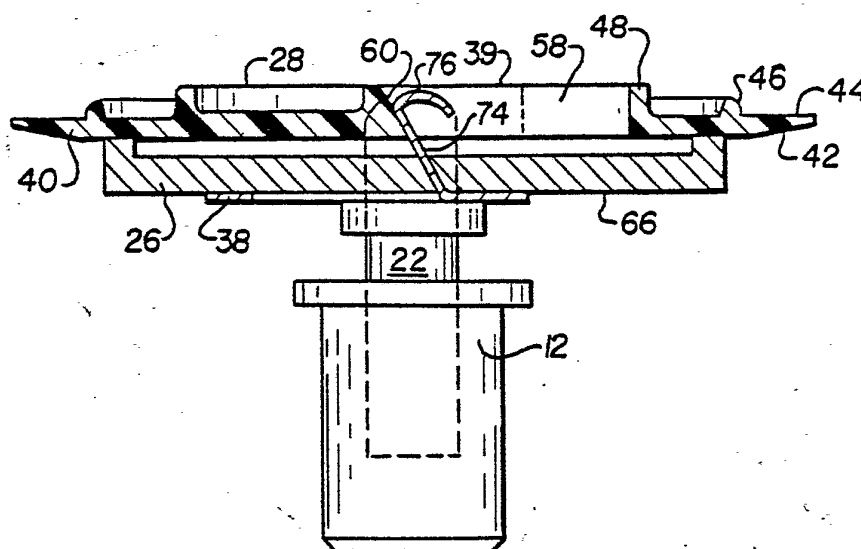




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(54) Title: A STORAGE DISK DRIVE MECHANISM**(57) Abstract**

A storage disk drive mechanism (10) for rotatably driving a storage disk (30) comprising a flexible circular information recording medium (32) attached to a hub member (28). The hub member is of the type having an enlarged central positioning aperture (50) and a radially spaced driving aperture (58). The drive mechanism comprises a rotatable clutch plate (26) having an axial positioning spindle (22) for receiving the positioning aperture of the hub member when a disk assembly containing the storage disk is mounted thereon. The clutch plate (26) further has a spring member (62) mounted thereon having a smooth uninterrupted laterally extending beveled claw (74) extending into the driving aperture (58). Upon rotation of the clutch plate (26), the claw (74) drivingly engages a driven surface defined by the driving aperture (58) for centering, retaining and driving the storage disk.

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-1-

A STORAGE DISK DRIVE MECHANISMField of the Invention

This invention relates generally to storage disk apparatus, and more specifically to an improved storage disk drive mechanism.

Description of the Prior Art

A flexible magnetic disk cassette enclosing a storage disk which is driven by a drive mechanism is disclosed in U.S. patent No. 4,445,155 to Takahashi et al. which issued on April 24, 1984. With reference to Figs. 3 and 5 of Takahashi et al., a disk 21 is mounted on a hub member 23 having an enlarged positioning aperture 24 and a radially spaced driving aperture 25. The positioning aperture has abutment surfaces 24a, 24b defining a V, and the bisector thereof is parallel to a driving edge 25b of the driving aperture. The drive mechanism, shown best in Figs. 13 and 18-21, has a clutch plate 90 onto which a spring member 86 is mounted. A drive pin 85 on spring member 86 is movable through an opening 89 in clutch plate 90 into driving aperture 25. The pin 85 engages positioning edge 25a for imparting radial movement to hub member 23 causing shoulders 24a, 24b to engage positioning shaft 83b for centering the disk. Pin 85 further engages a separate driving edge 25b for imparting rotation to storage disk 21.

Research Disclosure No. 25024 which was published on February, 1985 discloses a storage disk 10 mounted on a hub member 12. The hub member has a central hole 14 having a notch 16 providing two bearing surfaces for engaging spindle 18 for centering the disk. A bisector of the two bearing

-2-

surfaces is transverse to a driving edge of a beveled lug 26. The drive mechanism has a radially extending drive pin 24, 36, 48 for drivingly engaging lug 26 to draw hub 12 downwardly until pads 5 20 on the hub are seated on a locating surface 22 of the drive mechanism.

