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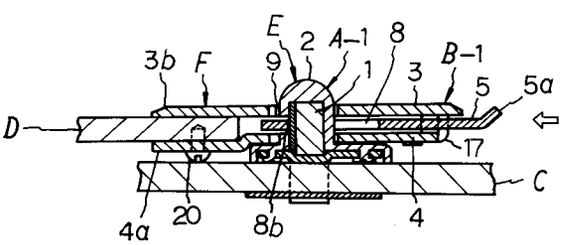
(54) Fastener.

(57) A fastener arrangement designed for releasably fastening a first means to a second means is described. The fastener comprises cooperating male (A-1) and female (B-1) members which are mounted respectively on the first and second means. The male member (A-1) has a projection (E) formed of or incorporating a permanent magnet (1) and having both a shank (2) and a head portion (2a) which overhangs the shank on at least one side of it. The female member (B-1) comprises a frame (F) having an opening which receives the projection (E) of the male member. A slide member (5) is slidably received within the frame (F) and is capable of manipulation from the exterior of the frame to release the fastener. The slide member (5) has an opening (8) which can be brought into confronting relation with the frame opening so that the projection (E) can be inserted through the frame opening and the slide opening at the same time. The slide member (5) is formed from ferromagnetic material and so is magnetically attracted to a shank (2) of the projection when inserted. As a result, the head portion (2a) of the projection (E) is entrapped beyond the slide opening by the slide member (5) engaging the shank beneath the overhang and as a result preventing retraction of the projection. The frame member (F) is formed from first (3) and second (4) generally parallel plate members each having an opening for the projection (E). The plate members (3,4) are spaced sufficiently to accommodate the slide member (5) between them. The frame (F) is completed by side members (3a) integral with one of the plate members. Side edges of the other plate member (4) and the corresponding edges of the side members (3a) have complementary configurations of projected and intended portions which interengage. The projected portions formed either on the edges of the side members (3a) or on the side edges of the other plate member (4) are deformed to firmly hold these edges interengaged and as a result to hold the plate members together to form the frame.

FIG. 6



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This invention relates to fasteners and more particularly to a fastener arrangement for releasably fastening a first means to a second means and comprising cooperating male and female members. Fastener arrangements of this kind are suitable for a variety of purposes including closing the flaps of bags such as shoulder bags or rucksacks, for fastening the ends of a belt, or for closing or holding open doors or the like of various kinds of structures including boxes (where the door would be a flap) or a door of a building structure.

Fasteners utilising the attraction force of a permanent magnet are well known and are available in a number of different constructions in which a male and female member are attracted together by magnetic forces.

However, we have found that fasteners of this general form do not always provide a sufficiently strong force holding the two means together. In particular, when a fastener of this kind is subjected to forces tending to disengage the fastener or to an unexpected impact which is stronger than the attraction force of the permanent magnet between the male and female members, they tend easily to become disengaged.

A number of structures have previously been proposed with a view to overcoming this problem. In one such arrangement a male member is received in an opening in a female member and then twisted so that, for example, the head of the projection is retained against detachment by the sides of the opening, the opening having a different diameter along one axis than along another axis. We have found that fasteners of this form are somewhat troublesome to operate because of the need to twist the projection. To release the fastener, it is necessary both to twist and to pull.

More recently, a new type of fastener has been proposed with a view to overcoming all the aforesaid difficulties. This fastener is described in Japanese Patent Publication Hei 3-14983. The aforesaid Japanese fastener has a male member having a projection with a permanent magnet. The projection comprises a shank and a head portion which overhangs the shank on one side. This prior proposed fastener also employs a female member comprising a frame having an opening adapted to receive the projection of the male member. A slide member is slidably received within the frame and is capable of manipulation from the exterior of the frame to release the fastener. The slide member has an opening which can be brought into confronting relation with the frame opening so that the projection may be inserted through the frame opening and the slide opening at the same time. The slide member is formed from ferromagnetic material and so is slidingly magnetically attracted to the shank of a projection when so inserted. This enables the head portion of the projection to be entrapped beyond the slide opening by the slide member engaging the shank beneath the overhand and as a result preventing retraction of the projection.

The fastener described and illustrated in the aforesaid Japanese Patent Specification is formed of a number of component parts which are neither easy to manufacture nor (especially) easy to assemble. The resultant fastener is of an unattractive style.

The present invention is directed to the provision of a fastener arrangement of the general kind proposed in Japanese Patent Publication Hei 3-14983 but of a simpler structure with a reduced number of component parts providing for a significantly improved ease of assembly and enabling the construction of practical embodiments of fastener with an attractive appearance as a consequence of the improved manner of construction.

In accordance with the present invention, there is provided a fastener arrangement for releasably fastening a first means to a second means, and comprising: cooperating male and female members; the male member being arranged to be mounted on the first means and having a projection formed of or incorporating a permanent magnet, the projection comprising a shank and a head portion which overhangs the shank on at least one side thereof; and the female member comprising a frame arranged to be mounted on the second means and having an opening adapted to receive the projection of the male member, and a slide member slidably received within the frame and capable of manipulation from the exterior of the frame to release the fastener, the slide member having an opening adapted to be brought into confronting relation with the frame opening, whereby said projection may be inserted through said frame opening and said slide opening at the same time, and the slide member being formed from ferromagnetic material so as to be slidingly magnetically attracted to the shank of a projection so inserted, whereby to entrap said head portion beyond said slide opening by said slide member engaging said shank beneath said overhang, thereby preventing retraction of said projection; the fastener arrangement being characterised in that the frame member comprises first and second generally parallel plate members each having a said opening therethough for said projection, the said plate members being spaced sufficiently to slidingly accommodate said slide member therebetween, and in that the frame is completed by side members integral with one said plate member, side edges of the other said plate member and the corresponding edges of the side members having complementary configurations of projected and in-

dented portions whereby to interengage, the projected portions formed on the side edges of the said other plate member and/or the projected portions formed on the edges of the side members being deformed to firmly hold said edges interengaged and thus to hold said plate members together as said frame.

