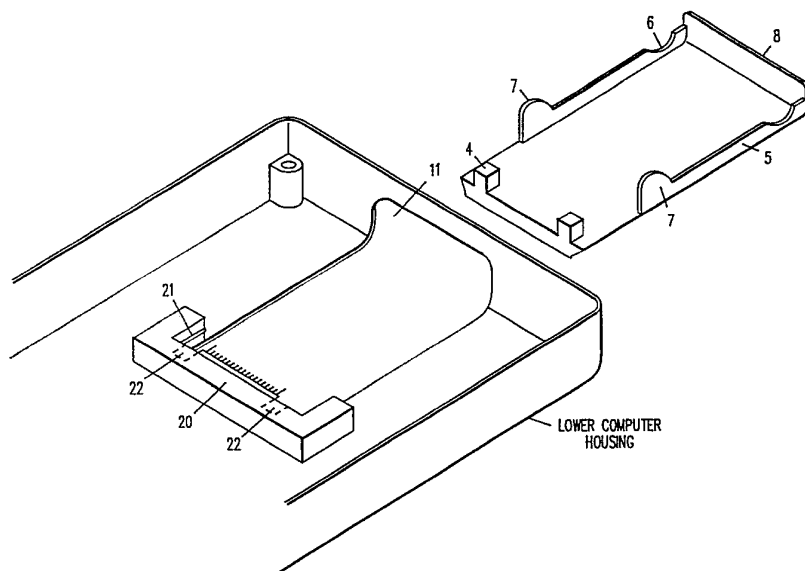




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(54) Title: MEMORY CARD TRAY FOR PORTABLE COMPUTER



(57) Abstract

A tray (1-8) for inserting a memory card into a portable computer is described. The tray (1-8) facilitates complete insertion of the memory card into the computer and optimum electrical interconnection between the memory card and the computer interior. The tray (1-8) is dimensioned such that it creates a tight seal with the computer housing and provides a coplanar fit with the exterior of the computer housing. No portions of the tray (1-8) or memory card protrude beyond the computer housing, thereby improving the durability, maneuverability, and compactness of the portable computer. A stop mechanism (4, 7) restrains the tray within the housing when the tray (1-8) is opened. A memory card can easily be placed thereinto or removed therefrom when the tray (1-8) is opened and yet the tray (1-8) does not become separated from the computer and lost.

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MEMORY CARD TRAY FOR PORTABLE COMPUTER

BACKGROUND OF THE INVENTION

5 This invention relates to a means for providing memory for a portable computer, in particular memory which uses very low power and occupies very small space.

The most common conventional method for providing memory in a stand-alone computer is using magnetic disk
10 drives. Nonvolatile memory on diskettes and their concurrent disk drives tend to require relatively large computer hardware and significant power. This method of memory storage and access is less desirable in portable computers. Consequently, volatile memory options have
15 been developed which require very low power and can be utilized effectively by leaving the power to the computer continuously on. Volatile and nonvolatile memory in the form of random access memory (RAM), one time programmable read only memory (OTPROM), and read only memory (ROM)
20 cards is now available to meet the demand for low power memory options.

According to a means for inserting a memory card within a computer housing used by Casio in their Pocketword PW-1000 hand held computer, the card itself
25 slides into an opening in the housing usually protected by a cover. The cover is fully removable and must be fully removed to insert the memory card. When the memory card is inserted, the cover can be easily misplaced. Without a cover, dirt and debris can accumulate inside the
30 computer's internal structure and cause malfunctions over time. Furthermore, the memory card does not slide into the opening completely. A portion of the card must protrude out beyond the edge of the computer housing to facilitate removal. This conventional arrangement
35 restrains the maneuverability, decreases the compactness of the portable computer and jeopardizes the proper

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functioning of the equipment over time. Since the trend in portable computer technology is miniaturization, maneuverability and compactness, this conventional computer design becomes less suitable to that end.

5 SUMMARY OF THE INVENTION

It is therefore an object of this invention to provide a means for holding a memory card which can be completely inserted into a computer housing such that the memory card fits tightly therein and does not protrude
10 beyond the computer's exterior housing wall. According to this invention, a tray is provided for holding and fully inserting a memory card into a computer housing. The memory card tray cannot easily be fully removed and thereby lost, but the open tray allows for easy access to
15 the memory card itself. Also, the memory card tray achieves good contact between the memory card and the electrical interconnections inside the computer. The tray aligns the memory card with an associated computer connector located inside the computer, and it eliminates
20 rattling associated with transporting the computer. These features improve the durability, reliability, compactness, and maneuverability of the portable computer.

The memory card tray is of unitary construction made from a material having electrically insulative
25 characteristics, preferably a moldable plastic such as Lexan® polycarbonate or ABS plastic (acrylonitrile-butadiene-styrene). The tray comprises a flat base with vertically projecting stops integrally formed on the base. The tray has two side walls integrally formed and
30 extending vertically up from the base. Each side wall may contain a cut out which exposes a thickness of the memory card when the memory card is placed in the tray. Also, a front wall is integrally formed and extends vertically up from the base, the exterior of the front wall being
35 dimensioned to fit flush with the exterior of the computer housing when the tray is fully inserted. The memory card

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has a socket along one edge and this edge is oriented to the back of the tray. The tray holds the memory card in position as both are inserted, back end first, into the computer. The socket mates with and is received by a plug 5 mounted in the computer housing as the tray is fully inserted. This plug preferably has a vertical thickness no greater than that of the memory card, so that the plug does not cause an increase in thickness of the housing beyond the thickness needed to accommodate the memory 10 card. The plug and socket preferably include corresponding means for preventing the card from being inserted incorrectly. A series of recessed serrations on the outside top of the tray base provide frictional contact for sliding the tray in and out of the computer 15 housing. The memory card tray may also contain one or more recesses on the inside top of the base into each of which a spring mechanism is inserted. The spring mechanism facilitates improved electrical contact between the memory card and the socket when the tray is fully 20 inserted into the computer housing. Also, the spring mechanism eliminates any rattling associated with transporting the computer. When the tray is opened, the spring mechanism facilitates lifting the memory card from the tray for easy removal. The tray may have one or more 25 additional features, i.e., spring mechanisms, stop clips or raised stops, which prevent the tray from being completely removed from the housing and lost.

It is preferable that an enabling electrical means be provided to indicate to the computer that the memory card 30 has been inserted or removed. The computer preferably includes means for recognizing that the memory card is being removed before data and control pins are disconnected. With this invention, a user may open the memory card drawer without the subsequent disconnection of 35 pins from their sockets causing any loss of data from the memory card. When the memory card socket connectors are beginning to be disconnected from the corresponding pins,

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there may be combinations of partial connections which cause undesirable voltage states in the memory card or computer and which may result in loss of memory card data or undesirable electrical results in the computer. To
5 prevent undesirable electrical response the enabling means is disabled before any pins have been removed from the socket and electrically disconnected.

One way this enabling means can be implemented is to provide one or more conductive extensions at the back of
10 the memory card tray which serve as a shorting bar between conductive side rails in a slot which receives the extension or extensions. The side rails are connected to a pair of lines recognized by the computer as indicating that a memory card is present. The side rails and
15 extensions are sized with respect to the pins and socket such that as the memory card is inserted into the computer by closing the memory card tray, the pins and socket make electrical contact before the extension or extensions make electrical contact with the side rails, and when the
20 memory card is removed, the extensions electrically disconnect from the side rails before the pins and sockets electrically disconnect.