A storage disk and drive mechanism is also disclosed in U.S. patent No. 4,466,031 to Mursoka which issued on August 14, 1984.

10

SUMMARY OF THE INVENTION

The objects of the invention are accomplished by a storage disk drive mechanism for rotatably driving a storage disk of the type comprising a circular information recording medium 15 attached to a circular plate-like hub member. The hub member has a central positioning or centering aperture and a radially spaced drive aperture defining a driven surface. The storage disk drive mechanism comprises a rotatably mounted clutch plate 20 member having a base surface and a radially spaced opening extending through the clutch plate parallel to the axis. Drive means are coupled to the clutch plate for imparting rotation thereto. A spring member is mounted on the base surface of the clutch 25 plate and has an integral part thereof forming a smoothly uninterrupted laterally and vertically extending beveled claw which extends through the opening. The claw has a beveled leading edge surface for drivingly engaging the driven surface on 30 the hub member for centering, retaining and driving the storage disk.

The invention is further directed to forming the claw of a thin flat material of rectangular cross section. The claw further has a

-3-

tongue at its free end which extends laterally in a direction opposite to the direction of rotation of the clutch plate.

5 A primary advantage of this invention is to provide an improved storage disk drive mechanism that is of simple design and construction, thoroughly reliable and efficient in operation, and economical to manufacture.

BRIEF DESCRIPTION OF THE DRAWINGS

10 In the detailed description of the invention presented below, reference is made to the accompanying drawings, in which:

Figure 1 is a side elevational view in section of a preferred embodiment of the storage disk drive mechanism of this invention;

Figure 2 is a top plan view of the storage disk drive mechanism of Figure 1 with the storage disk and jacket omitted for purposes of clarity;

Figure 3 is a section view taken substantially along line 3-3 of Figure 2;

Figure 4 is a top plan view of the drive spring of the storage drive mechanism of Figure 1;

Figure 5 is a top plan view of another embodiment of the drive spring of this invention; and

25 Figure 6 is a side elevational view of the drive spring of Figure 5.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to Figures 1-3 of the drawings, a preferred embodiment of the storage disk drive mechanism 10 of this invention is shown. The drive mechanism 10 is incorporated in a known type of recording and/or reproducing apparatus, not shown, for handling flexible or floppy magnetic disk assemblies, jackets, cassettes or the like. Since

-4-

the recording and/or reproducing apparatus per se does not form a part of this invention, only a portion of the mechanism thereof that supports the drive mechanism is shown.

5 The drive mechanism 10 comprises a cylindrical bearing shaft 12 mounted for rotation on roller bearings 14 interposed between shaft 12 and a fixed frame 16 on the recording and/or reproducing apparatus. The bearing shaft 12 is coupled directly
10 or through any suitable drive coupling, not shown, to a motor shaft 18 of any suitable drive motor 20. An upstanding positioning spindle 22 is press fit into an axial bore 24 of bearing shaft 12.

 A flat circular clutch plate 26 is secured
15 by any suitable means, not shown, to spindle 22 for supporting a novel hub member 28 of a conventional storage disk 30 when the storage disk is mounted thereon. The storage disk 30 is preferably mounted on hub member 28 by any suitable conventional means,
20 not shown, incorporated in the recording and/or reproducing apparatus. The storage disk 30 comprises a circular disk-like information recording medium 32 which is attached by any suitable means to hub member 28. The recording medium 32 is
25 preferably loosely enclosed within a flexible paper jacket 34 or cartridge, shown only in part in Figure 1, having a central opening 36 surrounding hub member 28.

 The hub member 28 is preferably a flat
30 circular plastic molded part having a flat smooth base surface 38, an upper irregular surface 39, and a peripheral rim 40. A lower annular surface 42 of the rim is slanted and one edge thereof merges with base surface 38. An upper annular surface 44 of

-5-

rim 40 is flat and parallel to base surface 38 and one edge thereof merges with annular surface 42 at the periphery of rim 40 and the opposite edge thereof merges with a ring 46. A center opening in recording medium 32 fits over ring 46 and a portion of the recording medium surrounding the opening is secured to upper annular surface 44 by any suitable means to form storage disk 30 in which the axes of hub member 28 and recording medium 32 are concentric.

