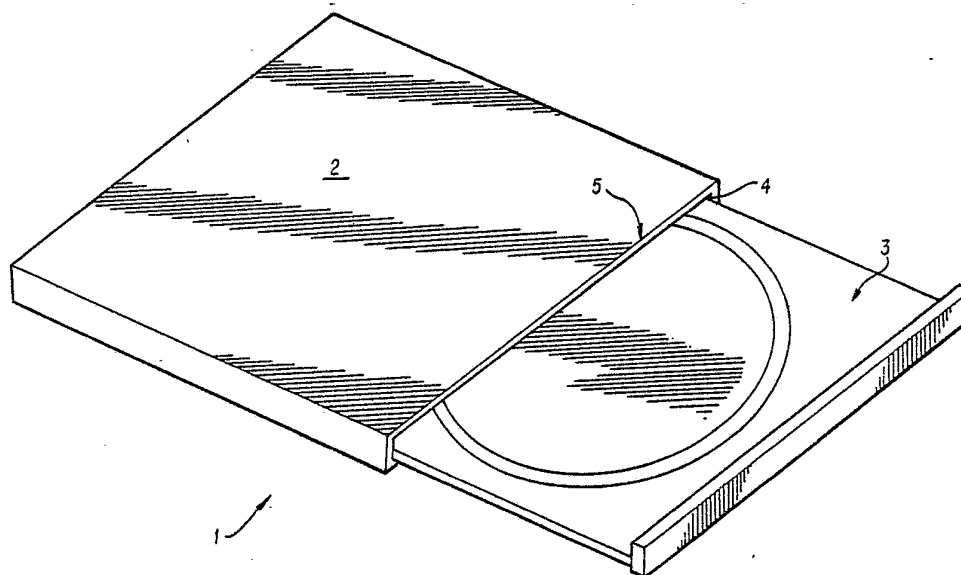




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(54) Title: OPTICAL DISK CARTRIDGE**(57) Abstract**

A disk cartridge (1) for protecting a disk upon which digital information is stored. The cartridge includes a rectangular shaped cartridge housing (2) and a cartridge insert (3). The cartridge insert is removably disposed within the housing through a side opening (4) thereof. The side opening has an exterior taper (12) which closely engages a cooperating interior taper (13) of the cartridge insert so that a tight seal is formed when the cartridge insert is fully inserted into the cartridge housing. The cartridge insert is locked into the housing by a pair of latches (6) that form an integral part of the cartridge insert. These latches cooperate with catches (7) that form part of the housing to securely lock the insert inside the housing. Only through the use of special engaging pins may the latches be released to allow the cartridge insert to be slidably removed from the housing.

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OPTICAL DISK CARTRIDGE

BACKGROUND OF THE INVENTION

The disclosed invention, a recording disk protective cartridge relates to the field of recording disk protective devices, and in particular to the field of protective devices which provide for the automatic loading and unloading of recording disks in information storage devices.

In the prior art, there have been a wide number of means developed for the non contact handling of workpieces, such as information recording disks. However, as the information has become more densely written on the disk surface, the sensitivity of the disk to contamination by dust, and susceptibility to damage during the loading operation has increased dramatically. This sensitivity to damage or contamination is extremely sensitive with the more recent high density magnetic and optical disks.

Exposing the disk surface to the open atmosphere usually results in serious contamination of the disk surface. Therefore, in devices having removable media, it is essential that the disk be kept in a protective covering when not actually loaded in the recording device. Also, disk damage and contamination as a result of human error during the loading and unloading of the disk into the device is an ever present concern.

The prior art has addressed these problems in part by permanently mounting the disk within the recording device. A device which can use removable media is much more versatile, allowing the



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user to have access to significantly more data than is possible with a fixed media device.

However, in both optical and magnetic disk devices the writing and reading of the data when a permanently sealed cartridge is used have required complex hub assemblies, and seals around said hub assemblies and entrance ports in order to reduce contamination. This method has also presented significant problems in maintaining accurate centering of the disk, as ever more dense data patterns are recorded. Also, because invariably, some contamination will enter the cartridge, some ducting method is required to provide a flow of clean air over the disk surface within the cartridge when it is installed in the information storage device. These problems have led to renewed interest in removing the disk from the cartridge for use.

This invention provides a unique and novel means of storing a disk in a cartridge and providing for the automatic, low contamination, loading and unloading of a disk from the cartridge for use in a data storage device.

It is an object of this invention to provide a means for preventing mishandling damage to a sensitive surface workpiece such as a data recording disk.

It is another object of this invention to provide a means for preventing the dust contamination of a sensitive surface workpiece such as a data recording disk.

It is yet another object of this invention to provide a means of automatically loading a sensitive surface workpiece such as a data recording disk into a data information storage device.



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BRIEF SUMMARY OF THE INVENTION

In the preferred embodiment of the disclosed invention, the disk cartridge consists of two components, the cartridge housing and the cartridge insert. The cartridge housing is a rectangular shaped enclosure having a rectangular shaped opening on one side of the housing. The cartridge insert is removably deposited within the housing through the side opening. The side opening of the housing has an exterior taper which closely engages an interior taper on the cartridge insert handle, such that when the insert is fully inserted into the cartridge housing, an air tight seal is formed.