The invention is hereinafter more particularly described by way of example only with reference to the accompanying drawings in which:-

Fig. 1 is an exploded perspective view of the female member B-1 of a first embodiment of fastener arrangement constructed in accordance with the present invention;

Fig. 2 is a perspective view of the said female member B-1;

Figs. 3 and 4 are similar sectional views of the female member B-1 respectively before and after deformation to unite first and second plate members so as to assemble the female member B-1;

Fig. 5 shows in section the offering up of a male member A-1 mounted on a first means C to the female member B-1 of Figs. 1-4 mounted on a second means D in the first embodiment of fastener arrangement constructed in accordance with the present invention;

Fig. 6 is a view generally similar to Fig. 5 showing the two members of the fastener interengaged;

Fig. 7 and Fig. 8 are top plan views of the embodiment of fastener arrangement shown in Figs. 5 and 6 but with the topmost plate of the frame of the female member omitted to illustrate how the slide member moves from one position to another as the male member is inserted into the female member;

Fig. 9 is a view generally similar to Fig. 5 illustrating an alternative embodiment of fastener;

Figs. 10 and 11 are views generally similar to Figs. 1 and 2 illustrating the female member B-3 of a third embodiment of fastener arrangement in accordance with the present invention;

Fig. 12 is a view generally similar to Fig. 4 for the embodiment of female member B-3 illustrated in Figs. 10 and 11;

Fig. 13 is a view generally similar to Fig. 1 illustrating the female member B-4 of a fourth embodiment of fastener arrangement in accordance with the present invention;

Fig. 14 is a view generally similar to Fig. 2 for the embodiment of Fig. 13 but with one component of the female member B-4 separated; and

Figs. 15 and 16 are views generally similar to Figs. 5 and 6 for an embodiment of fastener arrangement in accordance with the present invention including the female member of Figs. 13 and 14.

In the drawings the male member and female member of the first embodiment of fastener arrangement in accordance with the present invention are respectively identified A-1 and B-1.

The male member A-1 comprises a projection E which comprises a shank 2 with a permanent magnet 1 incorporated therein. The projection E is generally rectangular in plan view (Figs. 7 and 8) but in section as shown in Figs. 5 and 6 has a head 2a with a rounded profile for ease of insertion into an opening provided in the female member B-1. A groove-like portion 12 is formed in the side of shank 2 leaving an overhang 9 beneath the head and a corresponding step 13 to the remainder of the shank. The projection is integrally formed with a seat 2b extending laterally of the shank to a circumextending peripheral edge 2c. The male member is also provided with means for mounting the male member on a base material here schematically illustrated at C. In the illustrated embodiment mounting is achieved by a base 14 having prongs 14a which pass through one or more openings in the base material C and a washer 15 and are then bent sideways to hold the male member in place. Base 14 is mounted to the material of the projection 2 by means of bosses 2d which pass through openings in the base 14. It will be seen that the peripheral edge 2c has a height sufficient to accommodate the thickness of the base 14 and of the boss 2d. The base 14 also underlies the space within the shank occupied by the permanent magnet 1. A plate 16 formed of ferromagnetic material is mounted across the opening effectively provided at the groove portion 12.

Construction can be readily achieved by mounting the permanent magnet 1 in ferromagnetic plate 16 through the underside of the projection and then fitting the base 14 across that opening to close the same. The permanent magnet 1 may for example be made of ferrite which is relatively brittle and this construction avoids unacceptable damage to the permanent magnet. Alternatively, the whole of the male member with the exception of the means for fixing it to the base material C may be formed of a less brittle permanent magnet such as a plastic magnet. Since the whole of the male member is then constituted as a permanent magnet, the size of the male member may be reduced while retaining the same attractive effect.

In arrangements with the separate magnet 1, the ferromagnetic plate 16 acts not only to shield the magnet but also to converge the magnetic field in effect at a window provided at the groove 12. In some arrangements the ferromagnetic plate 16 may be omitted and in other arrangements the magnet 1 may be mounted within a blind hole so that there is no window as such.

The orientation of the magnet (ie the positions of its magnetic poles) can be varied giving different effects. Where a ferromagnetic plate is present, it is suitably coextensive with the magnet and extends to the side edges which may also be covered, thereby reducing possible leakage of magnetic flux.

The female member B-1 comprises a frame F formed by two generally parallel plate members 3 and 4 spaced sufficiently to enable a ferromagnetic slide member 5 to be slidingly accommodated therebetween. Since it is an essential purpose of the slide member that it be magnetically attracted to the permanent magnet incorporated in or providing the projection of the male member, the material of the slide member 5 is chosen to have good magnetic permeability. The material of plates 3 and 4 may be either magnetic of non-magnetic. When of non-magnetic material, this provides for ease of insertion of the projection of the male member and for smooth and accurate movement of the slide plate 5 as described in more detail below. When plates 3 and 4 are made of ferromagnetic material, this prevents or reduces magnetic leakage from the fastener when the male and female members are interengaged. One of the plates 3 and 4 may be ferromagnetic and the other not.

Integral with plate 3 are side members 3a which extend perpendicularly to the plane of the plate 3. The side members can readily be formed by simply being bent out of the plane of the remainder of the plate 3. The edge of each side member 3a is formed with projections 11 and indented portions for the purpose of interengagement with side edges of the other plate 4 as described in more detail below. The precise configuration of the indented and projected portions can vary considerably. In the arrangements shown in Figs. 1-4 projected portions 11 fit in indented portions 10 formed in the side edge 4c of plate 4 and stand proud of the surface thereof as can be best seen in Fig. 3. The two plates are united to form the frame F by the application of pressure to the projections 11 where they stand proud, thereby deforming them into the configuration shown in Fig. 4 or by bending the proud portions. The plate 3 includes portions 3b and 3d which extend beyond the region in which the side members 3a are located. One such region, namely region 3b assists in mounting of the frame F to a base such as the edge region D of a leather bag. Plate 3 has an opening 6 for the insertion therethrough of the male projection. The edge of opening 6 is formed with a step region 3c which assists in retaining the male projection.

The second plate 4 has a portion 4a which generally corresponds to the portion 3b of plate 3 but is displaced out of the principal plane of plate 4 by a bend 4b so that the separation between the two plates in the regions 3b and 4a is greater than elsewhere. As can best be seen from Fig. 5, this enables the thickness of material D to be received between the two plates and for fastenings such as screws 20 to pass through openings 18 in plate portion 4a to firmly hold the frame on the edge of the material D. The opposite end of plate 4 from region 4a includes engagement portion 17 downturned into engagement with region 3d of plate 3. Plate 4 has an opening 7 corresponding generally to opening 6 of plate 3 for insertion of the male projection. Slide plate 5 also has an opening 8, but its edges 8b and 8c have a greater separation than the corresponding edges of the openings 6 and 7. Side portions 5b of plate 5 slide within the space defined between side members 3a, as best shown in Figs. 3 and 4. The edge of plate 5 has notches 19 for accommodating engagement portion 17 of plate 4 and a region 5a with a curved lip which extends beyond the notches 19 so as to be exposed for manipulation as can be seen from the drawings.