Hub member 28 further has another ring 48 on its upper surface 39 that fits in central opening 36 in jacket 34. The jacket is of a conventional type for enclosing a storage disk 30 to protect it from physical damage, dust, fingerprints and other contaminants. The ring 48 cooperates with the inner periphery of opening 36 to limit the free movement of the storage disk and to thereby place the axis of the storage disk substantially in alignment with the axis of spindle 22 when jacket 34 or a jacket enclosed in a cassette is mounted by the recording and/or reproducing apparatus on clutch plate 26.

As best seen in Figure 2, a central aperture 50 extends through hub member 28 having a semi-cylindrical surface 52 of a radius larger than the radius of drive spindle 22 received thereby. The remainder of aperture 50 defines a V-shaped abutment surface 54 that merges with semi-cylindrical surface 52. When the hub member 28 is positioned with V-shaped abutment surface 54 in engagement with drive spindle 22, the spindle axis and axis of hub member 28 are coaxial. A space 56 between spindle 22 and semi-cylindrical abutment surface 52 allows some relative movement therebetween to accommodate existing play between

-6-

storage disk 30 and jacket 34 when the jacket is mounted on spindle 22.

A drive aperture 58 also extends through the hub member 28 parallel to and radially spaced from the axis thereof. The drive aperture 58 is of arcuate shape extending through an angle of about 90°. A leading driven edge 60 of the drive aperture extends substantially in a radial direction and is substantially at right angles to a bisector of V-shaped abutment surface 54. The driven edge 60 is beveled, as best seen in Figure 3, and extends from base surface 38 of hub member 28 to its upper surface 39.

With reference to Figs. 1-4, a drive spring 62 is disclosed having a flat portion 64 secured at one end to a base surface 66 of clutch plate 26 by a screw 68. The flat portion 64, as best seen in Fig. 4, has a first cut-out section 70 to accommodate spindle 22 extending therethrough and to give spring 62 the desired resilience. Flat portion 64 further has a second cut-out 72 portion to form an upturned, beveled claw 74 forming an angle of approximately 60° relative to flat portion 64 (Figure 3). The claw 74 is radially spaced from the axis of hub member 28 substantially the same distance as drive aperture 58, and extends therein for drivingly engaging beveled driven edge 60. The claw 74 is further provided with a laterally extending tongue 76 which is engageable by base surface 38 of hub member 28 when a jacket 34 containing a storage disk 30 is placed on clutch plate 26 without drive aperture 58 in register with claw 74.

With reference to Figures 5 and 6, another embodiment of a drive spring 78 is disclosed

-7-

comprising an arcuate flat portion 80 having one end thereof adapted to be secured to base surface 38 of clutch plate 26. The opposite end of flat portion 80 is upturned to form a claw 82 and tongue 84
5 substantially identical to claw 74 and tongue 76 respectively.

In the operation of this invention, a cassette or jacket 34 in which a storage disk 30 is enclosed is placed on clutch plate 26 by
10 conventional recording device means, not shown. The base surface 38 of hub member 28 engages tongue 76 in those instances in which drive aperture 58 is out of register with claw 74 and depresses drive spring 78 by virtue of its weight. Upon actuation of drive
15 motor 20, initial rotation of spring 62 and clutch plate 26 causes the tongue 76 to spring into drive aperture 58 when the two are in register with one another, and beveled claw 74 to drivingly engage complementary beveled driven edge 60 of drive
20 aperture 58. Torque applied to driven edge 60 causes abutment surface 54 of hub member 28 to engage spindle 22 for centering storage disk 30 so that its axis is coaxial with the spindle axis.

