for which the read/write head is rendered a data transfer port, certain configurations of the coupler 6 may be preferred. The coupler may also render the read/write head of the diskette drive an input port only or an output port only.

In Figure 1, a separate port 9 is shown which is associated with the read/write head of the diskette drive 4. This port would be provided in new computers to allow a direct connection to the circuitry within the computer associated with the read/write head. Thus, rather than forming a coupling via the read/write head, the port 9 is wired to the circuitry to allow serial data to flow directly to or from a connected peripheral. Such a port could utilize the desirable characteristics of the circuitry associated with the read/write head.

Some advantages the coupler and method of the present invention may have over other ports that are present on a personal computer or which may be installed in a

personal computer are as follows:

- Such an interface is almost universal, since most personal computers are equipped with removable-media diskette drives. Other types of communications ports are much less universally available on all personal computers.
- Installation is immediate and convenient. Most ports require the user to connect from behind the computer and may require the use of tools to remove and attach connectors. Where a suitable port does not exist and a circuit board must be installed in the personal computer to provide such functionality, then the user is forced to dismantle the computer and physically install hardware within the computer's chassis.
- Installation is foolproof, since connecting to the port is a task identical to inserting a diskette into the drive, a function that any computer user is comfortable with.
- This system provides a higher speed two-way channel than is typically available on personal computers.
- This system offers considerable cost savings over alternate methods having comparable performance.

Although various preferred embodiments of the present invention have been described herein in detail, it will be appreciated by those skilled in the art, that variations may be made thereto without departing from the spirit of the invention or the scope of the appended claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A coupler (6) receivable in diskette drive (4) of a computer (2) and adapted for rendering the read/write head (30) of such diskette drive (4) an input/output port suitable for connection with an external device (8) other than a conventional diskette, said coupler (6) comprising means (28, 36, 34) for coupling to, and transferring data via, the read/write head (30) of such diskette drive (4) and by means of which data can be transferred between such external device (8) and such computer (2).

2. A coupler (6) as claimed in claim 1 wherein said means for coupling (28, 36, 34) includes a coil read/write element (28) for coupling, with the read/write head (30) of such diskette drive (4) by means of eletromagnetic induction.

3. A coupler (6) as claimed in claim 1 wherein said means for coupling (28, 36, 34) includes a read/write element (28) for effecting a capacitive coupling with the read/write head (30) of such diskette drive (4).

4. A coupler (6) as claimed in claims 1, 2 or 3 having exterior dimensions of a standard diskette.

5. A coupler (6) as claimed in claim 1 wherein said means for coupling (28, 36, 34) is a read/write element (28) in a fixed position on said coupler to align with the read/write head (30) of such diskette drive (4) when inserted therein.

6. A coupler (6) as claimed in claim 5 including signal conditioning means (24) associated with said element (28) for enhancing the signal received by said element (28) from such read/write head (30).

7. A coupler (6) as claimed in claim 6 including an outer casing (20) generally corresponding to a standard diskette.

8. A coupler (6) as claimed in claim 7 wherein said element (28) forms an electromagnetic or capacitative coupling with the read/write head (30).

9. A coupler (6) as claimed in claim 1 including a rotating diskette-like medium (40) which forms part of the coupling of said coupling means (28, 36, 34) with the read/write head (30), said coupling means (28, 36, 34) including a stationary read/write element (28) associated with said diskette-like medium (40) for tranferring data to and from particular tracks (42) of said diskette-like medium (40).

10. A coupler as claimed in claim 1 including memory means (24) associated with said means for coupling (28, 36, 34) and by means of which an initial signal instructs the computer (2).

11. A coupler as claimed in claim 1, 2 or 10 including electrical generating means (23) positioned to be driven by said diskette drive (4) and a chargable battery (26), said generating means (23) when driven producing energy for charging said battery (26).

12. A coupler (6) as claimed in claim 1 including an interface (34) by means of which such external device (8) is coupled to such computer (2).

13. A coupler (6) for receipt in a diskette drive (4) of a computer (2), said coupler (6) comprising:

a body (20) shaped for receipt in a diskette drive (4),

coupling means (28, 36, 34) including a stationary data transfer element (28) located on said coupler (6) for transferring data between said stationary data transfer element (28) and a read/write head (30) of such diskette drive (4), and

means (36, 34) associated with said data transfer element (28) to connect said data transfer element (28) with a computer peripheral device (8).