As can be seen from Fig. 5, the three openings 6, 7 and 8 are generally in register with the edge 8b of the somewhat wider opening 8 of slide member 5 generally in alignment with the corresponding edges of plates 3 and 4 when the male projection is offered up to the female member.

The spacing and positional relation of the plates 3 and 4 and the slide member 5 are of some importance for the female member to work satisfactorily. The notches 19 must also be properly located in relation to the engagement portion 17 and deformation of the projections on the edge of the side members in the corresponding indented portions of the edge of the plate 4 must be such as to firmly hold the frame together with the parts engaged. Pressure is preferably applied to the portions 11 (which need not necessarily stand proud) so to cause sideways compression of the material of the projections 11 within the indented portions 10. The engagement portions 17 and notches 19 prevent the slide member 5 being removed from the frame, but the slide member may be pushed back and forth by manipulation of the lipped region 5a. With the openings 6, 7 and 8 aligned as shown in Fig. 5, the male projection E can readily be inserted. Thereafter magnetic attraction between the material of the slide member 5 and the permanent magnet of the projection cause sliding movement of the slide member into the grooved region 12 under the overhang 9 as shown in Fig. 6. Moreover, the magnet attraction ensures that this arrangement is maintained. Attempts to cause the male member to retract will fail until and unless sufficient sideways force is applied by manipulation at 5a to put edge 8b of opening 8 of the slide member out of engagement with the overhang 9 to

allow the male member to be retracted.

The fastener illustrated in Fig. 9 is generally similar to that illustrated in Figs. 1-8 and like reference numerals are employed for like parts. The description will be restricted to those features which differ in this embodiment from those in the first embodiment. In this arrangement there is no grooved portion in the shank of the male member. Nevertheless there is still an overhang 9a which functions in the same manner as in the first embodiment. It will be seen, however, that in this embodiment it is provided on the opposite side of the shank from the first embodiment. Opening 8d of the slide member 5 in this embodiment has side edges 8e and 8f but it is side edge 8f closest to the lipped portion 5a which is in general alignment with the corresponding edges of the lesser width openings 6 and 7 of plates 3 and 4 when the male member is inserted in this embodiment. As a result it is edge 8f which is attracted to the permanent magnet in the shank region of the male projection and so engages with the shank beneath the overhang 9a. Consequently, in this embodiment, to disengage the fastener it is necessary to pull (rather than to push) on the lipped portion 5a to disengage edge 8f of opening 8d with overhang 9a of the male projection.

The embodiment of Figs. 10-12 is also generally similar to the embodiment of Figs. 1-8 and like reference numerals are employed therein to those reference numerals employed in the aforesaid figures. Description will be restricted to those features in this embodiment which differ from the first described embodiment. As can readily be seen, the projections and indentations formed on the edges of the side members 3a and on the edge of the other plate member 4 have the opposite configuration to the arrangement of Figs. 1-8. In other words, indented regions 10' are provided in the edges of side members 3a while projections 11' are formed in the side regions 4c of plate 4 to fit in the indented regions 10'. As best shown in Fig. 12, the projected portions 11' stand proud of the side members 3a and are deformed by the application of pressure thereto or by bending so as to unit the two plates to form the frame F. Again it is not necessary that the indentations stand proud. The application of pressure may result in sideways deformation of the material of projected portions 11' within the indented portions 10' so as to provide for firm engagement.

Figs. 13-16 illustrate a fourth embodiment which again has many features in common with the first described embodiment, like reference numerals being employed for like parts. Description will accordingly be restricted to those features of this embodiment which differ from the corresponding features of the first described embodiment.

The male member A-4 is generally similar to the male member A-1 of the first embodiment except for the provision of a ferromagnetic plate 16' at the head end of magnet 1.

The frame F of female member B-4 of this embodiment comprises plates 103 and 104. The plates are united together in a fashion generally similar to that of the embodiment of Figs. 1-8. In this embodiment region 3b of plate 103 is provided with apertures 22. The opposite end of plate 3 is configured to provide lobes 3e and an otherwise indented region 21. Plate 104 is less extensive than corresponding plate 4 of the first embodiment and is provided with two sets of engagement portions 23 and 24 which are bent out of the general plane of plate 104 for engagement with corresponding portions of plate 103, engagement portions 23 making engagement with the lobes 3e and engagement portions 24 making engagement with region 3b. The separation between the engagement portions 23 is sufficient to accommodate manipulation portion 5a of the slide member 105 which can be pushed in or pulled out without significant play in this embodiment. The assembly of the female member with the slide member 105 between the plates 103 and 104 is generally similar to the assembly of the female member in the first described embodiment. It will be seen from Fig. 13 that alongside the manipulation portion 5a of plate 105 there are shoulder regions 27. These are caused to abut with the engagement portions 23, thereby preventing the slide member from sliding out of the frame.

A fixing plate 25 having apertures 25a with the same separation as the apertures 22 is provided for fixing the frame to the base material D. Headed pins are inserted through the apertures 25a, through the base material D and then through the apertures 22 and the opposite ends of the pins may then be compressed to deform the ends and prevent retraction of the pins.

This embodiment operates in exactly the same fashion as the first described embodiment. It will be seen, however, that the lipped portion 5a of slide member 105 is merely exposed at the indented portion 21 and so does not stick out beyond lobes 3e. This construction is beneficial in that unintended engagement of the lipped portion 5a tends not to occur in this arrangement.

As a further alternative, the frame may be provided with an opening therein enabling insertion of a finger to manipulate the underlying slide member from the exterior without the end of the slide member having to be exposed beyond the frame.

Claims

1. A fastener arrangement for releasably fastening a first means to a second means, and comprising: cooperating male and female members; the male member being arranged to be mounted on the first means and having a projection formed of or incorporating a permanent magnet, the projection comprising a shank and a head portion which overhangs the shank on at least one side thereof; and the female member comprising a frame arranged to be mounted on the second means and having an opening adapted to receive the projection of the male member, and a slide member slidably received within the frame and capable of manipulation from the exterior of the frame to release the fastener, the slide member having an opening adapted to be brought into confronting relation with the frame opening, whereby said projection may be inserted through said frame opening and said slide opening at the same time, and the slide member being formed from ferromagnetic material so as to be slidingly magnetically attracted to the shank of a projection so inserted, whereby to entrap said head portion beyond said slide opening by said slide member engaging said shank beneath said overhang, thereby preventing retraction of said projection; the fastener arrangement being characterised in that the frame member comprises first and second generally parallel plate members each having a said opening therethough for said projection, the said plate members being spaced sufficiently to slidingly accommodate said slide member therebetween, and in that the frame is completed by side members integral with one said plate member, side edges of the other said plate member and the corresponding edges of the side members having complementary configurations of projected and indented portions whereby to interengage, the projected portions formed on the side edges of the said other plate member and/or the projected portions formed on the edges of the side members being deformed to firmly hold said edges interengaged and thus to hold said plate members together as said frame.