Claims

1. In a storage disk drive mechanism (10) for rotatably driving a storage disk (30) comprising a circular information recording medium (32) attached to a circular plate-like hub member (28), the hub member having a central positioning aperture (50) and a radially spaced drive aperture (58) defining a driven surface (60), the combination comprising:
- 10 a clutch plate member (26) rotatable about an axis, said clutch plate member having an axial upstanding spindle (22) for receiving the positioning aperture (50) of the hub member (28) when the storage disk (30) is mounted thereon, said
- 15 clutch plate member (26) further having a lower base side (66), an upper side and a radially spaced opening extending through said clutch plate member parallel to said axis;
- drive means (18) (20) coupled to said
- 20 clutch plate member (26) for imparting rotation thereto in one direction; and
- a spring member (62) mounted on said base side of said clutch plate member, said spring member having a smooth uninterrupted laterally extending
- 25 beveled claw (74) which extends upwardly through said opening and above said upper side of said clutch plate member (26), said claw further having a beveled leading edge surface for engaging the driven surface (60) on the hub member and driving it in
- 30 said one direction for centering, retaining and driving the storage disk.
2. A storage disk drive mechanism according to claim 1 wherein the hub member (28) has a lower base surface (38) and an upper surface (39),

-9-

and the driven surface (60) on the hub member is a beveled surface extending from the base surface to the upper surface which is complementary to said beveled leading edge surface of said claw (74), and
5 said claw is formed of a thin flat material of rectangular cross section.

3. A storage disk drive mechanism according to claim 2 wherein said clutch plate member (26) has datum surfaces (54) on said upper
10 side whereby upon rotation of said clutch plate member, said beveled leading edge surface of said claw (74) engages the corresponding beveled driven surface (60) on the hub member for simultaneously centering the storage disk, pressing the hub member
15 against said datum surfaces and rotating the storage disk.

4. A storage disk drive mechanism according to claim 3 wherein the beveled driven surface (60) is on the leading edge of the drive
20 aperture (58) in said one direction of rotation of the clutch plate and hub member.

5. A storage disk drive mechanism according to claim 4 wherein said claw (74) and the drive aperture (58) are both radially spaced from
25 said axis of said clutch plate member (26) substantially the same distance when the storage disk is mounted on said clutch plate, said claw further having a tongue (76) at its free end which extends laterally in a direction opposite to said
30 one direction of rotation of said clutch plate, and which is engaged and depressed by the base surface (38) of the hub member (28) when the storage disk is mounted on said clutch plate, said claw springing into the hub member drive aperture (58) and engaging

-10-

the bevelled driven surface thereof upon further rotation of said clutch plate in said one direction.

6. A storage disk drive mechanism according to claim 5 wherein the positioning aperture (50) is enlarged relative to said spindle (22) and extends from the base surface (38) to the upper surface (39) and has a center adapted to be slightly offset from the axis of the hub member, the positioning aperture further being defined by a semi-cylindrical surface (52) and a merging V-shaped abutment surface (54) adapted to engage said spindle for aligning the center of the hub member with the axis of said spindle, and the leading driven edge (60) of the drive aperture (58) extends substantially radially in a direction transverse to the bisector of the V-shaped abutment surface.

7. A hub member (28) for supporting a flexible circular information recording medium (32) for use in a recording-reproducing apparatus comprising:

a plastic circular plate-like body portion having a smooth flat base surface (38) and an irregular upper surface (39), said body portion having a peripheral rim (40) having a flat upper annular surface (44) parallel to said base surface which merges on one edge with the periphery of said rim and merges on its opposite edge with a ring (46) on said upper irregular surface, said hub member further having an enlarged central aperture (50) extending from said base surface to said upper irregular surface defined by a semi-cylindrical surface (52) and a merging V-shaped abutment surface (54), and a radially spaced arcuate aperture (58) extending through said body portion from said base

-11-

surface to said upper irregular surface, said
arcuate aperture having a substantially radially
extending leading edge (60) thereof extending from
said base surface to said upper surface, said
5 leading edge extending in a direction transverse to
the bisector of said V-shaped abutment surface.

8. A hub member according to claim 7
wherein said peripheral rim (40) has a slanted lower
annular surface (42) in register with said upper
10 annular surface and smoothly merges with said base
surface, and said leading edge (60) is beveled.