14. A coupler (6) as claimed in claim 13 wherein said stationary data transfer element (28) is located on said coupler (6) in a position corresponding to a read/write head position associated with a conventional diskette.

15. A coupler (6) as claimed in claim 14 including signal control and conditioning means (24) associated with said stationary data transfer element (28).

16. A coupler (6) as claimed in claim 13 wherein said coupling means (28, 36, 34) includes a diskette medium (40) similar to a conventional diskette with said stationary data transfer element (28) being located to transfer data between said data transfer element (28) and such read/write head (30) indirectly via said diskette medium (40).

17. A coupler (6) as claimed in claim 13, 14 or 15 wherein said data transfer element (28) is selected from the group consisting of a read, a write or a read/write element.

18. A coupler (6) as claimed in claim 13, 14 or 15 wherein said data transfer element (28) is a read/write element (28).

19. A coupler (6) as claimed in claim 16 wherein said data transfer element (28) is selected from the group consisting of a read, a write or a read/write element.

20. A coupler (6) as claimed in claim 16 wherein said data transfer element (28) is a read/write element (28).

21. A method of rendering the read/write head (30) of a diskette drive (4) of a computer (2) a port suitable for use with separate computer peripherals (8), said method comprising:

forming a coupling between a stationary data transfer element (28) and the read/write head (30) of the diskette drive (4) suitable for transmitting data therebetween, and

providing an electrical path (36, 34) for transferring data between the data transfer element (28) and at least one separate computer peripheral (8).

22. A method as claimed in claim 21 wherein said step of forming a coupling is accomplished by aligning the stationary data transfer element (28) against the read/write head (30) of the diskette drive (4).

23. A method as claimed in claim 21 wherein said step of forming a coupling includes coupling the read/write head (30) with a rotating diskette-like medium (40) and coupling the stationary data transfer element (28) with the rotating diskette-like medium (40) and in a manner to transfer data between the stationary data transfer element (28) and the read/write head (30) via the rotating diskette-like medium (40).

24. A method as claimed in claim 22 including providing an initial instructing signal to the computer via the stationary data transfer element (28) to reconfigure the hardware and software of the computer in accordance with the at least one separate computer peripheral (8).

25. A method as claimed in claim 24 including memory storage means (24) for maintaining in storage the instructing signal and wherein said step of providing an instructing signal is carried out by recalling from said memory storage means (24) the instructing signal.

26. In a computer (2) having at least one diskette drive (4) having a read/write head (30) and circuitry (28, 36, 34, 24) associated for transfer of data with said read/write head (30) the improvement comprising a separate port (30) which bypasses the read/write head and connects with the associated circuitry (28, 36, 34, 24) generally in the same manner as said read/write head (30) whereby serial data is transferrable directly to said associated circuitry (28, 36, 34, 24) via said separate port (34) as if the serial data had been processed by said read/write head (30).

27. In a computer (2) as claimed in claim 26 including an external peripheral device (8) connected to said separate port (34) forming an electrical connection therewith having DC continuity.

28. A coupler (6) as claimed in claim 1 including electrical generating means (23) positioned to be driven by said diskette drive (4).

29. A coupler (6) for transferring data between a computer (2) having a diskette drive (4) and a device (8) external to both the computer (2) and the diskette drive (4), said coupler (6) comprising means for coupling (28, 36, 34) with the read/write head (30) of such diskette drive (4), and by means of a conduit thus created, data is transferred between the external device (8) and the computer (2) through the read/write head (30) of the diskette drive, said means for coupling (28, 36, 34) including a stationary data

transfer element (28) positioned to cooperate with the read/write head (30) of the diskette drive.

30. A coupler (6) as claimed in claim 24 wherein said data transfer element (28) includes a coil read/write element (28) for coupling, with the read/write head (30) of such diskette drive (4) by means of electromagnetic induction.

31. A coupler (6) as claimed in claim 29 wherein said data transfer element (28) includes a read/write element (28) for effecting a capacitive coupling with the read/write head (30) of such diskette drive (4).