The side opposite the housing opening has a set of recesses in the housing which allow a loading device to clamp onto the cartridge for automatic loading and unloading.

The cartridge insert is locked into the housing by means of a pair of latches formed as an integral part of the cartridge insert. These latches cooperate with catches formed as an integral part of the cartridge housing to lock the cartridge insert in the housing when the latches are in their intended position.

Also, located on that opposite side of the housing, on the bottom of the housing, are a pair of holes which allow the passage of a pair of release cams. These release cams, when moved upward through the holes, engage the latches, disengaging them from the housing catches, thereby allowing the insert to be freely partially extracted from the cartridge. This configuration thereby only allows the insert to be removed from the housing when the cartridge is in the closed clean-air environment in the interior of the information storage device. Opening the cartridge housing (breaking the tight seal) to remove the insert from the housing outside of the



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clear environment of the information storage device is extremely difficult.

The housing and the insert have a interlock arrangement which prevents the insert from being fully extracted from the housing. The insert has an access opening which allows an elevator assembly to remove the disk from the cartridge insert; the opening in the insert supports the disk around its outer perimeter.

In operation, the cartridge is either manually or automatically loaded into the device. After the cartridge has been loaded in the device, any conventional means is used to engage the cartridge locking means and release the cartridge insert from the cartridge housing. Once the cartridge insert is unlatched from the housing, it is pulled from the cartridge housing. Once fully pulled from the cartridge housing, the insert is deposited over the elevator assembly. The elevator assembly is then activated, lifting the disk from the cartridge insert. The unloading of the disk from the data storage device is accomplished by reversing the above described procedure.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is pictorial representation of the cartridge, showing the cartridge insert partially removed from the cartridge housing.

FIG. 2a is a top view of the cartridge showing the cartridge insert fully inserted into the cartridge housing. FIG 2b is a pictorial representation of the cartridge insert fully extracted from cartridge housing.

FIG. 3 is a partial cross section view of the cartridge showing the tapered fit of the cartridge housing and the cartridge insert.



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FIG. 4 is a pictorial representation of the preferred embodiment of the disclosed invention configured for use with an optical recording disk, the disk cartridge is partially introduced into the load/unload apparatus.

FIG. 5 is a pictorial representation of the preferred embodiment disclosed invention showing the cartridge fully inserted into the load/unload apparatus.

FIG. 6 is a pictorial representation of the preferred embodiment of the disclosed invention showing the cartridge separator having removed the cartridge insert from the cartridge housing.

FIG. 7 is a pictorial representation of the disclosed invention showing the cartridge introduced from the side as when loaded from a jukebox type configuration.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in FIG. 1, the preferred embodiment of the protective cartridge 1 is comprised of a cartridge housing 2 and a cartridge insert 3. The cartridge housing 2 has a rectangular shape and a rectangular cavity 4 in one side 5 of the cartridge housing 2.

FIG. 2a shows the cartridge insert 3 lockably inserted in the cartridge housing 2, with the pair of latches 6 integral to the cartridge insert 3 engaged by the restraining catches 7, which are in turn integral to the cartridge housing. Also shown in FIG. 2a is the circular opening 8 which supports the disk (not shown), but allows the passage of the disk elevating means (not shown in FIG. 2a).

FIG. 2b shows the cartridge insert 3 fully extended, more clearly showing the latches 6, and the restraining catches 7. FIG.



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2b also shows the cooperation of the insert shoulder 9, and the housing neck 10 in preventing the cartridge insert 3 from being completely removed from the cartridge housing 2. FIG. 2b, also more clearly shows the housing holes 11, through which the insert release cams reciprocate.

FIG. 3 shows, in partial cross section, the means by which the protective cartridge 1 is sealably engaged. The cartridge housing 2 has an exterior taper 12, which closely contacts the interior taper 13 on the cartridge insert 3.

The operation of the cartridge in conjunction with a cartridge loading device mechanism for use with an information storage machine device can be seen by reference to FIGS. 4-6. FIG. 4 shows a cartridge 1, partially inserted into a load/unload apparatus 14, said apparatus 14 having as its major components, the guide frame 15, the pull-in tray 16, the cartridge insert separator 17 and the elevator assembly 18. The guide frame 15 has a first leg 18, the first leg 18 having a rectangular shaped opening through which the cartridge 1 is introduced. The pull-in tray 16 is in its forward most position and engages and supports the cartridge housing 2. As shown in FIG. 4, the insert handle 19 on one side of the cartridge housing 2 is supported by the insert separator 17 while the opposite side is supported by the second leg 20 of the guide frame 16.

At this point, the cartridge 1 is clamped to the pull-in tray 16, and the tray 16 then is moved rearward, pulling the cartridge 1 into the device.

FIG. 5 shows the fully inserted cartridge 1, the pull-in tray 16 at its rearmost position. Once fully inserted, the latches 6 are disengaged from the restraining catches by release cams (not shown) thereby freeing the insert 3 to slide from the housing 2. The



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insert handle 19 at this point is fully disposed within the U-shaped channel 21 of the cartridge separator 17. At this point, the cartridge insert 3 is clamped to the separator 17.