Another way this enabling means can be implemented is to use an enabling feature within the memory card, in
25 which certain socket contacts indicate to the memory card that the card has been connected to a computer. To implement this method, those pins which correspond to the socket contacts which enable the card are made shorter than the other pins by an amount sufficient to assure that
30 the remainder of the pins have made contact before the short pins have made contact, and remain connected until after the short pins have been disconnected.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a side view of the memory card tray
35 illustrating a first embodiment of this invention;

Fig. 2 is an inside top view illustrating the first

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embodiment of this invention as in Fig. 1;

Fig. 3 illustrates an outside bottom view of an embodiment of this invention;

Fig. 4 is an inside top view illustrating a second
5 embodiment of this invention;

Fig. 5 is an inside top view illustrating a third embodiment of the present invention;

Fig. 6a illustrates the memory card tray in an opened position in a portable computer housing;

10 Fig. 6b illustrates the memory card tray in a fully closed position within a portable computer housing;

Fig. 7 is an inside top view illustrating the first embodiment of this invention with a lower computer housing;

15 Fig. 8 is an inside top view illustrating an embodiment of this invention with a lower computer housing;

Fig. 9a is an alternative outside bottom edge view illustrating an embodiment of this invention;

20 Fig. 9b is an outside bottom view illustrating the first embodiment of this invention;

Fig. 10 is an inside top view illustrating an embodiment of this invention with a lower computer housing; and

25 Fig. 11 is an outside side view illustrating an embodiment of this invention with a lower computer housing.

DETAILED DESCRIPTION OF THE INVENTION

Figs. 1 and 2 illustrate a first embodiment of the
30 memory card tray. As shown in Figs. 1 and 2, the tray is constructed with a flat base 1, the top surface of which supports a memory card (not shown). The top surface of the base 1 has a vertically extending rear stop 4,
dimensionally sized and positioned and integrally formed
35 thereon at the back of the tray to provide stop points for positioning the memory card in the tray. The tray has

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side walls 5 integrally formed with base 1 extending vertically up on either side of base 1 along a length thereof. In a preferred embodiment, the side walls 5 have a cut out 6 near the front of the tray exposing an area of 5 the memory card's thickness for easy removal of the memory card. The side walls 5 further may have stop mechanisms 7 added at the ends thereof opposite the front end of the tray to prevent complete and easy removal of the tray from the computer housing. The stop mechanisms may extend 10 differently relative to the side walls 5 depending on the embodiment, as illustrated in Figs. 7, 8, 10 and 11. In Figs. 1 and 7, a first embodiment, the stop mechanisms 7 extend up vertically from side walls 5. The stop mechanisms contact the inside wall above slot 11 to catch 15 the tray in an open position by its stop mechanisms 7. Fig. 8 illustrates an embodiment, wherein stop mechanisms 12 extend horizontally from the side walls 5. The computer housing has catch mechanisms 16 just inside the computer housing near slot 11 which catch the tray at a 20 specified opened position by its stop mechanisms 12. In Fig. 10, stop clips 14 which extend lengthwise back from the side walls 5 are provided to latch the tray into a closed position. These stop clips 14 clip on to associated catch points 18 within the computer housing. 25 Fig. 11 illustrates an embodiment having an alternative spring mechanism design wherein springs 15 protrude laterally out from the side walls 5. The springs provide tension against the associated internal wall catch mechanisms 19 of the computer housing when the tray is 30 fully inserted into the computer housing. When the tray is opened to a specified amount, the stop springs 15 are released from the catch mechanisms 19 inside the computer housing.

The memory card has a socket along one edge and this 35 edge is oriented to the back of the tray against rear stops 4. When the tray is fully inserted into the computer housing, the memory card socket mates with and

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makes electrical contact to plug 20 attached to the computer housing, as illustrated in Figure 7 (memory card not shown). Plug 20 includes guide 21 located at one end of its length. Guide 21 mates with a corresponding slot 5 on the memory card. No corresponding guide and slot are provided at the other end of plug 20 and the memory card, thus it is not possible to insert the memory card in the wrong orientation. Plug 20 also has guide members 22 which receive rear stops 4 and cooperatively provide fool- 10 proof alignment of the memory card with plug 20. Plug 20 preferably has an overall vertical height no greater than that of the memory card. Plug 20 is preferably bonded to the lower surface of a printed circuit board (not shown) to which contacts leading from plug 20 are connected.

15 This printed circuit board is described in detail in commonly assigned copending application serial no. 07/375,721, attorney docket no. M-968, entitled PORTABLE LOW POWER COMPUTER, incorporated herein by reference.

20 The plug and socket preferably include means for enabling the memory card to be used by the computer only after all the connecting pins have been connected. In a first embodiment, stops 4 are covered with a conductive outer surface or are made of a conductive material.

25 Coordinating with these stops, guide members 22 include conductive side rails applied to a side surfaces of guide members 22 which are shorted together by the insertion of stops 4, indicating that the memory card is in place. Pins 25-1 through 25-k are sized such that they make 30 contact with corresponding socket connectors (not shown) before the conductive portion of stops 4 makes contact with the conductive side rails in guide members 22.

In a second embodiment, one ore preferably two of pins 25-1 through 25-k which cooperate with those socket 35 connectors which are used by the memory card (not shown) to enable the memory card, or used by conductive lines in the computer to provide an enable signal to the memory

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card are made shorter than the rate of pins 25-1 through 25-k so that the rate of the pins will make contact with their corresponding socket before the enable pins make contact.

5 As the memory card tray is opened and the memory card removed from the computer, these enabling devices, either the pins or the conductive stops, disconnect before the pins used for control and data signals disconnect.

The front end of the tray has a wall 8 formed
10 integrally with base 1 and side walls 5. The front wall 8 is dimensionally sized and shaped so that the exterior of the front wall is flush with the exterior of a computer housing when the tray is inserted completely thereinto, as illustrated in Fig. 6b. As illustrated in Fig. 9b, that
15 outside bottom edges of the tray along the sides and back of the base may have both a sliding edge 9 extending vertically thereinto for a portion of the base thickness and a load carrying edge 10 extending diagonally out from sliding edge 9, meeting with the outside of side walls 5.
20 Alternatively, the embodiment illustrated in Fig. 9a incorporates outside bottom edges of the tray having a single slanted edge 13 which both carries the vertical load and provides a horizontal guide. These dimensional nuances facilitate a tight seal when the tray is inserted
25 completely into its computer housing slot 11, as illustrated in Fig. 6, and smooth sliding movement of the tray.

Fig. 3 illustrates an outside bottom view of the tray. On the bottom surface of the flat base 1, a series
30 of recessed serrations 3 are provided for frictional contact when sliding the tray without the need for a protrusion such as a handle. The recessed serrations may extend along the full length of the tray or part way, as shown.

35 Fig. 4 illustrates an inside top view of the memory card tray in a second embodiment. The tray contains all the features of the first embodiment, illustrated in Figs.