32. A coupler (6) as claimed in claim 29 wherein said data transfer element (28) is a read/write element (28) in a fixed position on said coupler (6) to align with the read/write head (30) of such computer (2) when inserted in an appropriate diskette drive.

33. A coupler (6) as claimed in claim 32 including signal conditioning means (24) associated with said element (28) for enhancing the signal received by said element (28) from such diskette drive read/write head (30).

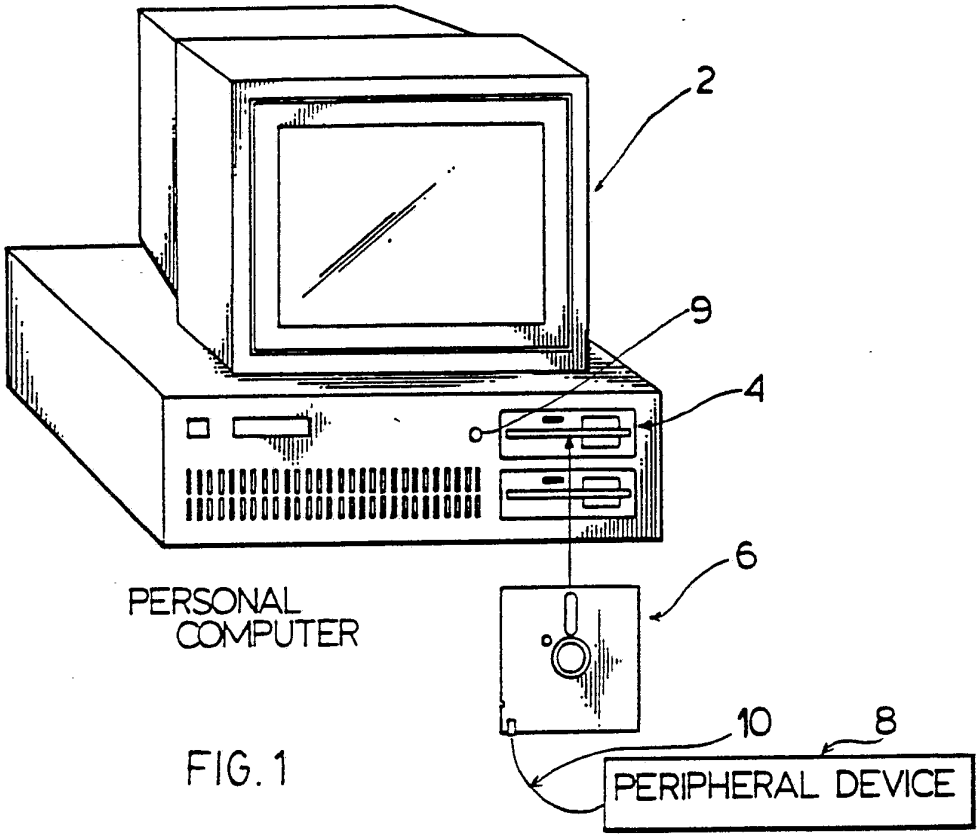
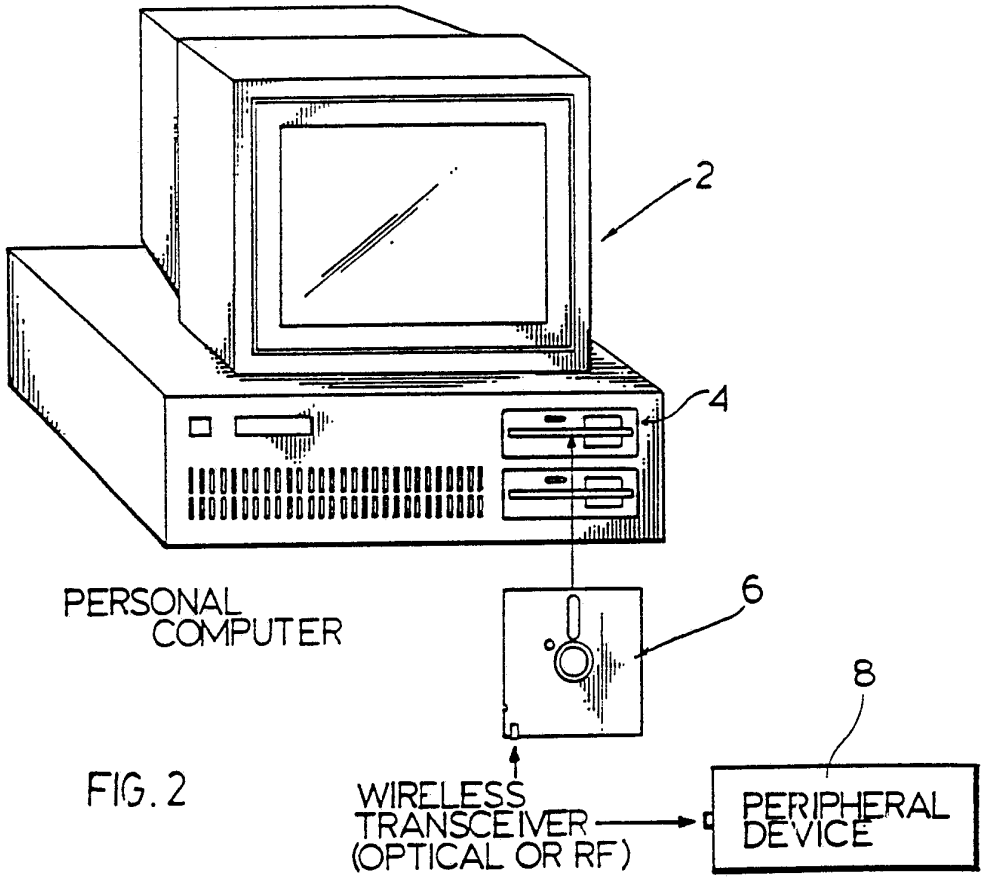