As shown in FIG. 6, once clamped, the cartridge insert 3 is extracted from the cartridge housing 2. As shown in FIG. 6, once fully extracted the cartridge insert 3 and in particular the insert hole 8 is positioned over the elevator assembly 18 so that the assembly 18 can be activated, thereby removing the disk (not shown) from the cartridge insert 3, presenting the disk to the spindle (not shown) for use.

FIG. 7, shows a partially inserted cartridge 1 being introduced from the opposite side, as when loaded from a jukebox-type device (not shown). In this configuration, the jukebox device will fully introduce the cartridge, thereafter, the loading/unloading operations are as discussed above.

While the preferred embodiment has disclosed the apparatus in conjunction with a specific embodiment of the load/unload apparatus, those skilled in the art will recognize that the disclosed invention is adaptable to a wide number of alternative configurations, and that the disclosed embodiments are in no way intended to limit or otherwise narrow the scope of this invention.



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CLAIMS

We claim:

1. A recording disk protective cartridge comprised of:
 - a cartridge housing, said housing having an opening for introduction of a cartridge insert, and;
 - a cartridge insert, said insert removably disposed in the opening in the cartridge housing, and said insert supporting a recording disk around its outer perimeter;
 - such that when the insert is fully inserted into the cartridge housing, the disk is completely enclosed and protected, and such that when the insert is extracted, the disk is presented for loading into an information recording device.
2. The protective cartridge of claim 1, further comprising a means for sealably enclosing the disk within the cartridge when the cartridge insert is fully inserted into the cartridge housing.
3. The protective cartridge of claim 2, wherein the means for sealably enclosing the disk is comprised of:
 - an outside taper on the cartridge housing; and
 - an inside taper on the cartridge insert, such that when the cartridge insert is fully inserted within the cartridge housing, the inside taper of the insert and the outside taper of the housing sealably engage, thereby sealably enclosing the disk within the cartridge.
4. The protective cartridge of claim 1, further comprising a



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means for lockably inserting the cartridge insert in the cartridge housing.

5. The protective cartridge of claim 4, wherein the means for lockably inserting the cartridge insert in the cartridge housing is comprised of:

a pair of latches, said latches mounted integral to the interior end of the cartridge insert;

a pair of retaining catches, said catches integral to the cartridge housing located such that when the cartridge insert is fully inserted into the cartridge housing, the insert latches and the retaining catches lockably engage; and

a means for releasing said latches, said means passing through a set of holes in the cartridge housing, such that when the releasing means is activated, the latches are disengaged from the retaining catches, thereby releasing the cartridge insert from the cartridge housing.

6. The protective cartridge of claim 1, further comprising a means for preventing the complete removal of the cartridge insert from the cartridge housing.

7. The protective cartridge of claim 6, wherein the means for preventing the complete removal of the cartridge insert is comprised of a pair of outward projecting shoulders, said shoulders located on the interior end of the cartridge insert, and cooperating with the neck of the cartridge housing to prevent the cartridge insert from being completely removed from the cartridge housing.



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8. The protective cartridge of claim 1, wherein the cartridge insert has an opening, said opening being large enough to allow the passage of a disk elevating platform, said platform being for the purpose of presenting the disk to the device spindle for use, but small enough to support the outer perimeter of the disk.

9. The protective cartridge as in claim 5 wherein said means for releasing said latches cannot be activated except by extraordinary means when said protective cartridge is exterior to an information storage device, inside of which information storage device said cartridge insert is adapted to be used.



AMENDED CLAIMS

[received by the International Bureau on 4 September 1984 (04.09.84);
original claims 1 to 9 cancelled; claims 10 and 11 new]

1-9. Cancelled.

10. (New) A sealable recording disk protective cartridge comprised of:

a rectangular shaped cartridge housing, said cartridge housing having an opening on one side thereof, said cartridge opening having a protruding taper around its entire perimeter, said opening being in communication with a cavity in the cartridge housing;

a cartridge insert, said cartridge insert slidably disposed in the cartridge cavity and supporting a recording disk around its outer perimeter, said cartridge insert further having a tapered recess on the edge of the cartridge insert which is in contact with the cartridge housing opening when the cartridge insert is fully inserted into the cartridge housing, such that when the cartridge insert is fully inserted into the cartridge cavity the cartridge protruding taper and the tapered recess on the cartridge



insert cooperate to sealably enclose the cartridge cavity;

means for selectively locking the cartridge closed when the cartridge insert is fully inserted into the cartridge housing; and

means for preventing the complete removal of the cartridge insert from the cartridge housing when the cartridge insert is fully extended out of the cartridge cavity.



11. (New) The protective cartridge of Claim 10, wherein the means for the cartridge insert in the cartridge housing cavity is comprised of:

a pair of latches, said latches being intergally mounted to the interior end of the cartridge insert;

a pair of retaining catches, said catches being integral to the cartridge housing located on the end of the cartridge cavity away from the cartridge cavity opening such that when the cartridge insert is fully inserted into the cartridge housing the insert latches and the retaining catches lockably engage without interfering with a complete seal of the cartridge cavity; and means for selectively releasing said latches.