2. A fastener arrangement according to Claim 1, further characterised in that said frame is formed of non-magnetic material.

3. A fastener arrangement according to Claim 1, further characterised in that at least one of said first and second plate members is formed of ferromagnetic material.

4. A fastener arrangement according to any preceding claim, further characterised in that the deformed projected portions of the said other plate member or of the side members are so deformed by the application of pressure to regions of said projected portions which prior to the application of such pressure stand proud of the surface of the side members or of the other plate member respectively.

5. A fastener arrangement according to any of Claims 1 to 3, further characterised in that the deformed projected portions of the said other plate member or of the side members are so deformed by bending of the projected portions over regions of the side members or of the other plate member respectively.

6. A fastener arrangement according to any preceding claim, wherein a portion of the slide plate projects laterally beyond said frame to allow for the said manipulation thereof from the exterior of the frame.

7. A fastener arrangement according to any of Claims 1 to 5, wherein one of said plate members has a region thereof removed or omitted whereby to expose a portion of said slide member enabling the said manipulation of the slide member from the exterior of the frame.

8. A fastener arrangement according to any preceding claim, wherein said overhang is provided by a groove-like step being formed in the side of said projection.

9. A belt provided with a fastener arrangement according to any preceding claim, the female member being attached to or adjacent one end of the belt and the male member being attached to or adjacent the other end of the belt.

10. A belt according to Claim 9, further characterised in that a plurality of similar male members are provided at successively greater spaced positions from the distal extremity of the said other end of the belt.

11. A bag having an opening provided with a flap or like means adapted to extend across said opening, the bag being provided with a fastener arrangement according to any of Claims 1 to 8, one of said male or said female member being attached to said flap and the other of said male member or said female member being attached to said bag alongside said opening in a position for interengagement with one of the male or female members mounted

on said flap.

12. A structure having an openable door and provided with a fastener arrangement according to any of Claims 1 to 8 adapted for holding said door open, said door having mounted thereon one of said male or said female members and the other of said male and female members being mounted on said structure in a position for confronting relation with the said one male or female member mounted on the door when the door is fully open for operative interengagement between the two members to hold the door open.

FIG. 1

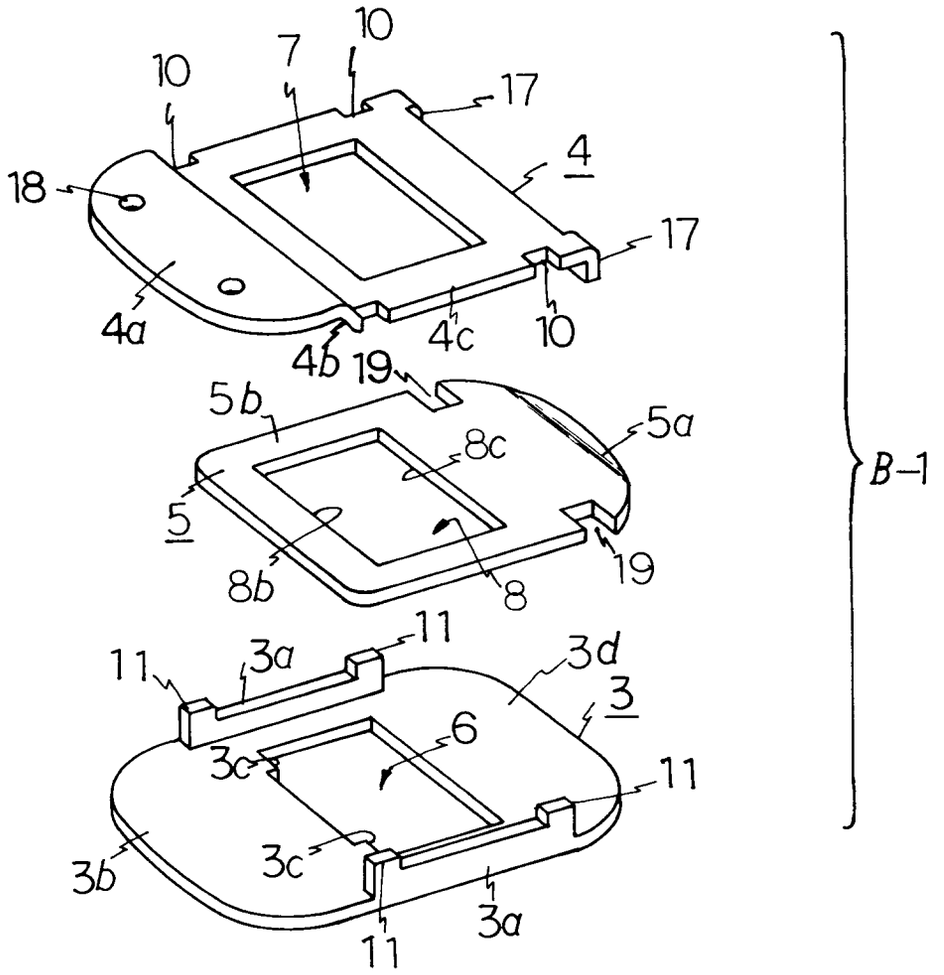
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FIG. 2

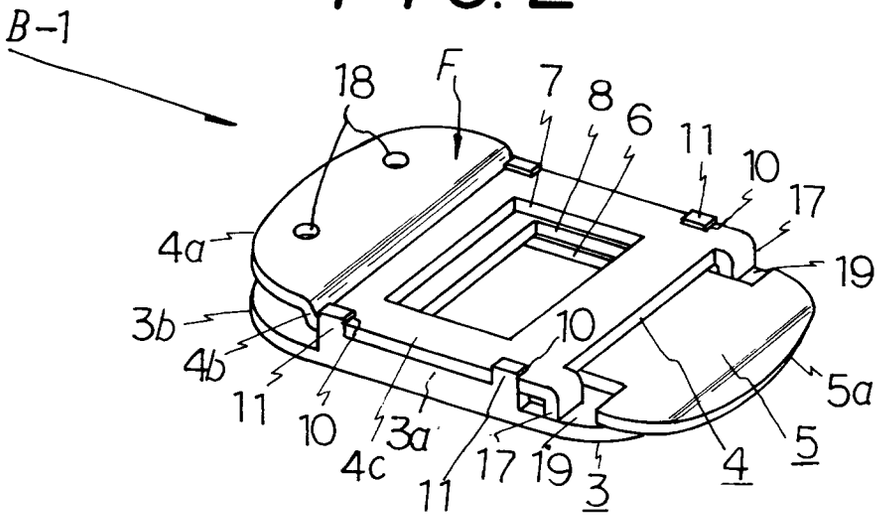
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FIG. 3