2
9
4
6
PERSONAL COMPUTER
10
8
PERIPHERAL DEVICE

FIG. 1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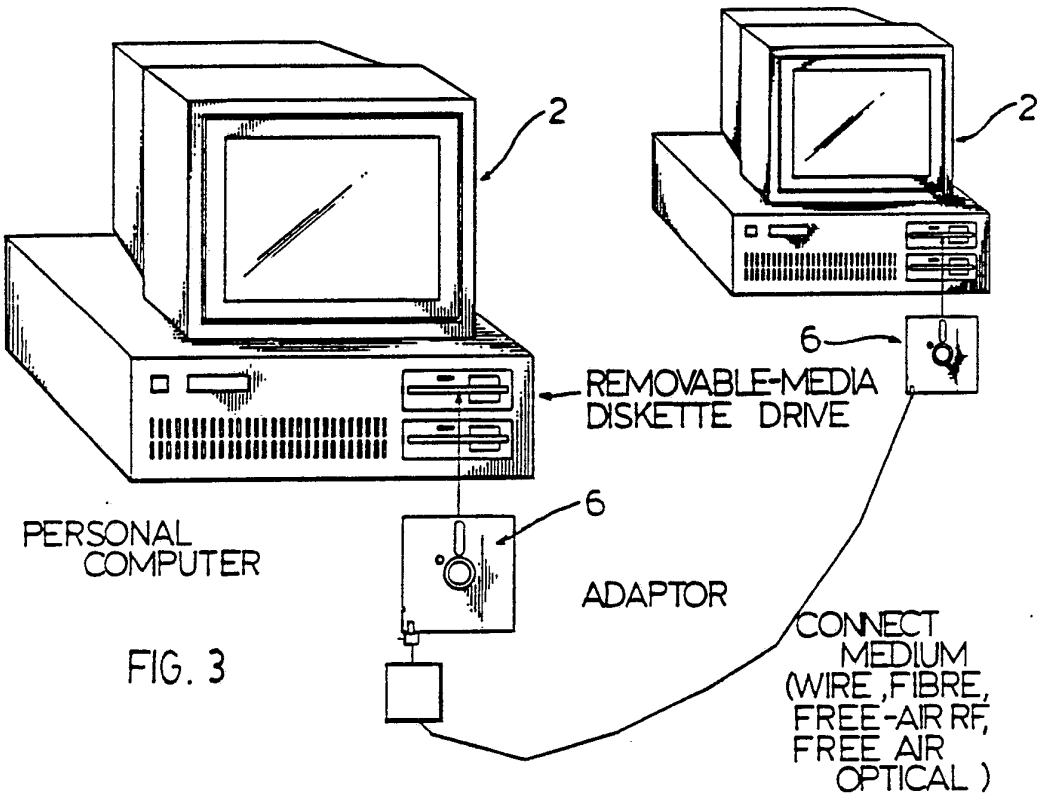
4
6
PERSONAL COMPUTER
8
WIRELESS TRANSCEIVER (OPTICAL OR RF)
PERIPHERAL DEVICE