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1 and 2, except the cutouts 6. Instead of cutouts 6 in the side walls 5, this embodiment includes a pair of spring mechanisms 2 embedded into the inside top of the base 1. Each spring mechanism 2 consists of a thin strip 5 of curved plastic which can be compressed by the inserted memory card when the tray is closed. Each spring mechanism 2 provides tension to the memory card (not shown) when the memory card is inserted into the computer housing and facilitates card removal when the tray is 10 opened. If the memory card were to fit loosely when inserted into slot 11 in the computer housing, rattling due to movement of the portable computer would cause loose electrical interconnections and damage to the memory card over time. The spring mechanism 2 eliminates the rattling 15 of the memory card caused by a loose fit and eliminates the potential for damage to the memory card when the portable computer is moved around. Nevertheless, the spring mechanism 2 requires an added fabrication step, so that this disadvantage must be weighted with the 20 advantages listed above. Alternatively, the first embodiment, illustrated in Figs. 1 and 2, relies on the accurate fit of the memory card to eliminate the rattling and to maintain electrical contact.

Figure 5 is an inside top view of the memory card 25 tray in a third embodiment. This embodiment of the memory card tray includes all of the features from Figures 1, 2, and 4. Consequently, this tray comprises both a spring mechanism 2 providing tension to the memory card when the memory card is inserted into the computer housing and 30 cutouts 6 which provide access to the sides of the memory card for easy removal and placement into the tray. In all embodiments, the positioning of the memory card in the tray and the insertion of the tray into slot 11 provide alignment of the memory card with the electrical 35 interconnections of the computer for fool-proof operation after insertion. Moreover, all embodiments are molded from an electrically insulating material, preferably

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Lexan® or ABS plastic, into a unitary construction. Those embodiments incorporating spring mechanisms have additional pieces of an electrically insulating plastic included therein and require some assembly.

5 Figure 6a shows the memory card tray associated with a representative portable computer housing. The memory card tray having all of the features described above, as illustrated in Fig. 5, is partially inserted in the computer housing slot 11. Figure 6b illustrates the
10 memory card tray in a fully inserted position depicting a flush fit with the computer housing exterior.

While the invention has been described in connection with several exemplary embodiments, it will be understood that many modifications will be apparent to those of
15 ordinary skill in the art. Other modifications or variations might include two memory card trays instead of one; trays inserted at either end long the length of the portable computer or trays inserted from the sides across the width of the portable computer; one tray or both trays
20 might be located in the upper housing rather than the lower housing of the portable computer; the trays might be oriented at different angles wherein one might be inserted from the end and the other from the side of the computer housing; the memory card and the tray may be spring loaded
25 into the portable computer housing using an alternative spring mechanism; the tray could be designed to slide and carry the memory card in alternative ways; and different stop mechanisms and associated catch mechanisms as well as eliminating the stop mechanism altogether are all examples
30 of the potential modifications that are possible. This application is intended to cover any adaptations or variations of this invention.

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CLAIMS

What is claimed is:

1. A tray means for inserting and holding a memory card in a computer housing comprising:
 - 5 a flat base;
 - a pair of vertical side walls integrally formed on a first side and a second side of said flat base, said first and second sides being parallel to each other; and
 - 10 a vertical front wall integrally formed on a front end of said flat base, said front end being opposite a back end, wherein an outside surface of said vertical front wall and said flat base are dimensioned to fit flush with the exterior of a
 - 15 computer housing wall when the tray is completely inserted into the computer housing.
2. A tray means for inserting and holding a memory card in a computer housing according to Claim 1, wherein said flat base has a spring mechanism extending upward
- 20 therefrom.
3. A tray means for inserting and holding a memory card in a computer housing according to Claim 1, wherein said flat base has a spring mechanism extending upward therefrom.
- 25 4. A tray means according to Claim 1 wherein said flat base has a lower surface and an upper surface, said lower surface having a length extending between said first and second sides smaller than a length of said upper surface extending between said first and second sides, and
- 30 said computer housing includes an opening for said tray, said opening having dimensions corresponding to said lengths of said upper and lower surfaces.

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5. A tray means according to Claim 4, wherein said length of said lower surface remains constant for a lower portion of the total thickness of said flat base, between said lower and upper surfaces, and said length of said upper surface constantly increases from said lower portion to said upper surface for a remaining portion of said total thickness of said flat base.

6. A tray means according to Claim 4, wherein a length between said first side and said second side has a depth between said upper surface and said lower surface which equals the total thickness of said flat base, said length constantly decreasing from said upper surface to said lower surface.

7. A tray means for inserting and holding a memory card in a computer housing according to Claim 1, wherein said pair of vertical side walls have a stop mechanism integrally formed thereon.

8. A tray means for inserting and holding a memory card in a computer housing according to Claim 7, wherein said stop mechanism extends vertically up from said side walls.

9. A tray means for inserting and holding a memory card in a computer housing according to Claim 7, wherein said stop mechanism extends horizontally out from said side walls.

10. A tray means for inserting and holding a memory card in a computer housing according to Claim 7, wherein said stop mechanism extends lengthwise from said side wall opposite said front end.

11. A tray means for inserting and holding a memory card in a computer housing according to Claim 7, wherein

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said stop mechanism extends laterally out from said side walls on said outside surface thereof.

12. A tray means for inserting and holding a memory card in a computer housing according to Claim 11, wherein
5 said stop mechanism is a spring mechanism, which compresses into at least one of said side walls.

13. A tray means for inserting and holding a memory card in a computer housing according to Claim 1, wherein a stop is integrally formed at said back end of said flat
10 base.

14. A tray means for inserting and holding a memory card in a computer housing according to Claim 13, wherein said stop extends vertically up from said flat base.

15. A tray means for inserting and holding a memory
15 card in a computer housing according to Claim 14, wherein said computer housing holds a plug for making electrical connection to said memory card, said plug cooperating with a socket in said memory card.

16. A tray means for inserting and holding a memory
20 card in a computer housing according to Claim 15, said plug having a guide for receiving said stop formed in said tray.

17. A tray means for inserting and holding a memory card in a computer housing according to Claim 16, wherein
25 said plug includes a sliding guide which cooperates with a corresponding guide in said memory card for aligning said memory card and which prevents incorrect orientation of said memory card.

18. A tray means for inserting and holding a memory
30 card in a computer housing according to Claim 1, wherein

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said computer housing holds a plug for making electrical connection to said memory card, said plug cooperating with a socket in said memory card.

19. A plug for electrically connecting a memory card
5 to a printed circuit board of a computer, said plug being
fixedly attached at an upper surface to a lower surface of
said printed circuit board and having a plurality of pins
for making electrical connection to said memory card
extending in a direction approximately parallel to said
10 lower surface of said printed circuit board, said plug
having a vertical thickness not appreciably greater than a
vertical thickness of said memory card, whereby said plug
does not increase a thickness required by a computer
housing for accommodating said memory card.

15 20. A connector for connecting a memory card to a
computer comprising:

a socket in said memory card comprising a
plurality of socket connectors, at least some of said
socket connectors for providing data and control
20 signals between said memory card and said computer;

a plug in said computer comprising a plurality
of plug pins, each of said plug pins corresponding to
one of said socket connectors;

means for inserting said memory card into said
25 computer and thereby connecting said some of said
socket connectors for providing data and control
signals to corresponding some of said plurality of
plug pins; and

means for enabling said some of said pins to be
30 electrically connected to said some of said socket
connectors, said means for enabling being enabled
only when all of said some of said socket connectors
for providing data and control signals between said
memory card and said computer are connected.