9. A hub member according to claim 7
wherein said leading edge (60) is beveled at an
angle of about 60° to the plane of said base
15 surface (38).

1/2

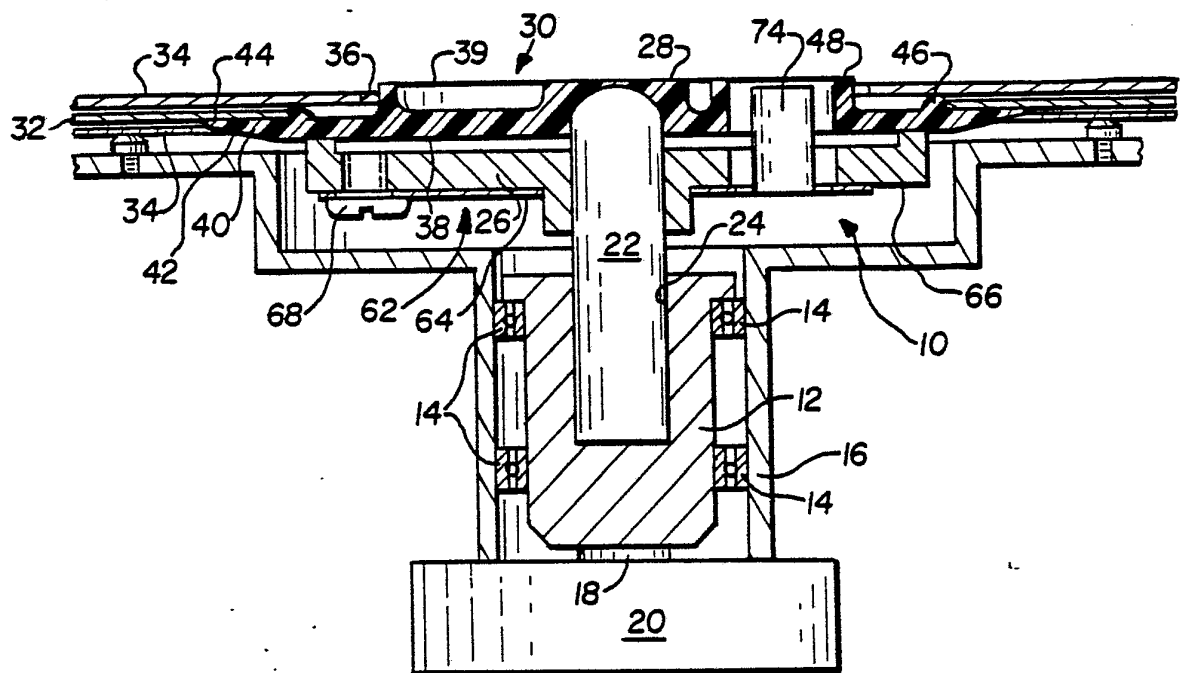


FIG 1