FIG. 2


2
2
6
REMOVABLE-MEDIA
DISKETTE DRIVE
6
PERSONAL
COMPUTER
ADAPTOR
CONNECT
MEDIUM
(WIRE, FIBRE,
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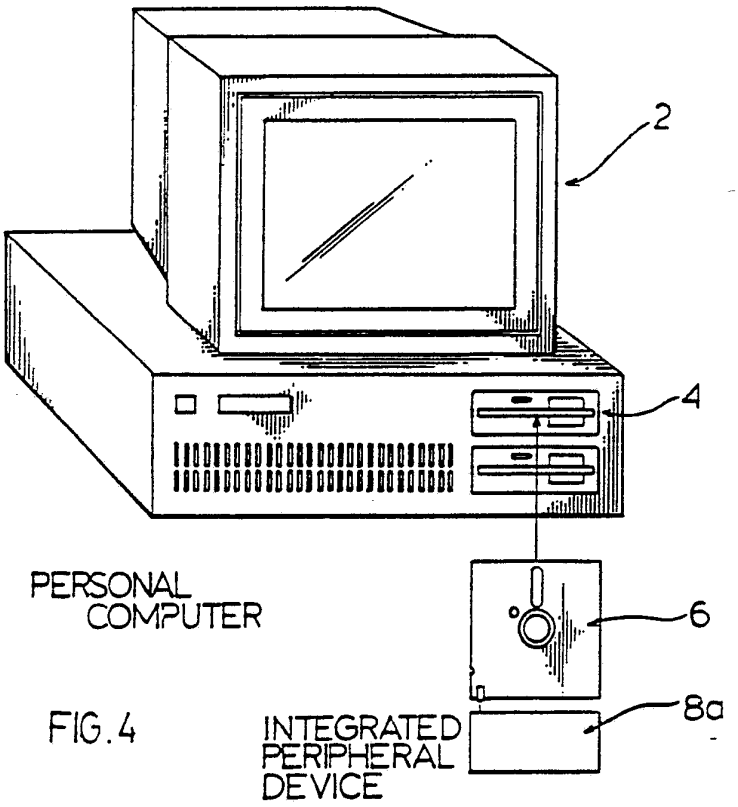
FREE AIR
OPTICAL)

FIG. 3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4
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COMPUTER
6
8a
INTEGRATED
PERIPHERAL
DEVICE