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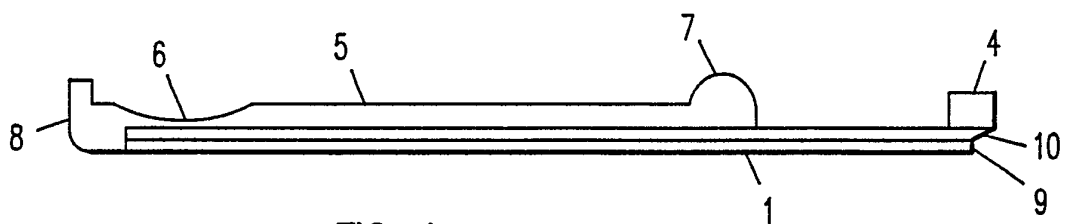


FIG. 1

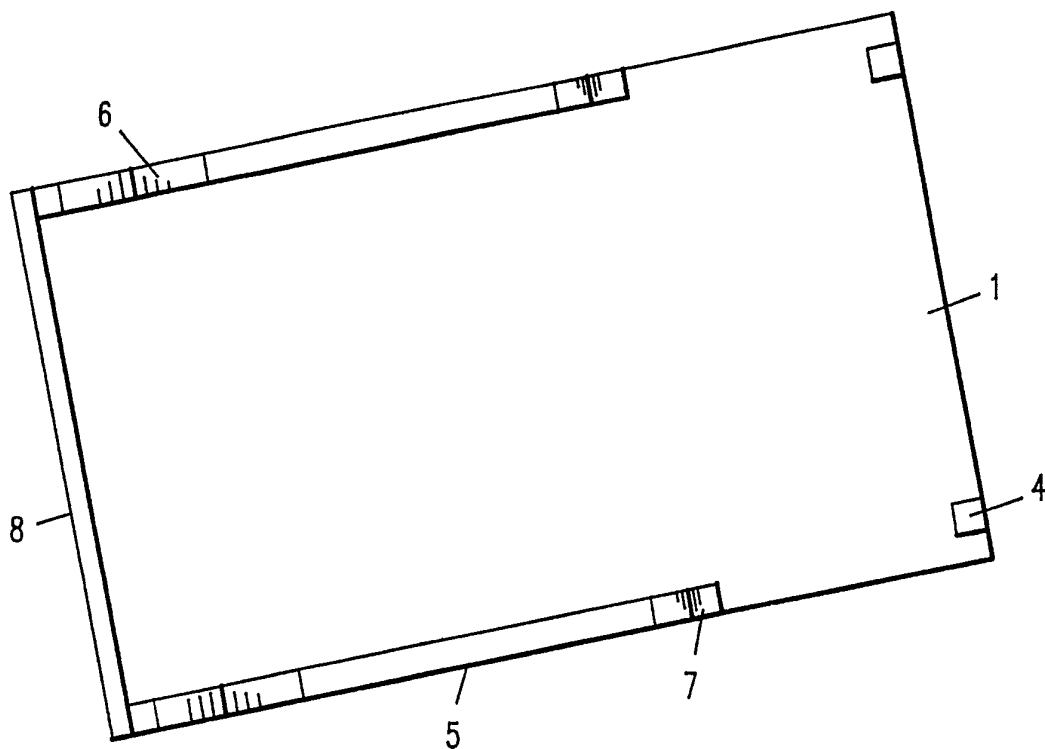


FIG. 2

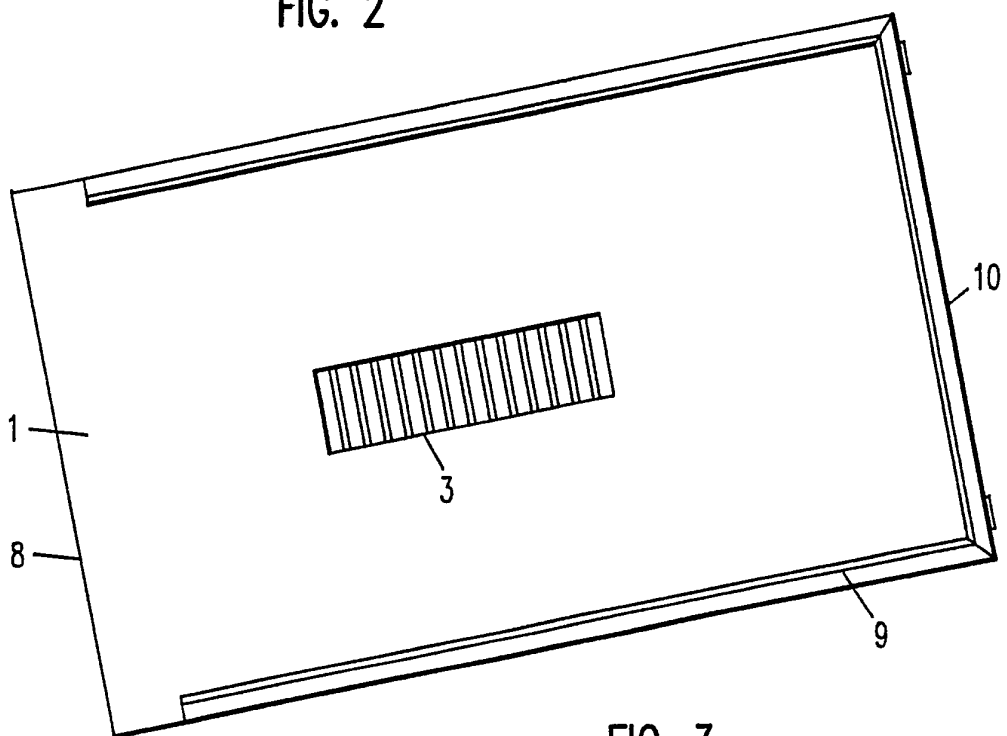


FIG. 3

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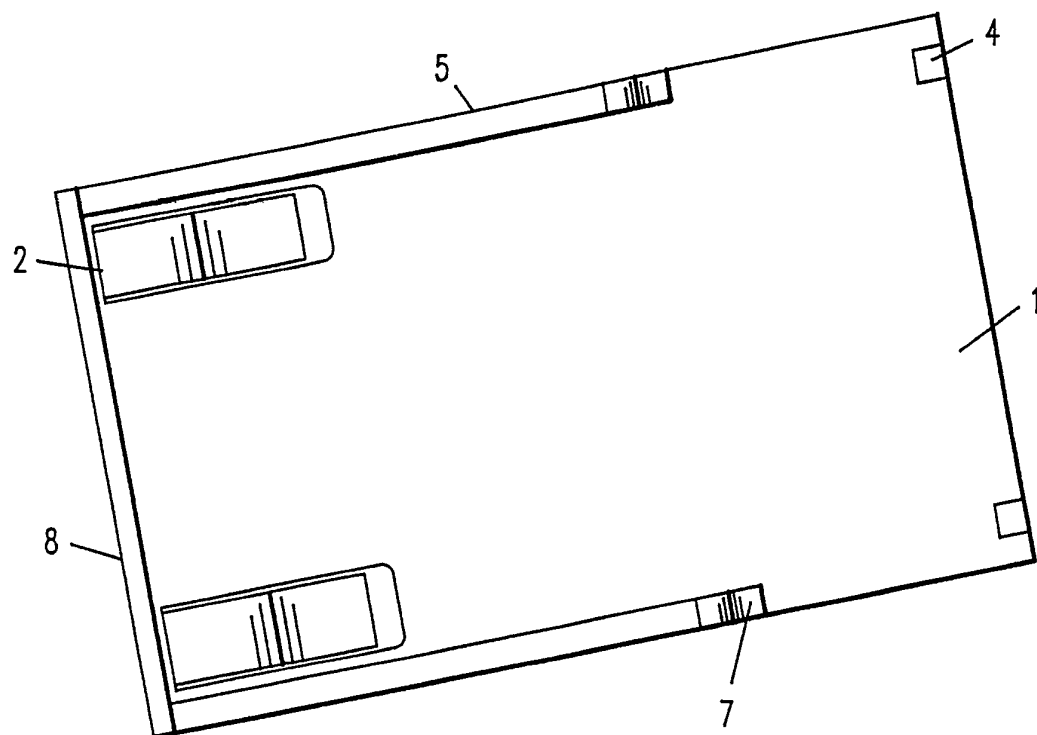