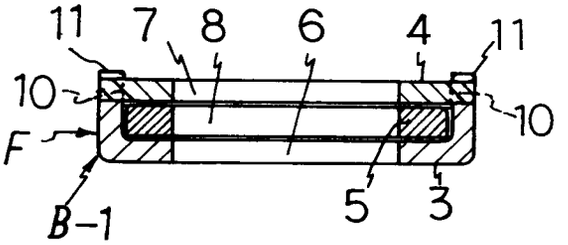

FIG. 4

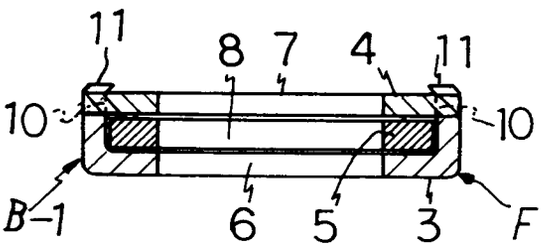

FIG. 5

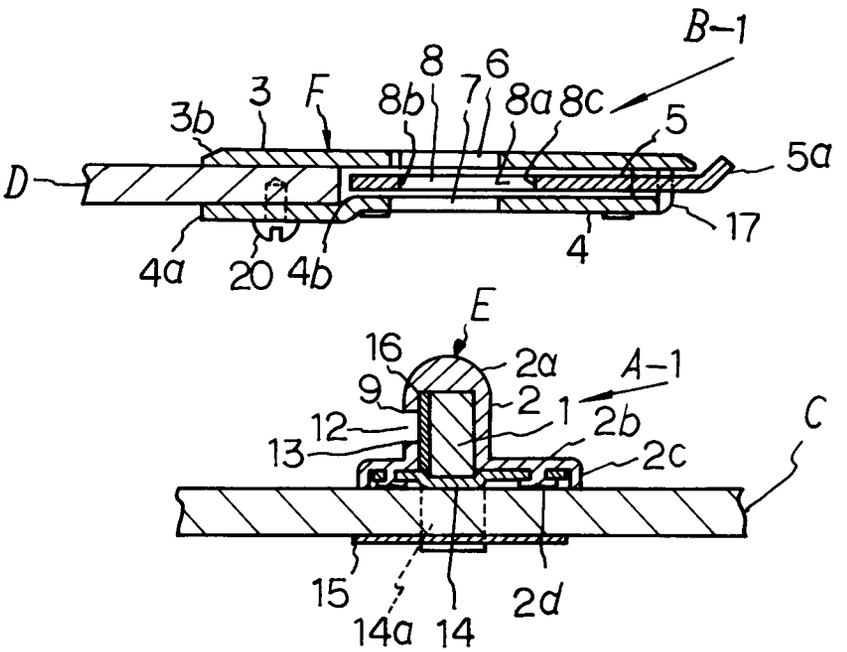

FIG. 6

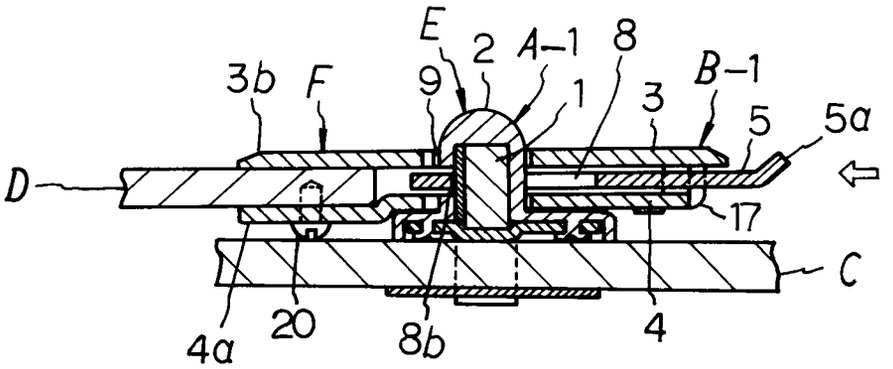
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FIG. 7

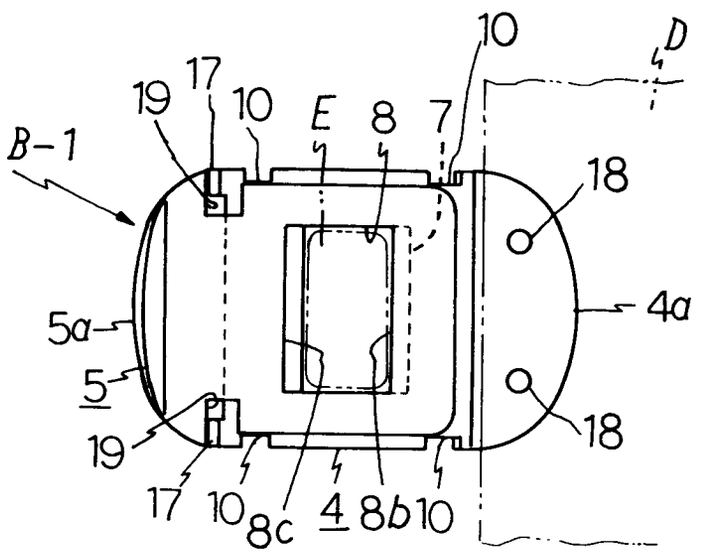
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FIG. 8