FIG. 4

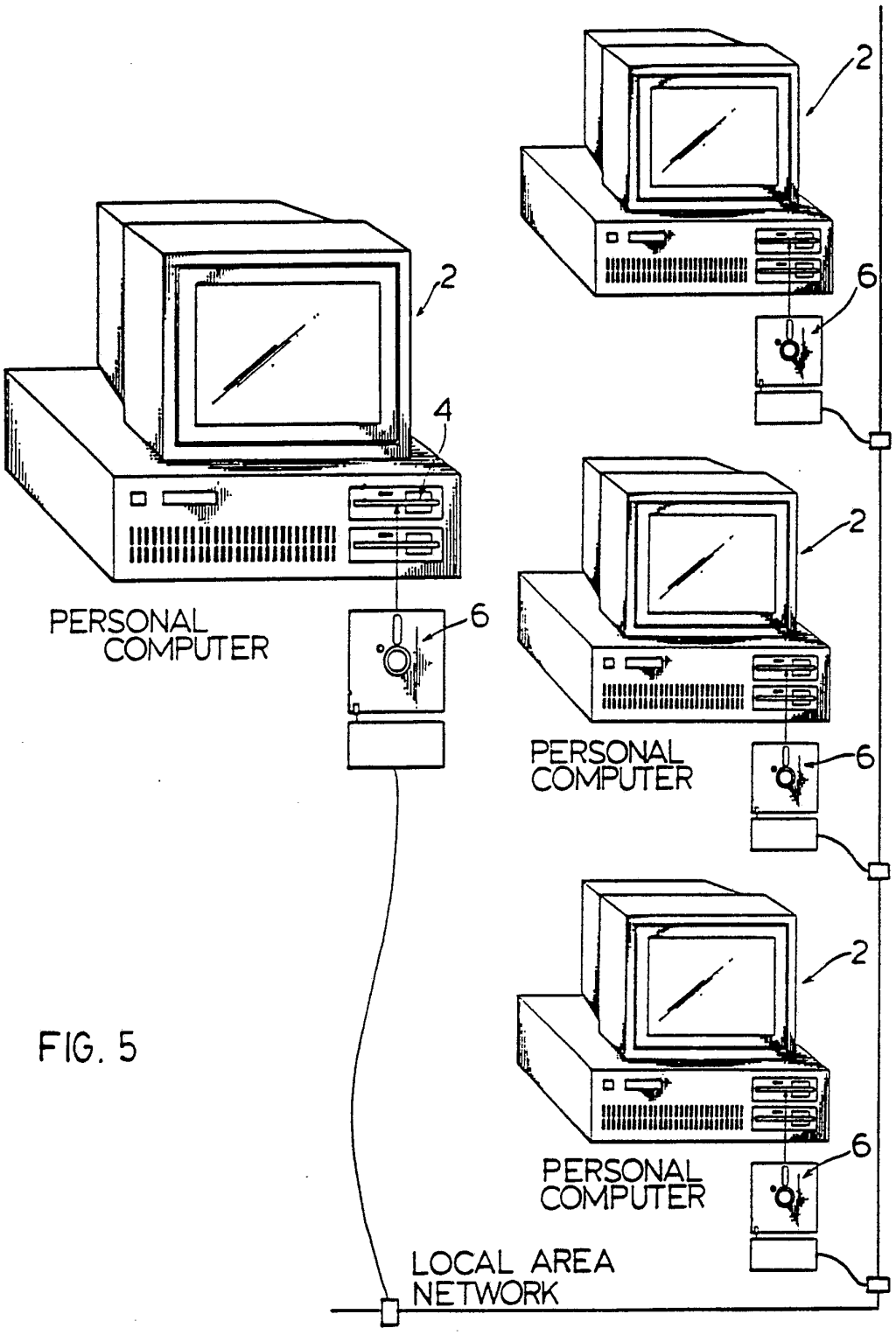
2
2
6
4
PERSONAL COMPUTER
6
2
PERSONAL COMPUTER
6
2
6
PERSONAL COMPUTER
LOCAL AREA NETWORK