FIG. 4

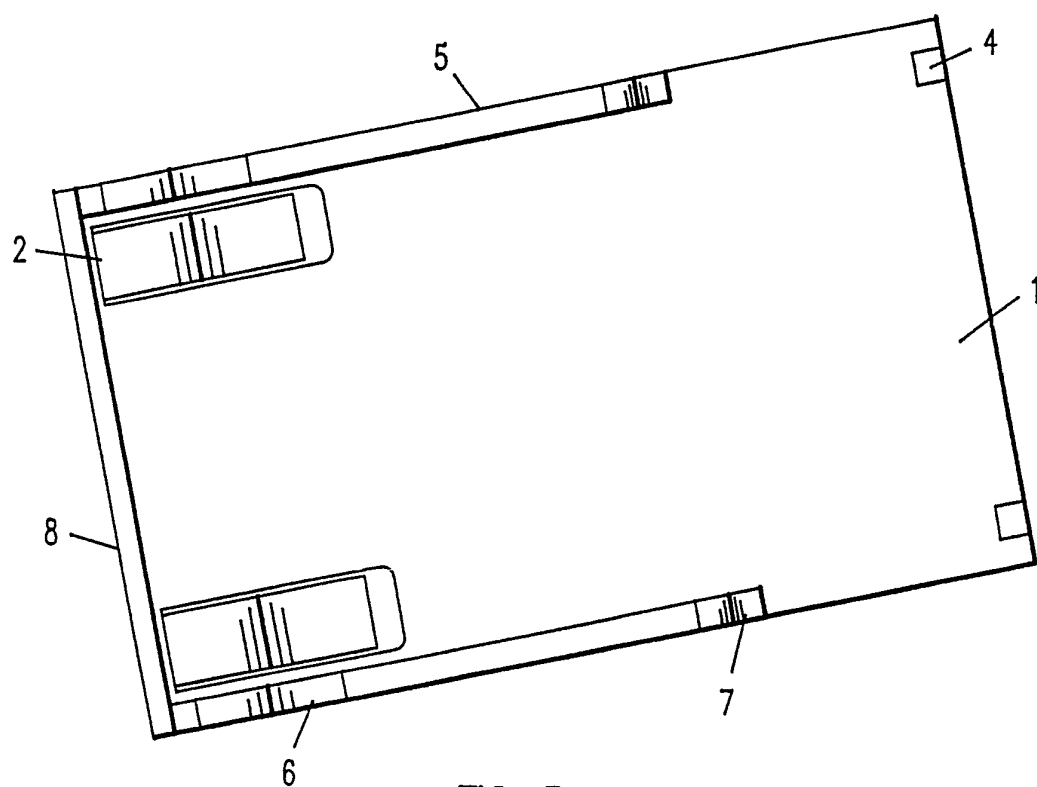
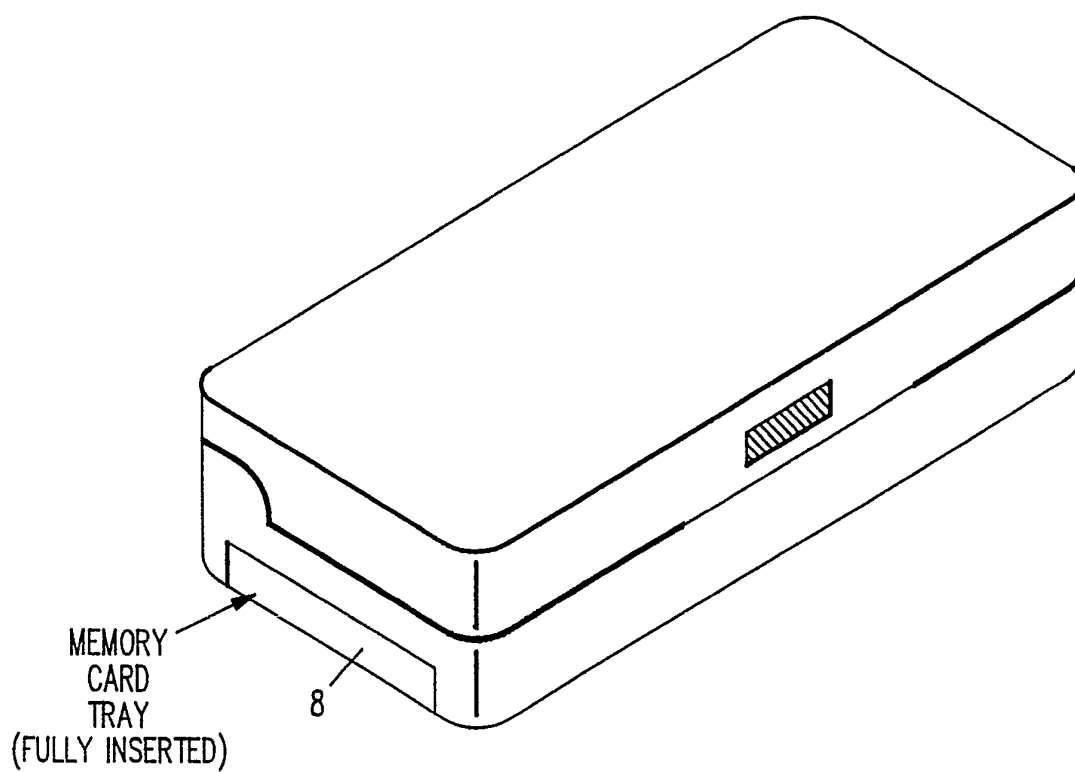