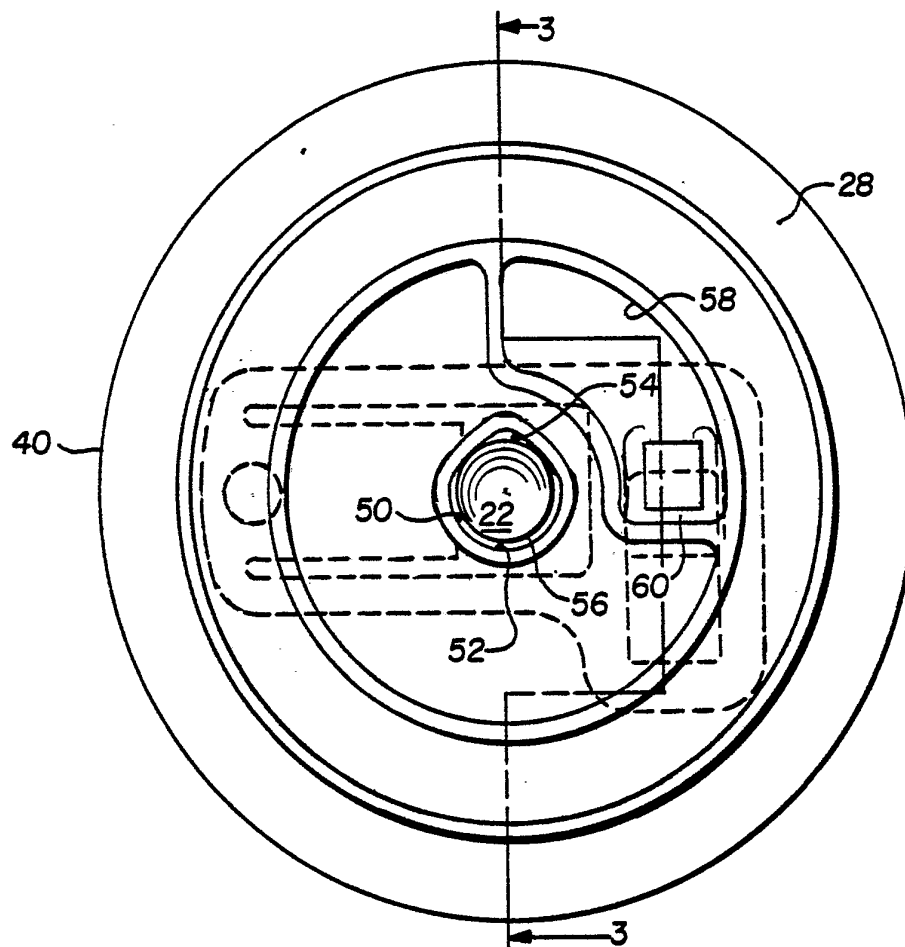
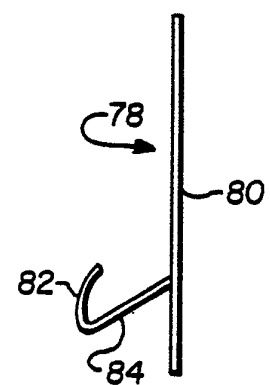
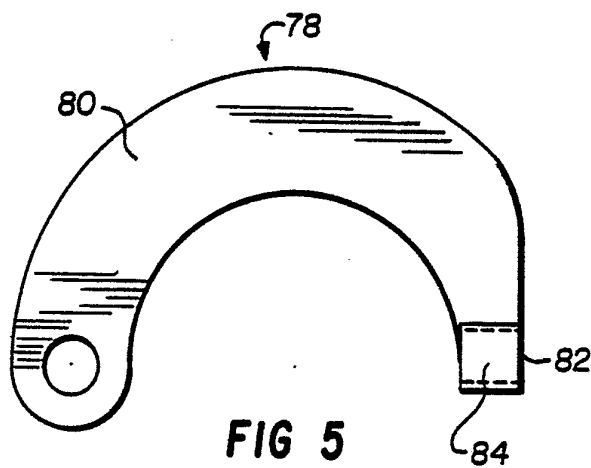
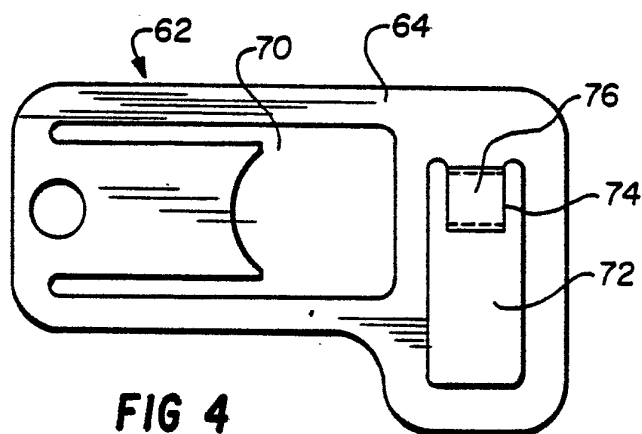
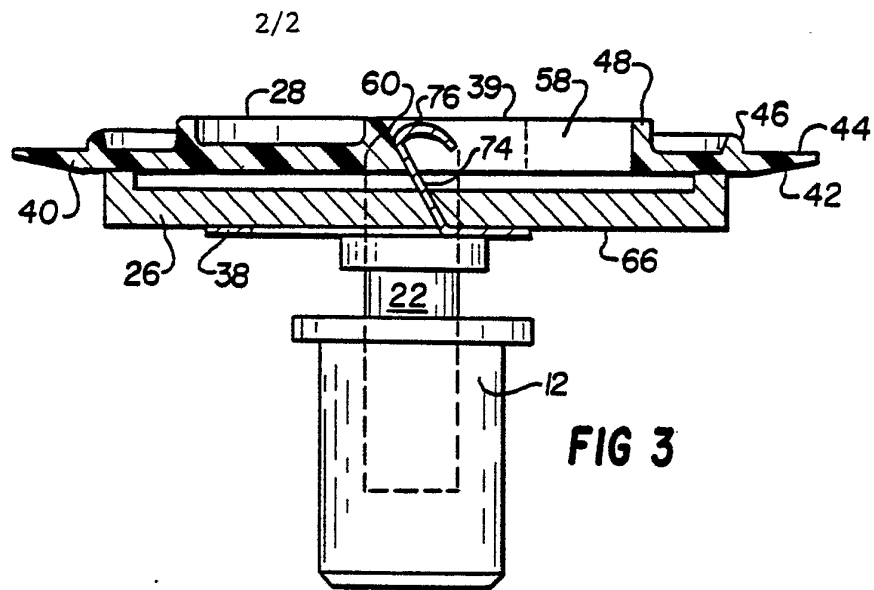