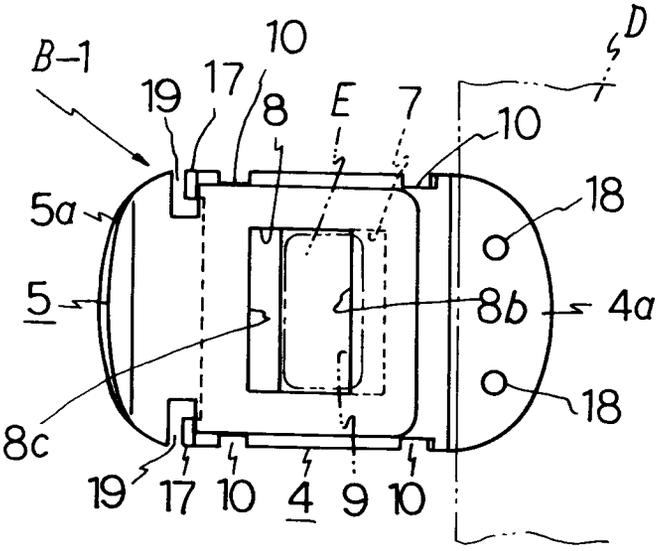
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FIG. 9

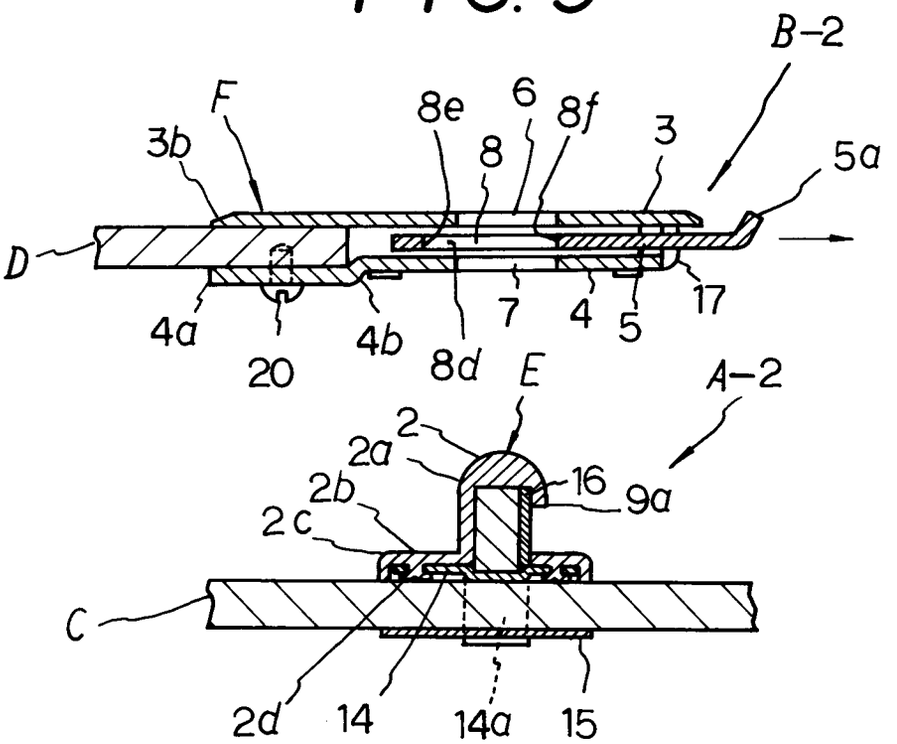
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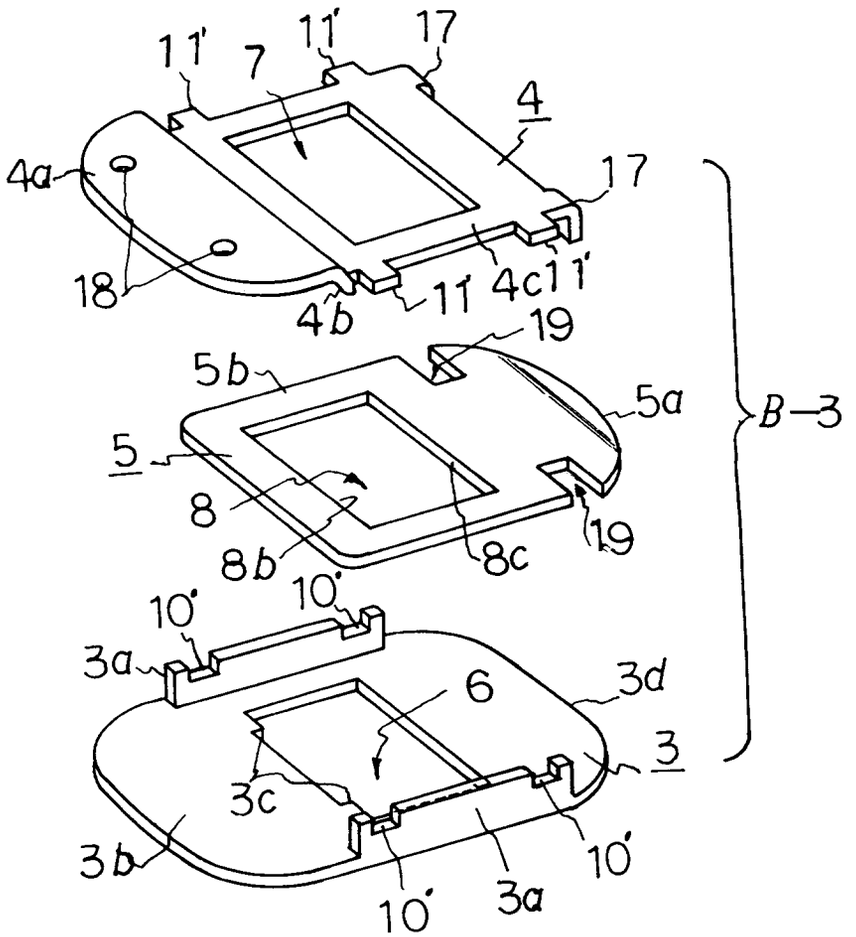
FIG. 10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4c
11'
19
5b
5a
B-3
5
8
8b
8c
19
10'
10'
3a
6
3d
3
3c
3b
10'
10'
3a