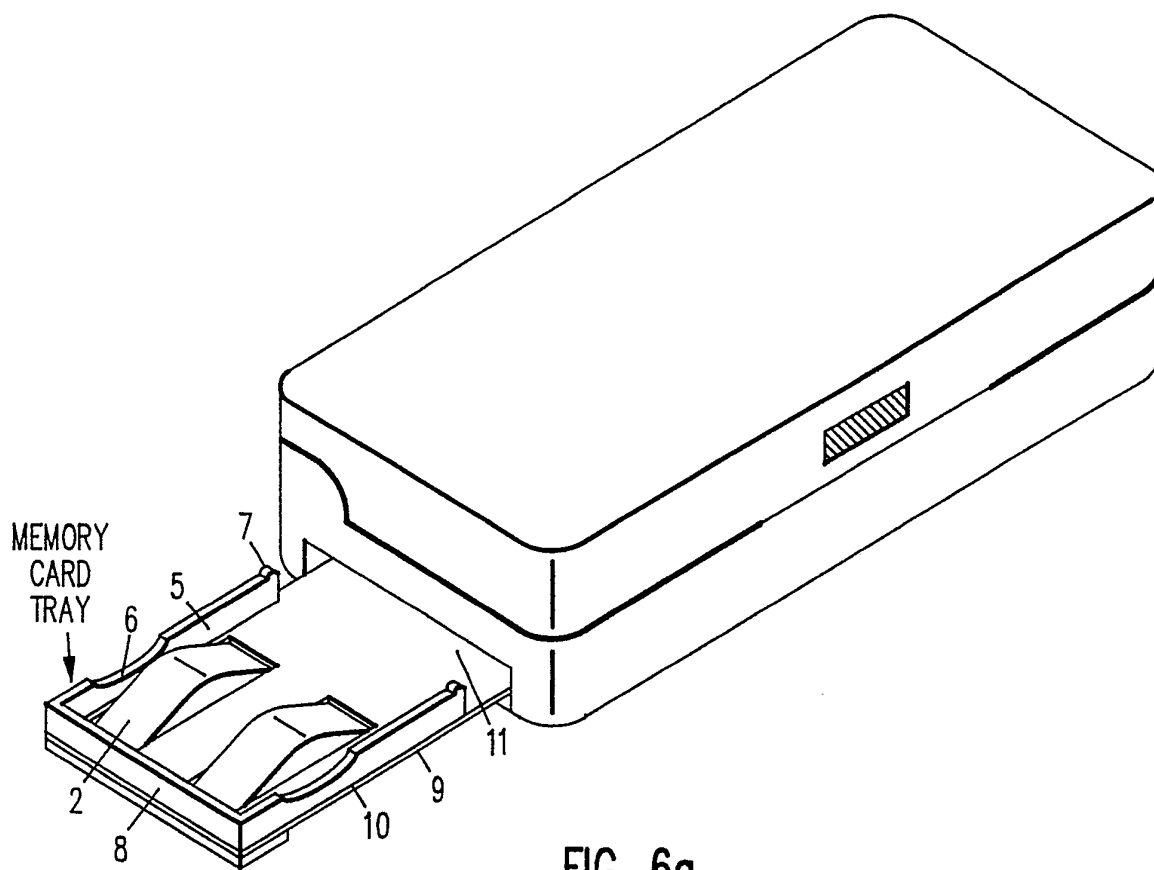
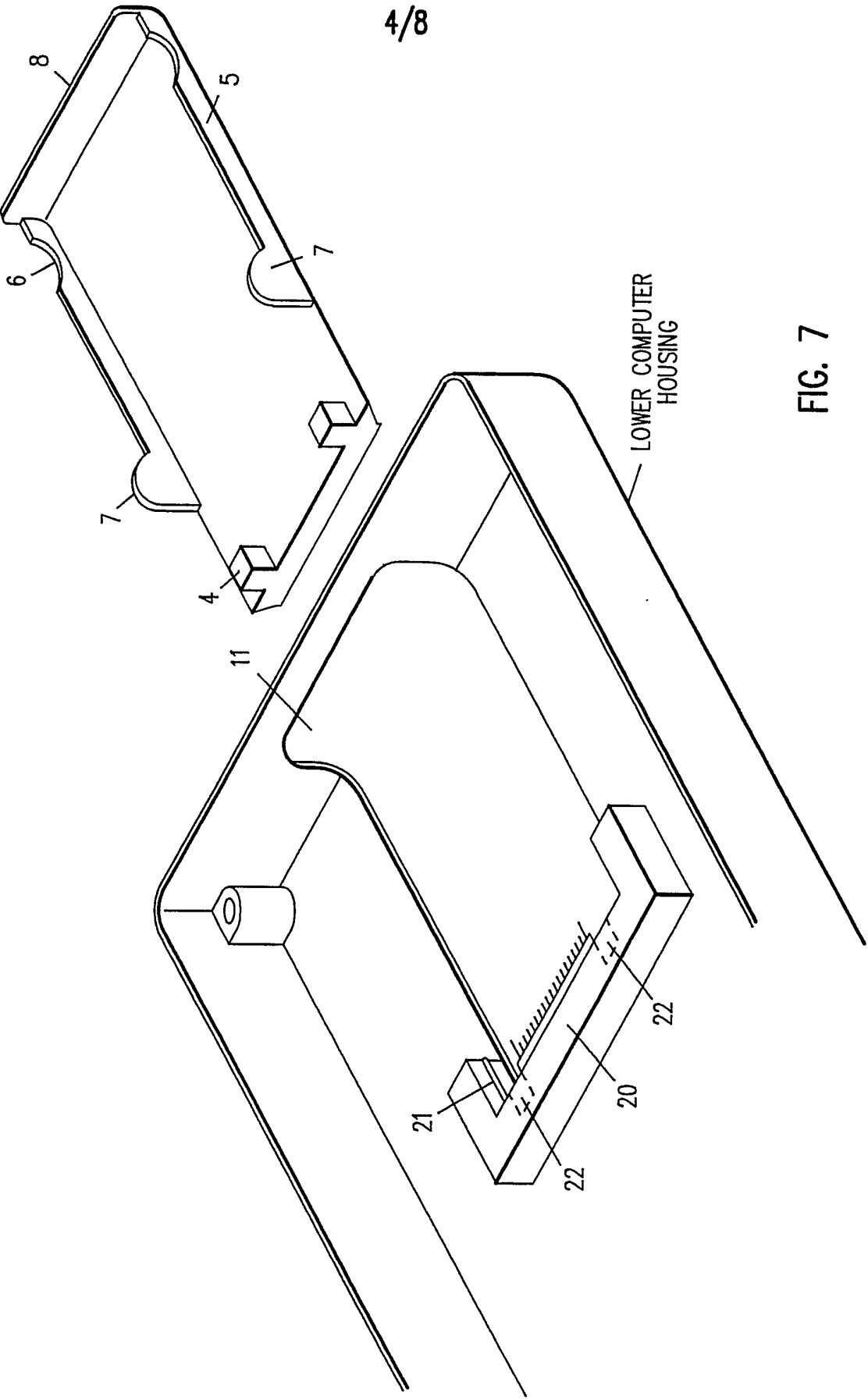
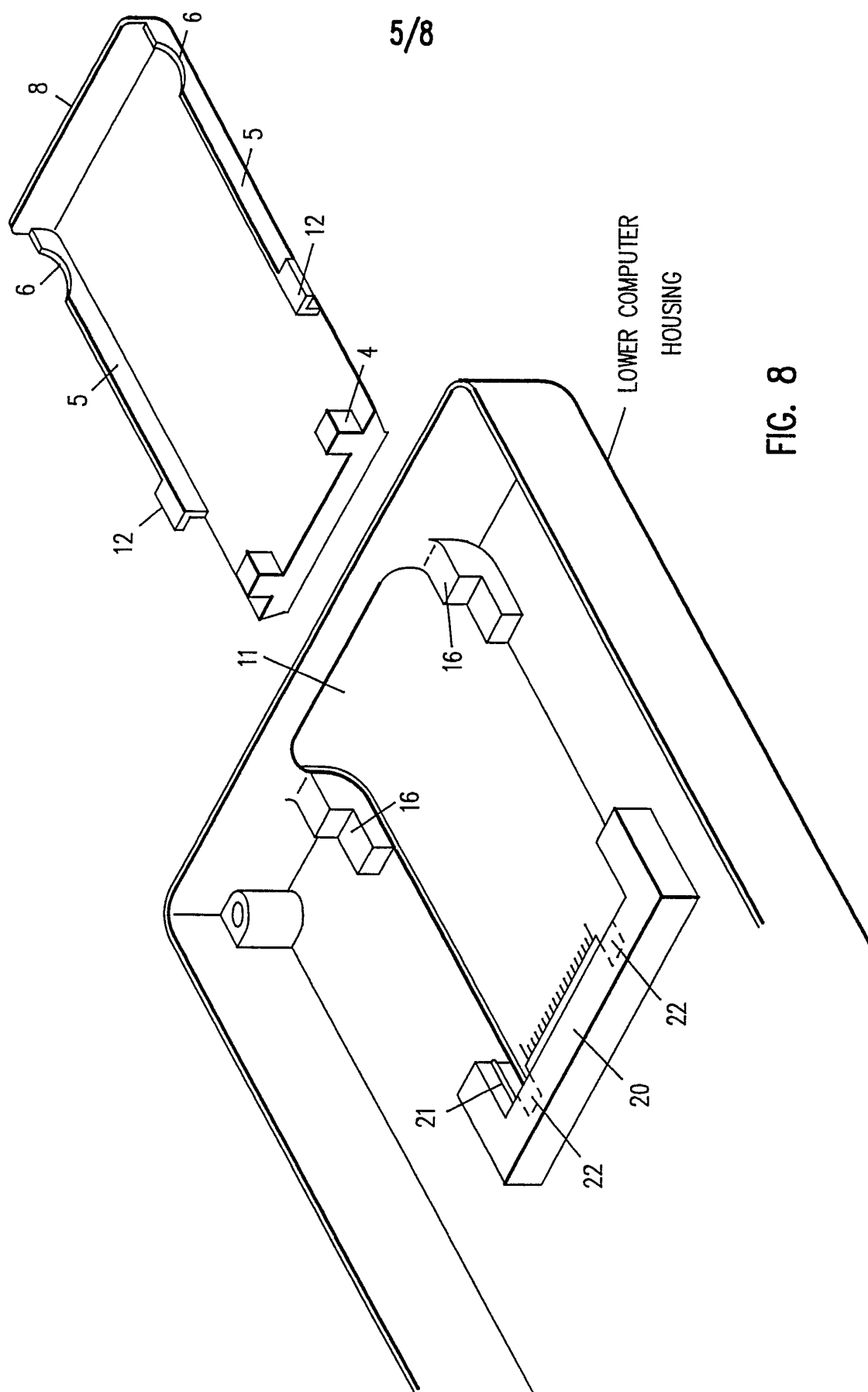