FIG 2



INTERNATIONAL SEARCH REPORT

International Application No PCT/US 86/02375

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) *		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC ⁴ : G 11 B 17/028; G 11 B 19/20; G 11 B 23/00		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
IPC ⁴	G 11 B	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched *		
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹		
Category *	Citation of Document, ¹¹ with Indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
Y	GB, A, 2146483 (SONY) 17 April 1985 see page 5, lines 37-93; page 8, lines 14-110; figures 18-21, 28-31	1
A	cited in the application	3, 5-7
Y	CH, A, 96495 (E.J. SEGURA) 16 October 1922 see page 3, last paragraph - page 4, end of the first paragraph; figures 6, 8	1
A		2-5
A	Research Disclosure, no. 250, February 1985, (Emsworth, Hampshire, GB), "Mechanical centering and torque limiting drive pin", pages 109-111, disclosure 25024 see the whole document cited in the application	1, 2
A	US, A, 4149207 (T.H. PORTER et al.) 10 april 1979 see column 8, line 58 - column 10, line 24; figures 13-15	6, 7
	./.	
* Special categories of cited documents: ¹⁰ "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		Date of Mailing of this International Search Report
25th February 1987		- 3 APR 1987
International Searching Authority		Signature of Authorized Officer
EUROPEAN PATENT OFFICE		M. VAN MOL 

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

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	Patents Abstracts of Japan, volume 8, no. 163 (P-290)(1600), 27 July 1984, see the whole abstract & JP, A, 5958677 (KIYANON DENSHI) 4 April 1984 --	1,5,6
A	Patents Abstracts of Japan, volume 204, no. 204(P-301)(1641), 18 September 1984, see the whole abstract & JP, A, 5987677 (MATSUSHITA) 21 May 1984 --	1,5-7
A	Patents Abstracts of Japan, volume 7, no. 245 (P-233)(1390), 29 October 1983, see the whole abstract & JP, A, 58130480 (SUWA SEIKOSHA) 3 August 1983 -----	1

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. PCT/US 86/02375 (SA 15360)

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 13/03/87

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB-A- 2146483	17/04/85	BE-A- 889940	12/02/82
		GB-A, B 2081959	24/02/82
		JP-A- 57036473	27/02/82
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		AT-B- 357783	25/07/80
		CA-A- 1121049	30/03/82
		CH-A- 636468	31/05/83
		SE-A- 7810467	26/04/79

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