FIG. 5

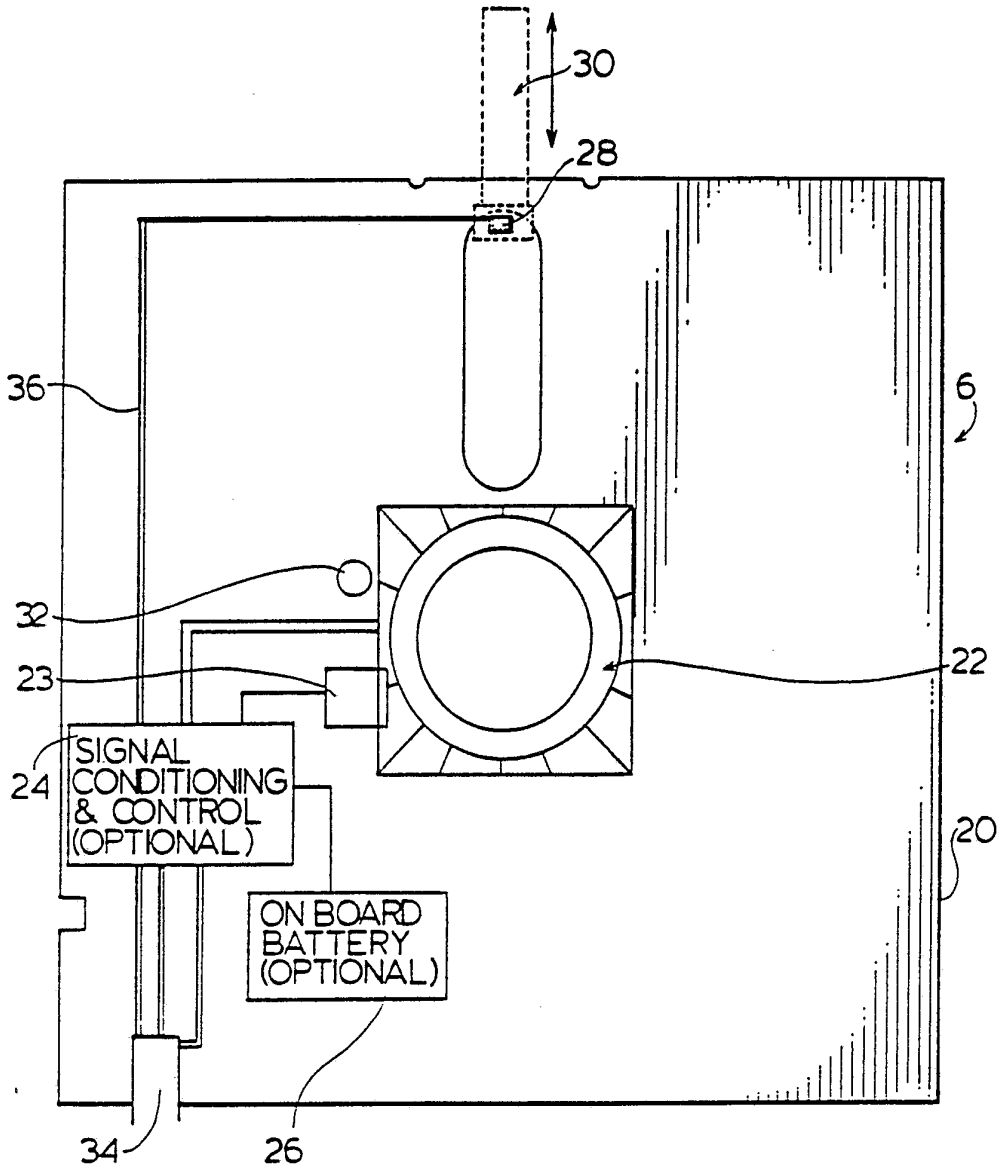
30
28
36
6
32
23
22
24
SIGNAL CONDITIONING & CONTROL (OPTIONAL)
20
ON BOARD BATTERY (OPTIONAL)
34
26