FIG. 5

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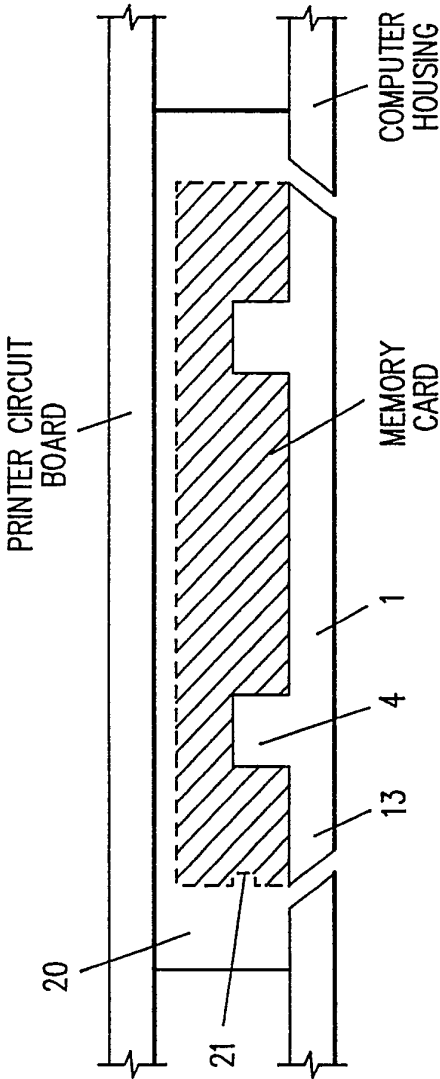


FIG. 9a

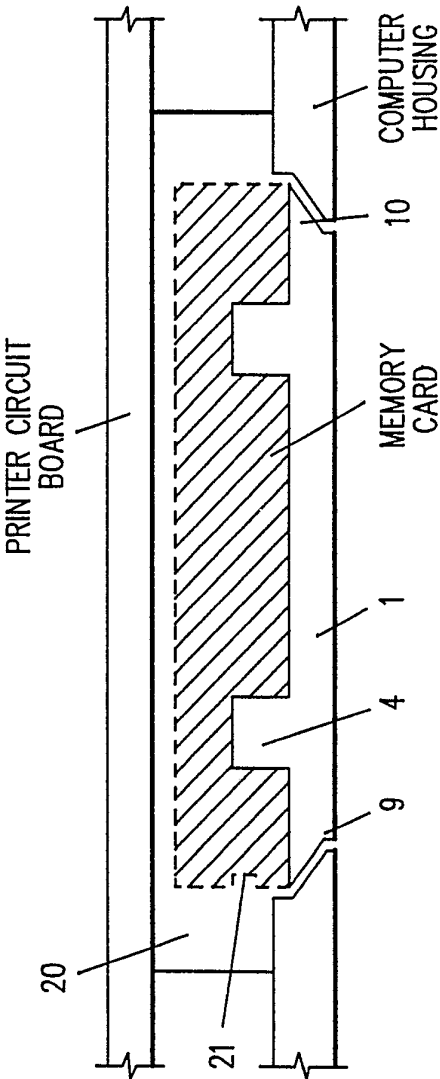
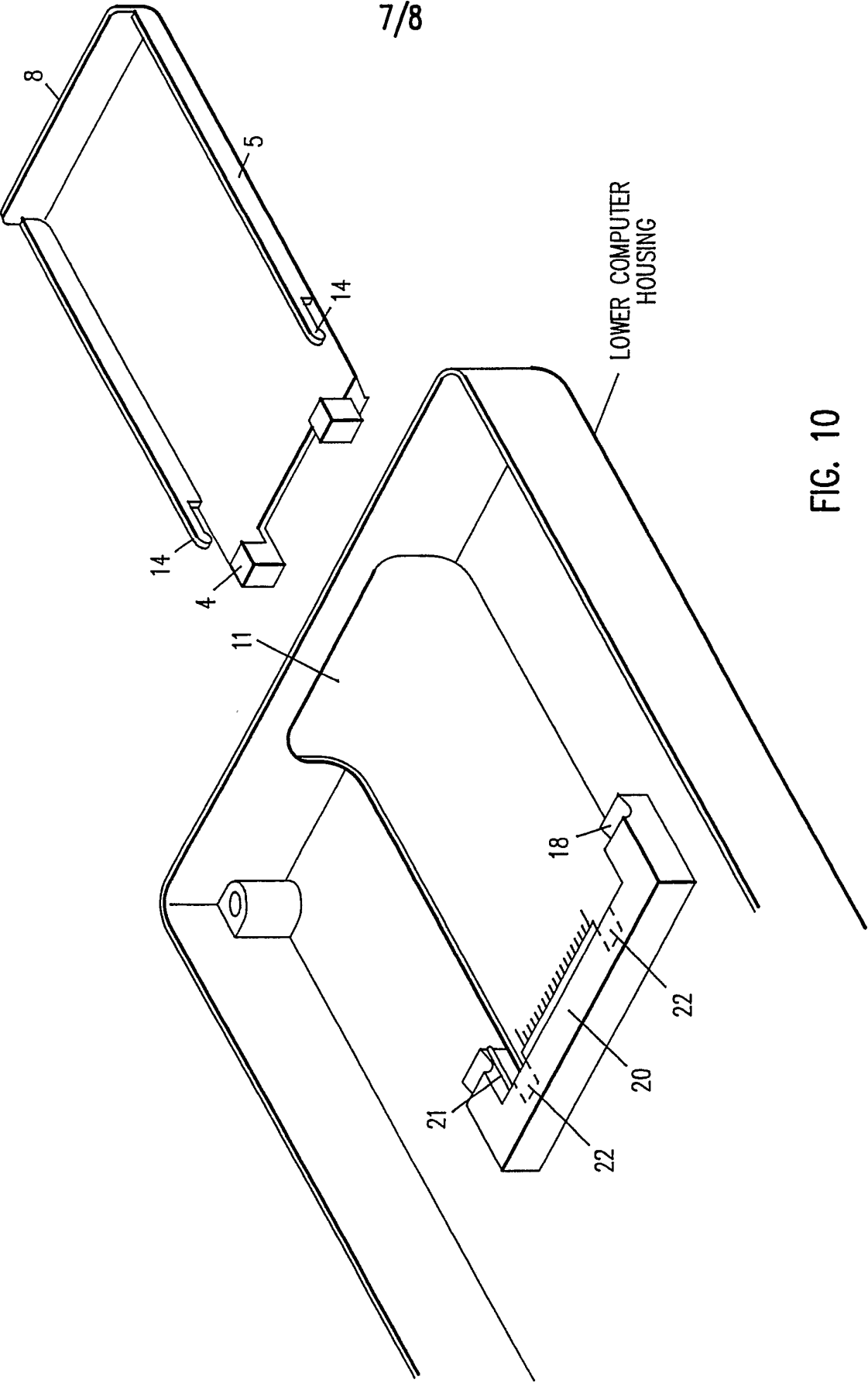