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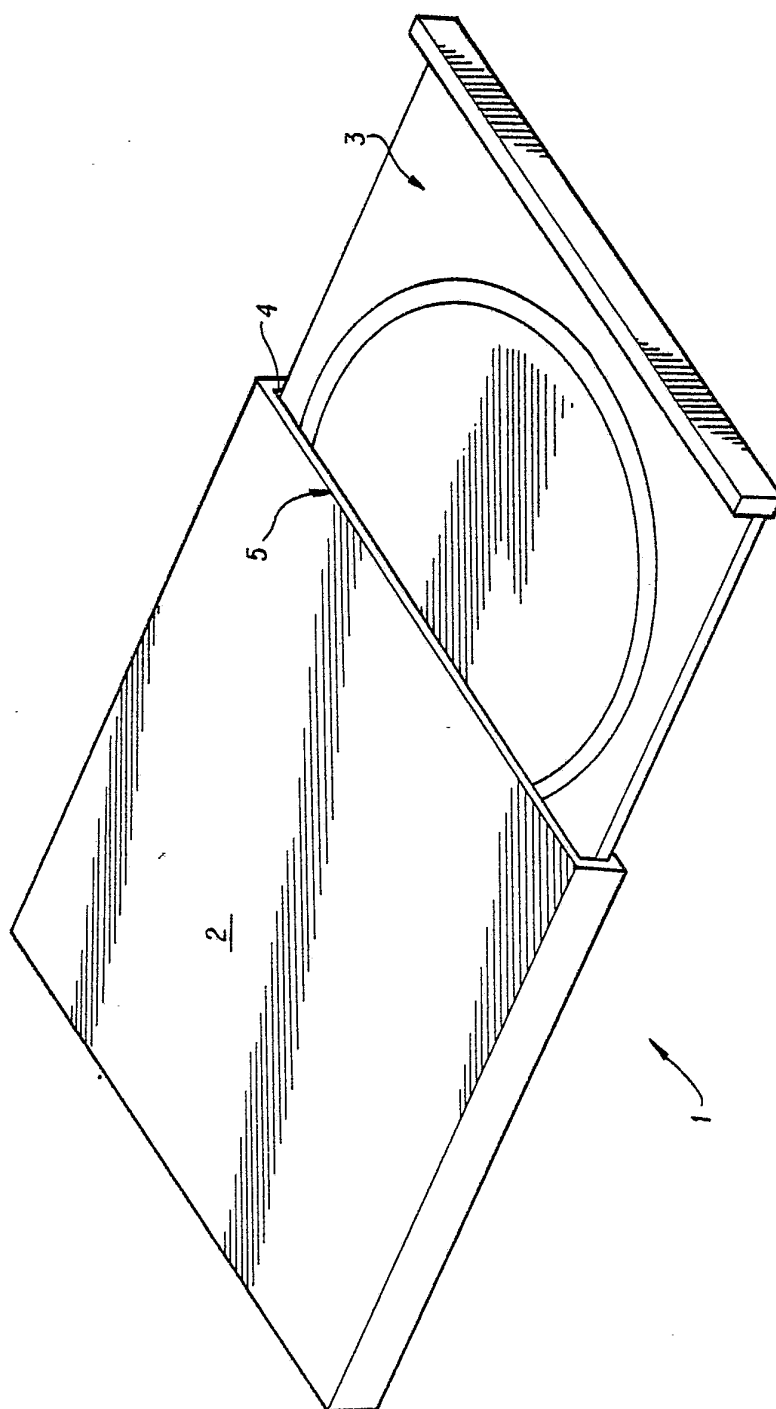


FIG. 1

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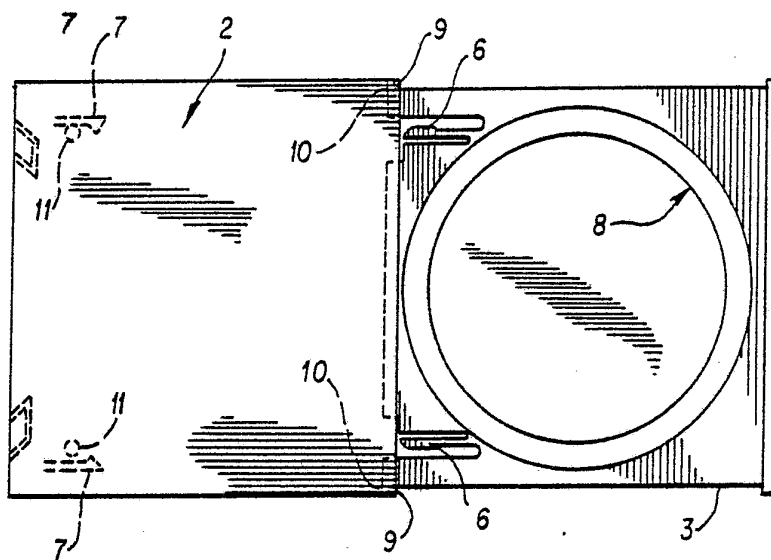