FIG. 6

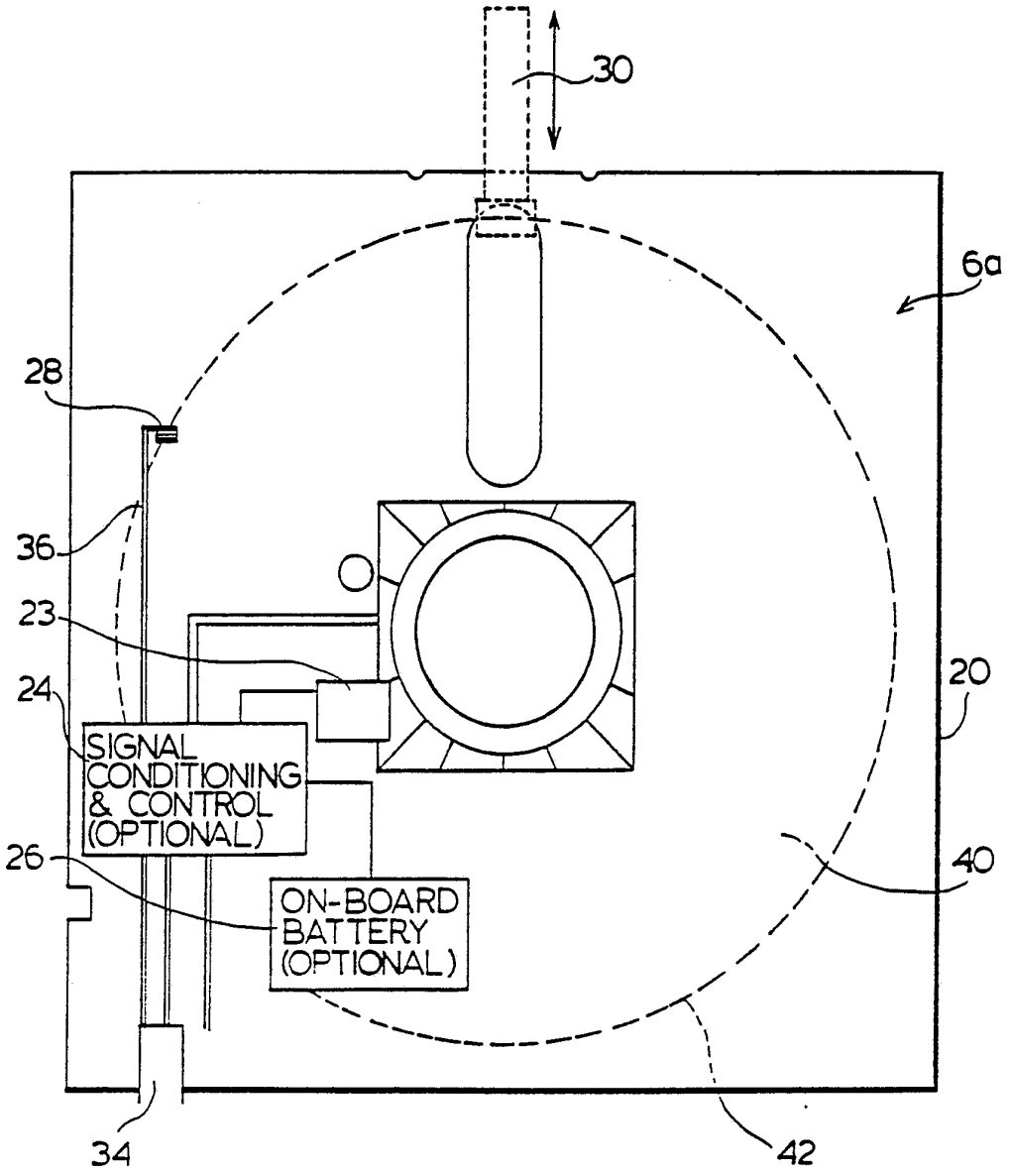
30
6a
28
36
23
24
SIGNAL CONDITIONING & CONTROL (OPTIONAL)
20
26
ON-BOARD BATTERY (OPTIONAL)
40
34
42

FIG. 7

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 89/01271

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

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

Int.Cl. 5 G11B23/03 ; G06F3/00

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
Int.Cl. 5	G11B ; G06F

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category °	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
A	EP,A,0266101 (HITACHI MAXELL LTD) 04 May 1988 see column 3, line 22 - column 4, line 18; figures 3, 4	1, 2, 4-9, 13-23, 26
A	EP,A,0275657 (HITACHI MAXELL LTD) 27 July 1988 see column 2, lines 1 - 18 see column 4, lines 6 - 16, 27 - 35 see figures 1-3	1, 4, 5, 9, 12-23 26, 27
A	PATENT ABSTRACTS OF JAPAN vol. 9, no. 133 (P-362)(1856) 08 June 1985, & JP-A-60 15880 (CANON K.K.) 26 January 1985, see the whole document	1, 4, 5, 12-23, 26, 27

° Special categories of cited documents :[10]

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

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"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	Date of Mailing of this International Search Report
23 JANUARY 1990	23. 02. 90
International Searching Authority	Signature of Authorized Officer
EUROPEAN PATENT OFFICE	T.K. WILLIS

Form PCT/ISA/210 (second sheet) (January 1985)

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.

PCT/GB 89/01271
SA 31933

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-0266101	04-05-88	JP-A- 1067781	14-03-89
		JP-A- 63098721	30-04-88
		US-A- 4814924	21-03-89
EP-A-0275657	27-07-88	JP-A- 63266680	02-11-88

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82