FIG. 9b



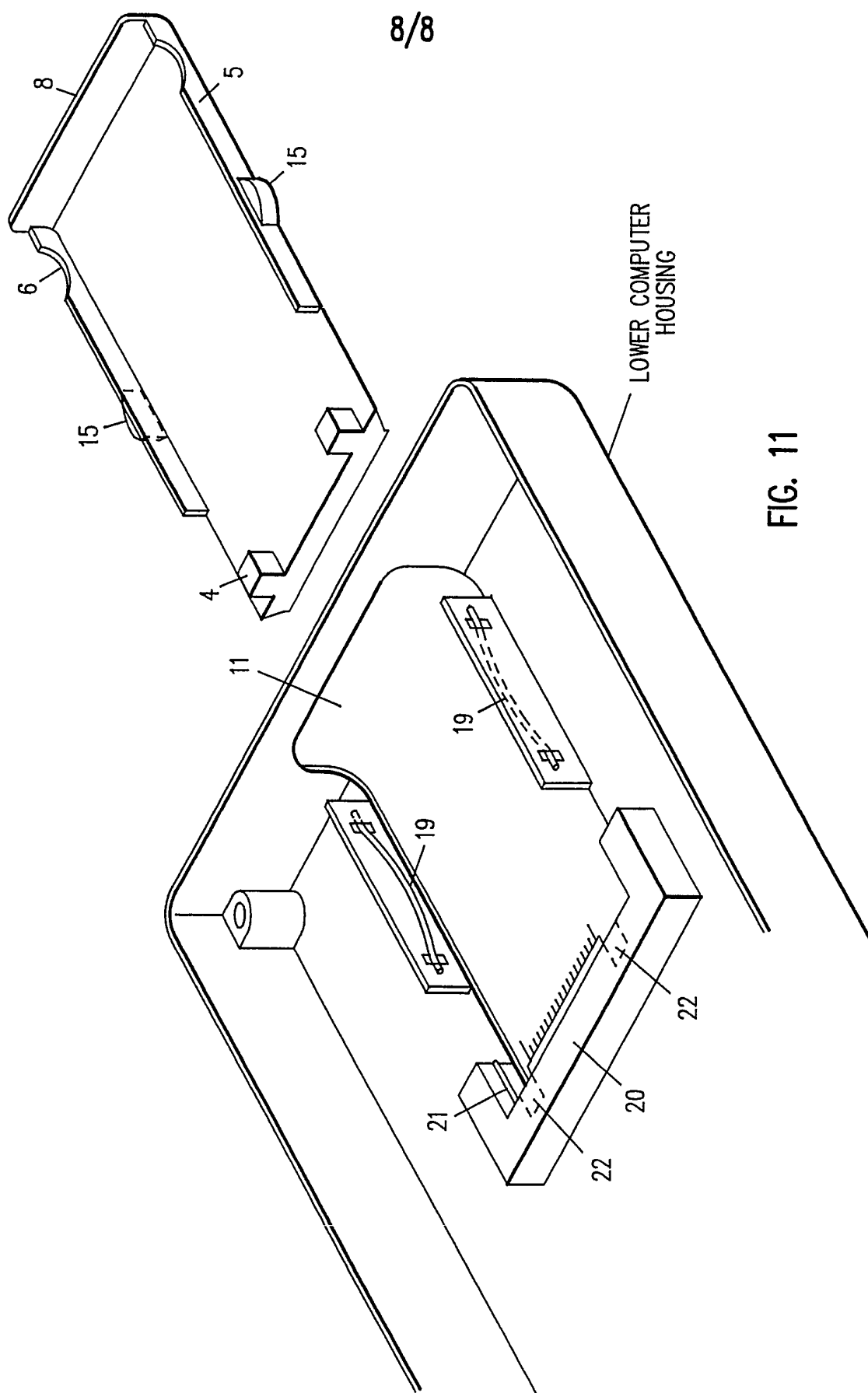



FIG. 11

INTERNATIONAL SEARCH REPORT

International Application No **PCT/US90/03638**

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): H05K 1/14 H05K 7/14 G06F 1/00 US. CL.: 361/395, 415 364/708		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁴		
Classification System	-Classification Symbols	
U.S.	439/374, 377, 296-298 312/331, 333, 334, 337-338 369/75.1 364/708 361/331, 338, 339, 380, 391, 393-395, 399, 415	
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
X P	US, A, 4,879,635 (COLLINS ET AL) 07 November 1989 See the entire document	1, 7, 13, 18-20
X P	US, A, 4,899,254 (FERCHAU ET AL) 06 February 1990 See the entire document	1, 7, 13 18-20
X	US, A, 4,399,487 (NEUMANN) 16 August 1983 See the entire document	1, 7, 13 18-20
X	US, A, 4,190,306 (LITCHFIELD ET AL) 26 February 1980 See the entire document	1-2, 7, 13
X	US, A, 4,458,964 (HARDY) 10 July 1984 See the entire document	1-2, 7, 13
A P	US, A, 4,941,841 (DARDEN ET AL) 17 July 1990 See the entire document	
<div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <p>¹⁵ Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 48%;"> <p>"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</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"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.</p> <p>"&" document member of the same patent family</p> </div> </div>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search ²	Date of Mailing of this International Search Report ²	
29 AUGUST 1990	<div style="text-align: center; font-size: 1.2em; font-weight: bold;">06 NOV 1990</div>	
International Searching Authority ¹	Signature of Authorized Officer ²⁰	
ISA/US	<div style="text-align: center;">  GREG THOMPSON </div>	