FIG. 2b

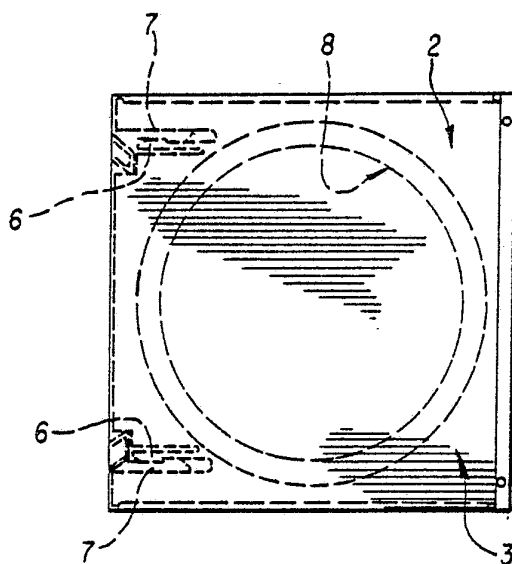


FIG. 2a

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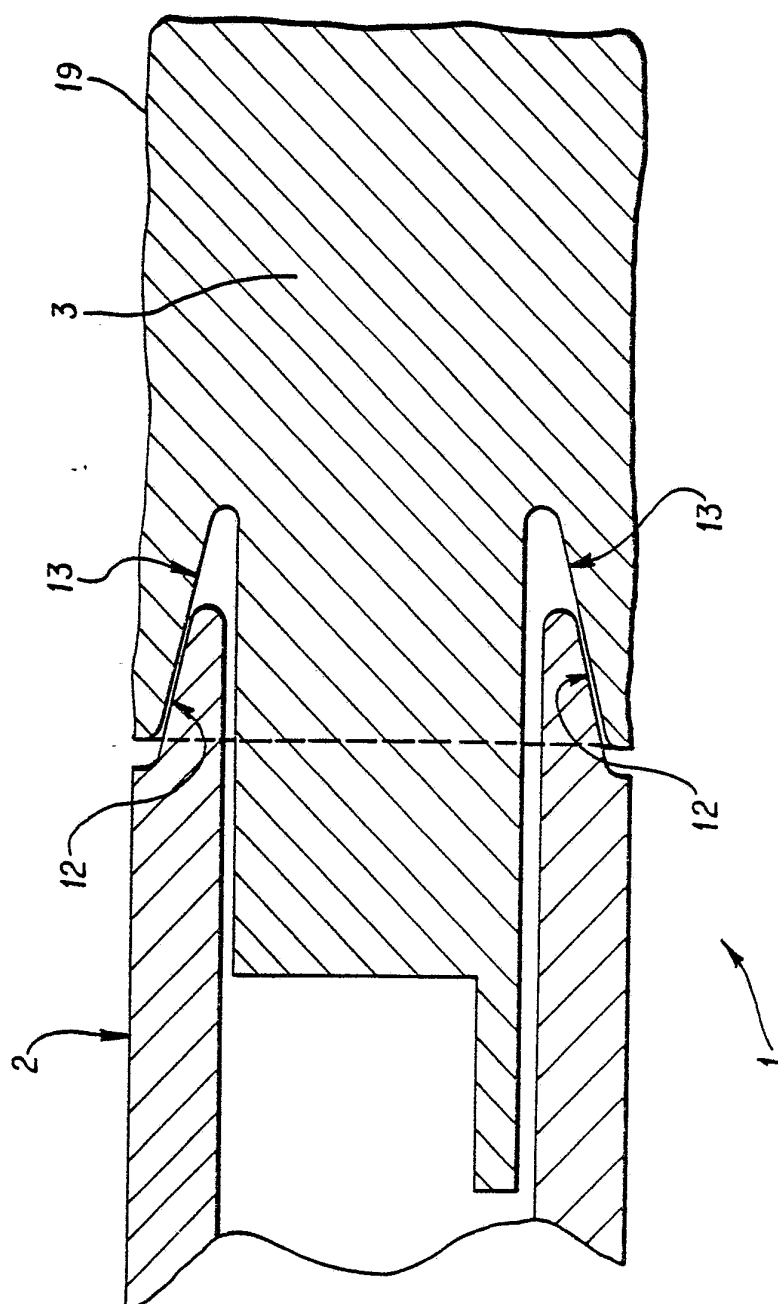