FIG. 11

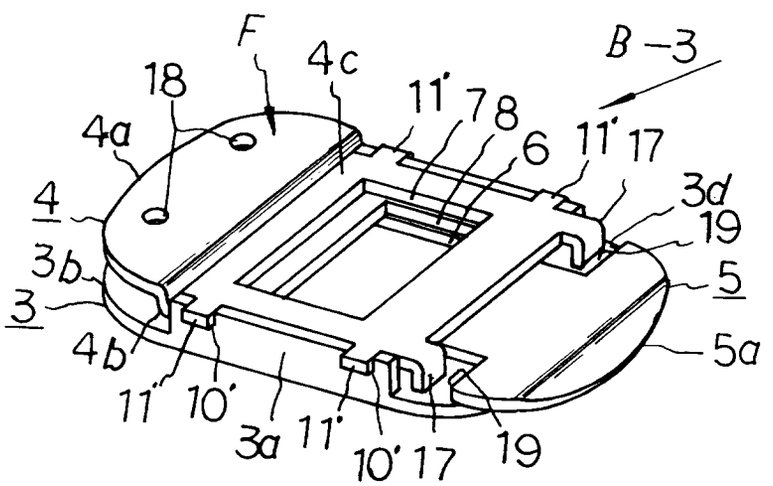

F
4c
B-3
18
11'
7
8
4a
6
11'
17
3d
4
19
3b
5
3
4b
5a
11'
10'
3a
11'
10'
17
19

FIG.12

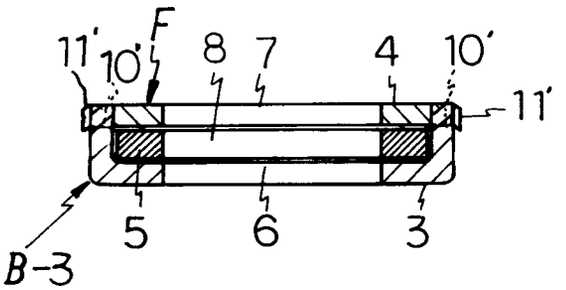

11'
10'
F
8
7
4
10'
11'
5
6
3
B-3

FIG.13

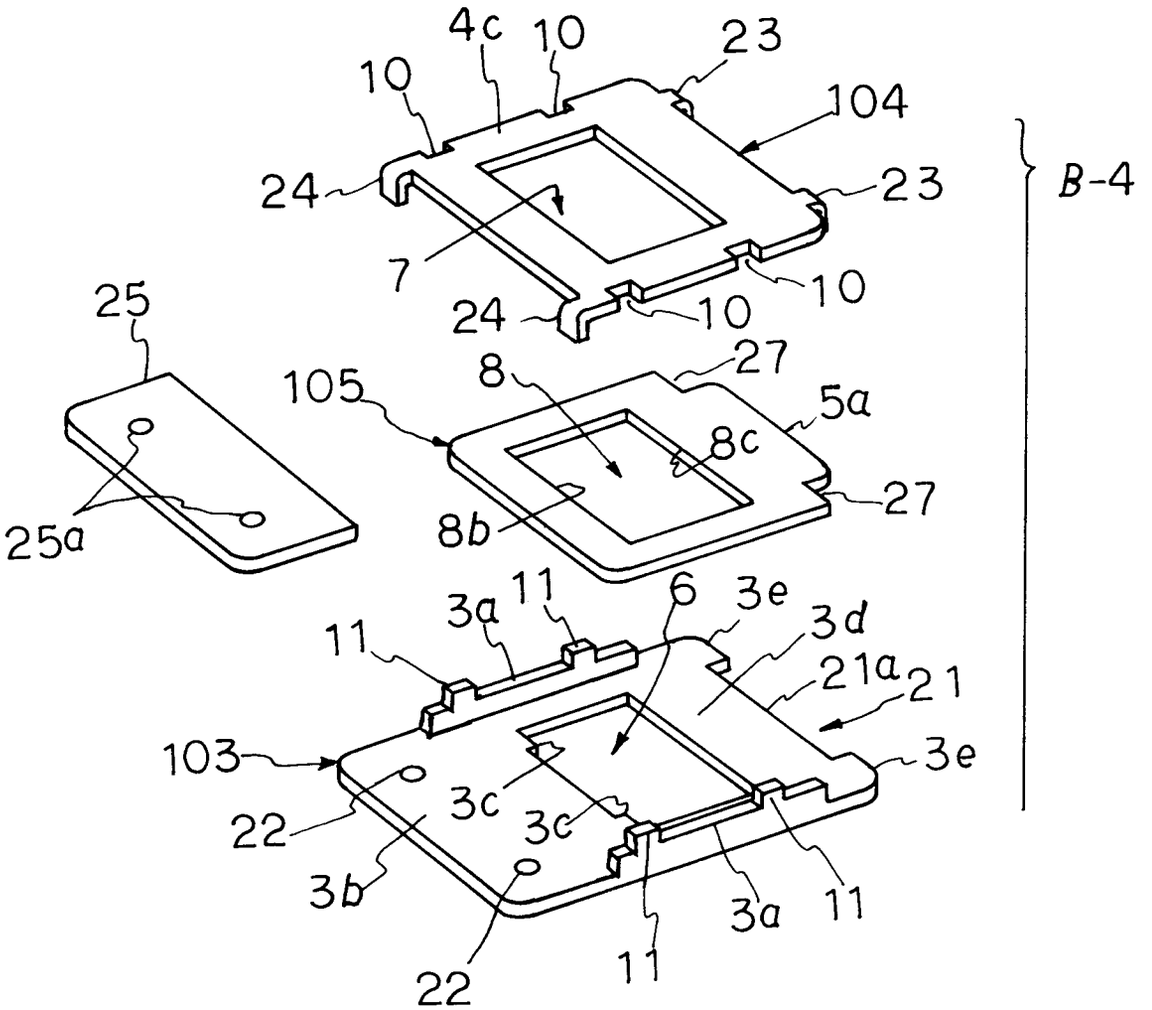

4c
10
23
10
104
24
23
B-4
7
10
24
10
25
27
105
8
5a
8c
27
25a
8b
3a
11
6
3e
3d
11
21a
21
103
3e
3c
3c
22
3b
3a
11
11
22

FIG.14

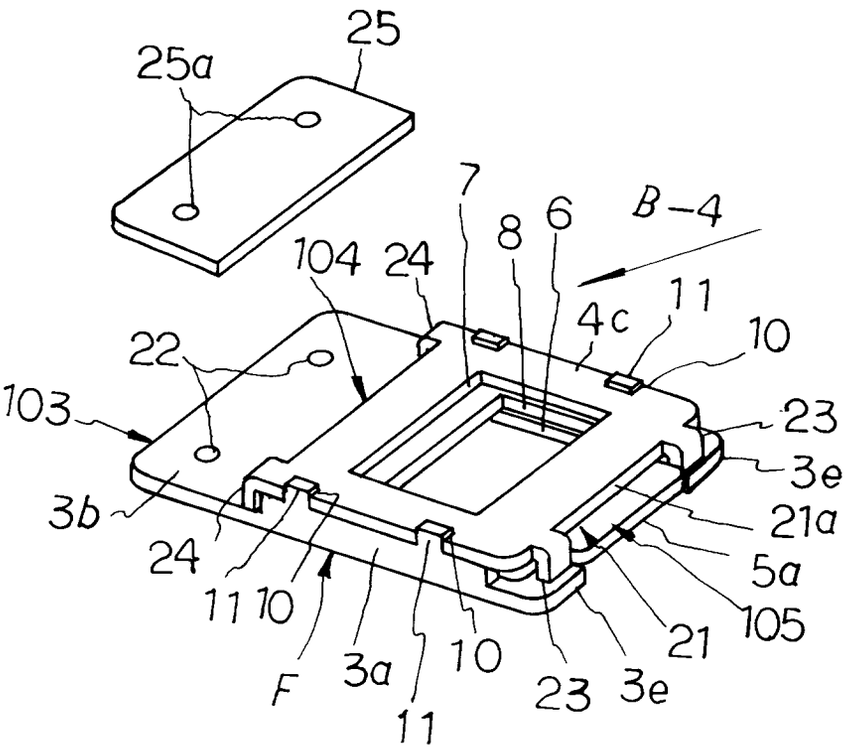

25
25a
7
8
6
B-4
104
24
4c
11
10
22
103
23
3e
3b
21a
24
5a
11
10
105
21
F
3a
10
23
3e
11

FIG.15

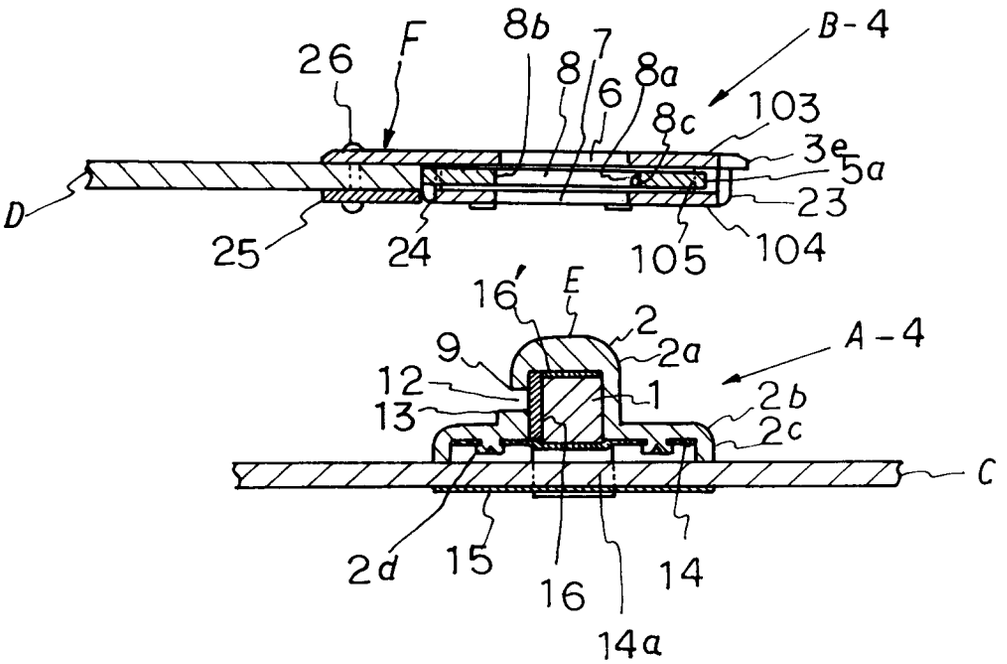
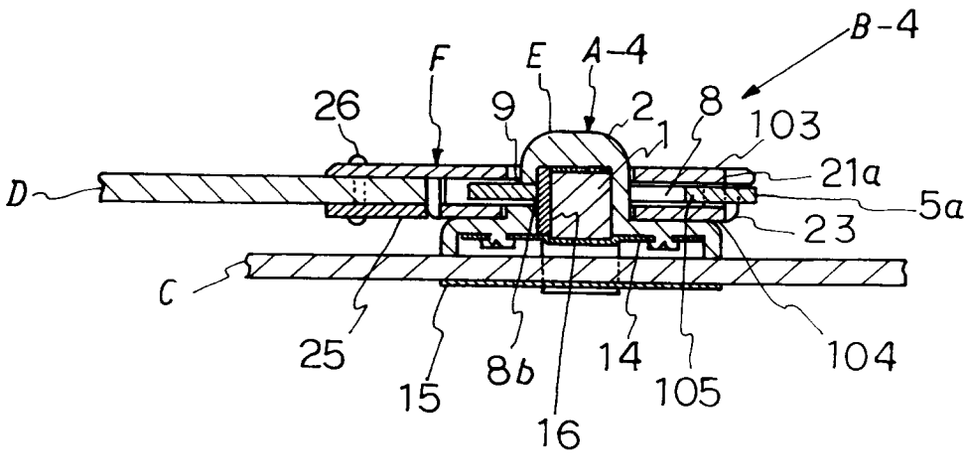

26
F
8b
7
8
6
8a
8c
B-4
103
3e
5a
23
D
25
24
105
104
16'
E
2
2a
A-4
9
12
13
1
2b
2c
C
2d
15
16
14
14a

FIG.16


B-4
F
E
A-4
26
9
2
1
8
103
21a
5a
D
23
C
25
15
8b
16
14
105
104

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EUROPEAN SEARCH REPORT

Application Number

EP 92 30 8831

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X,D	JP-B-314 983 (...) * figures 1-3 *	1,5	A44B11/25 A45C13/10 E05C19/16
Y	FR-A-2 397 050 (APPLICATION ART LABORATORIES CO. LTD)	1	H01F7/02
A	* page 5, line 32 - page 7, line 29 * * page 8, line 35 - page 9, line 12 * * page 10, line 2 - line 24; figures 5-9,15,17-19 *	2,6,9,11	
Y	US-A-1 465 578 (J. B. CAROLIN) * page 1, line 44 - line 65; figures 1-3 *	1	
A	US-A-2 475 226 (R. P. ELLIS) * column 1, line 41 - column 3, line 17; figures 1-3 *	1	
A	PATENT ABSTRACTS OF JAPAN vol. 16, no. 173 (M-1240)24 April 1992 & JP-A-40 16 684 (TAAMO KK) 21 January 1992 * abstract *	1	
A	US-A-2 856 221 (A. ORCEL)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

A44B
A45C
A41F
H01F
E05C
E05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	19 MAY 1993	GARNIER F.M.A.C.

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