FIG. 3

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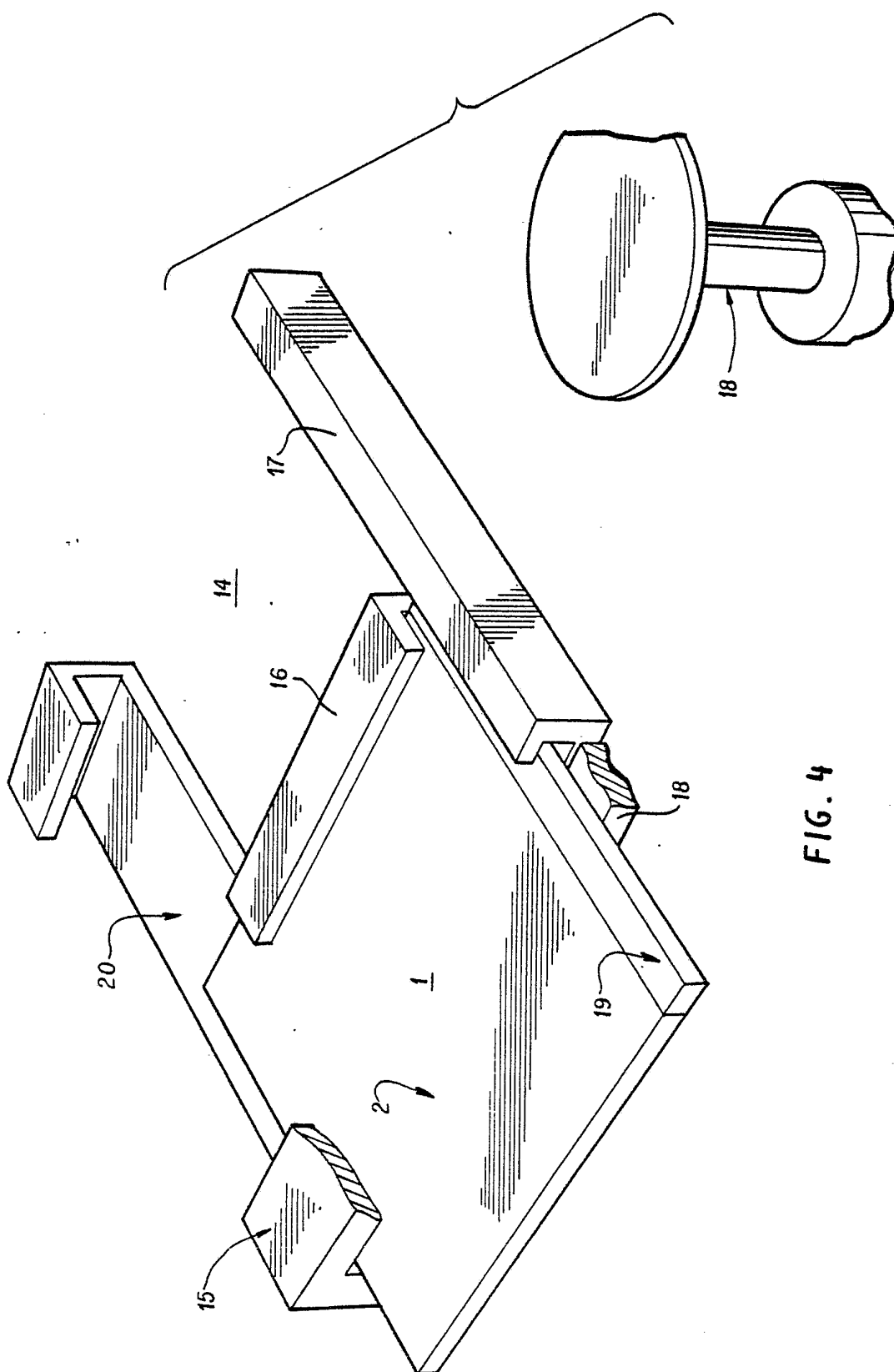


FIG. 4

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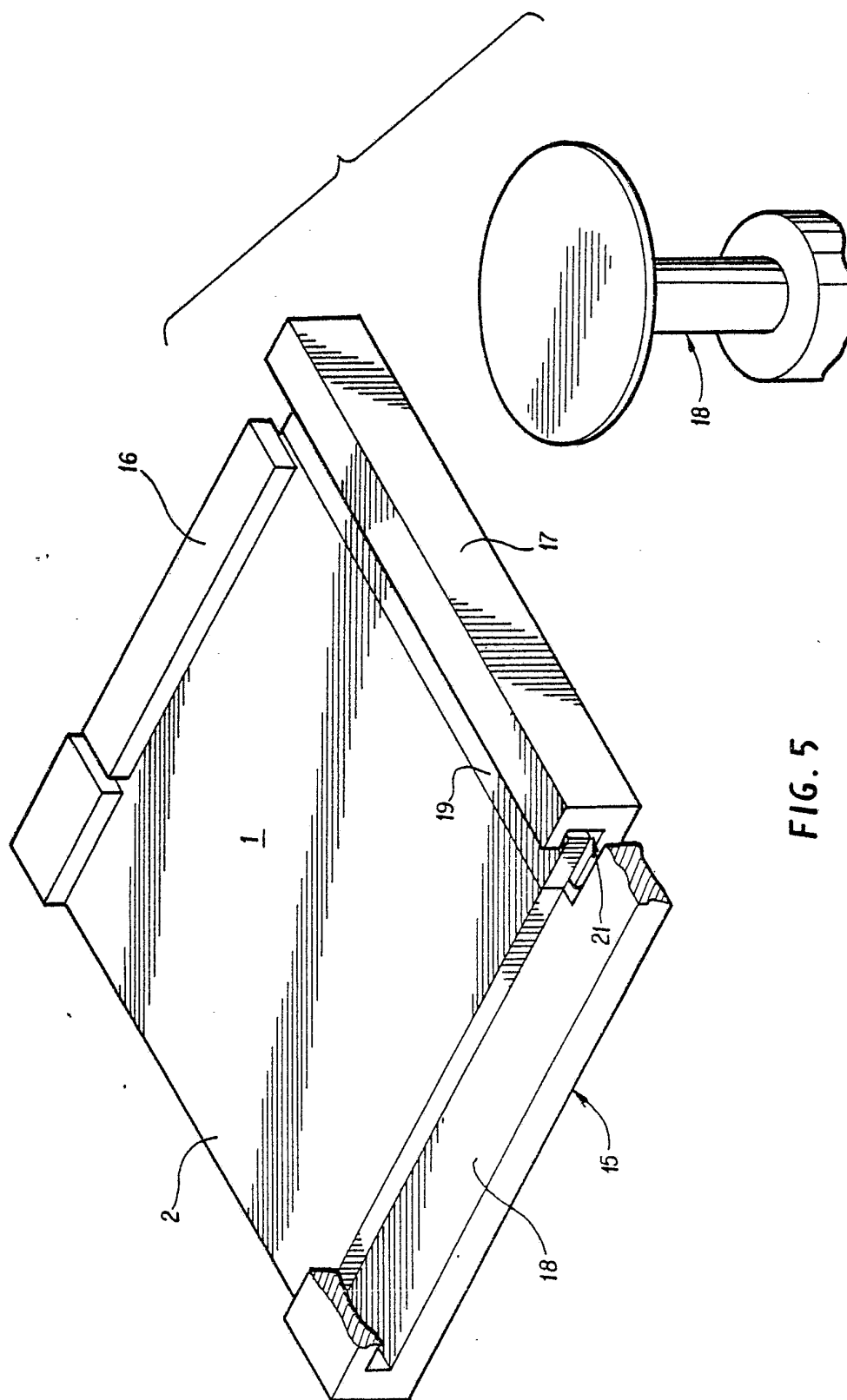


FIG. 5

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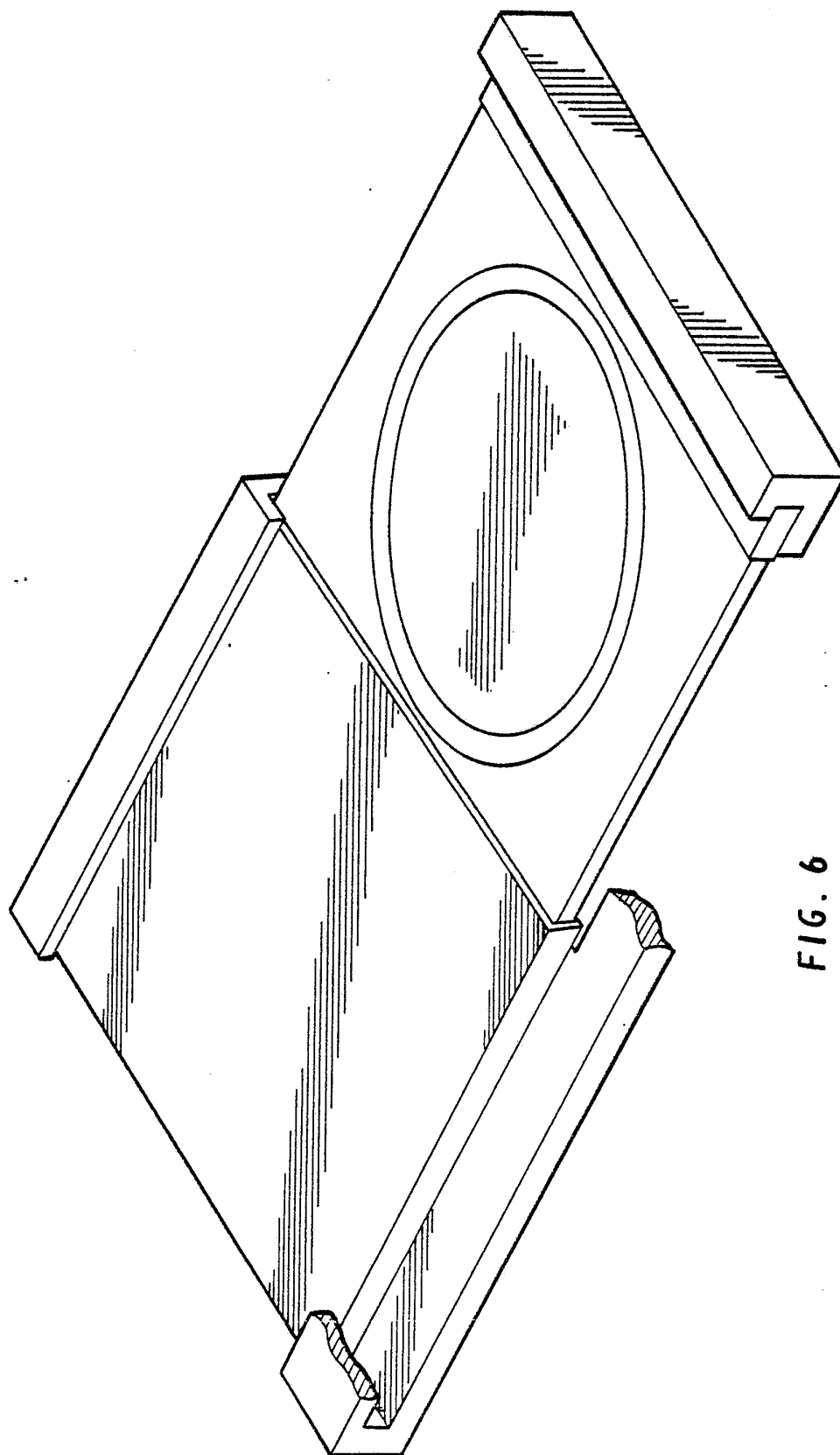


FIG. 6

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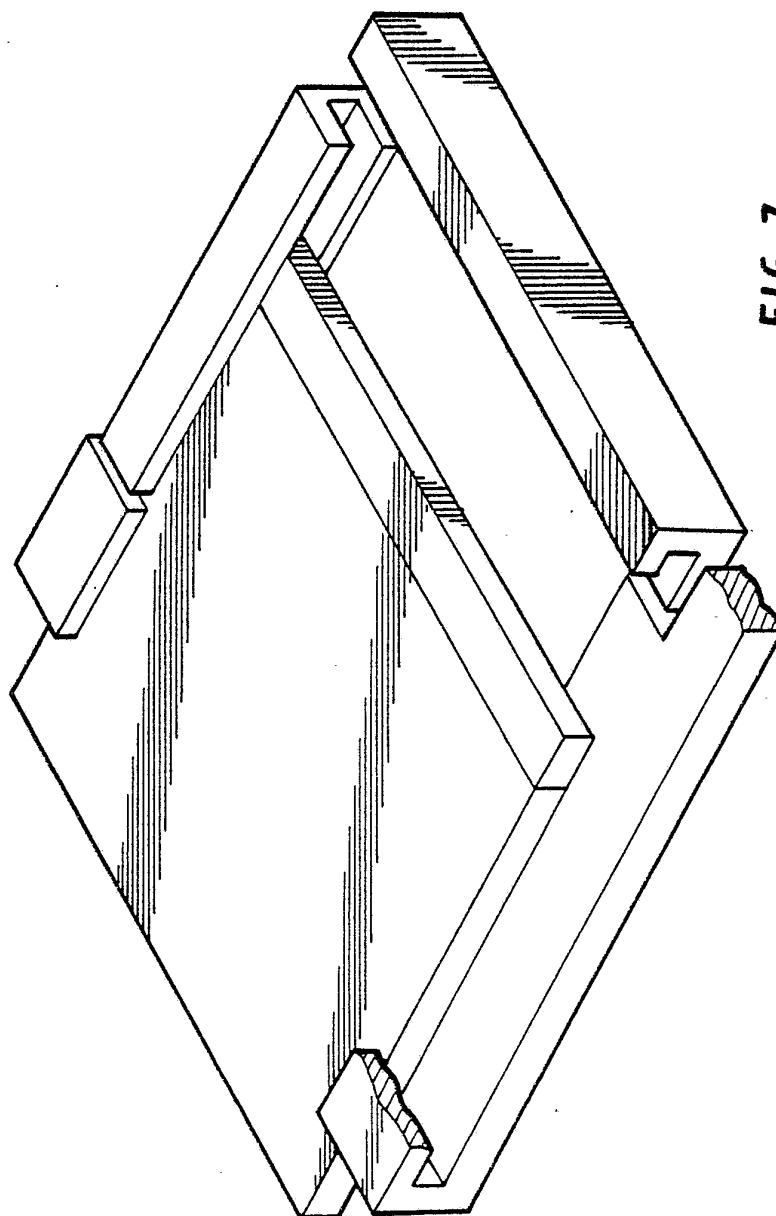


FIG. 7

INTERNATIONAL SEARCH REPORT

International Application No PCT/US 84/00815

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		
INT. CL. ³ B65D 85/30, 85/38		
U.S. CL. 206/309, 444, 455		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁴		
Classification System	Classification Symbols	
U.S.	206/1.5, 307, 309-313, 387, 444, 455, 456; 312/12; 360/133	
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, ¹⁵ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁸
X	US, A, 4,266,784 (Torrington) 12 May 1981	1-9
Y	US, A, 3,951,264 (Heidecker et al) 20 April 1976	3
Y	US, A, 1,953,037 (Ash) 27 March 1934	5,9
Y	GB, A, 8207 (Bertram et al) 30 March 1897	6,7
A	US, A, 4,164,782 (Stewart) 14 August 1979	
A	US, A, 4,239,238 (Coleman) 16 December 1980	
A	US, A, 4,379,507 (Llabres) 12 April 1983	
A,P	US, A, 4,419,709 (Saito et al) 06 December 1983	
[*] 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		
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ISA/US	S. P. Garbe 4/27/84	