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(11) EP 0 768 697 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
16.04.1997 Bulletin 1997/16

(51) Int. Cl.⁶: H01H 85/20

(21) Application number: 96201679.6

(22) Date of filing: 15.06.1996

(84) Designated Contracting States:
DE ES FR GB IT NL PT SE

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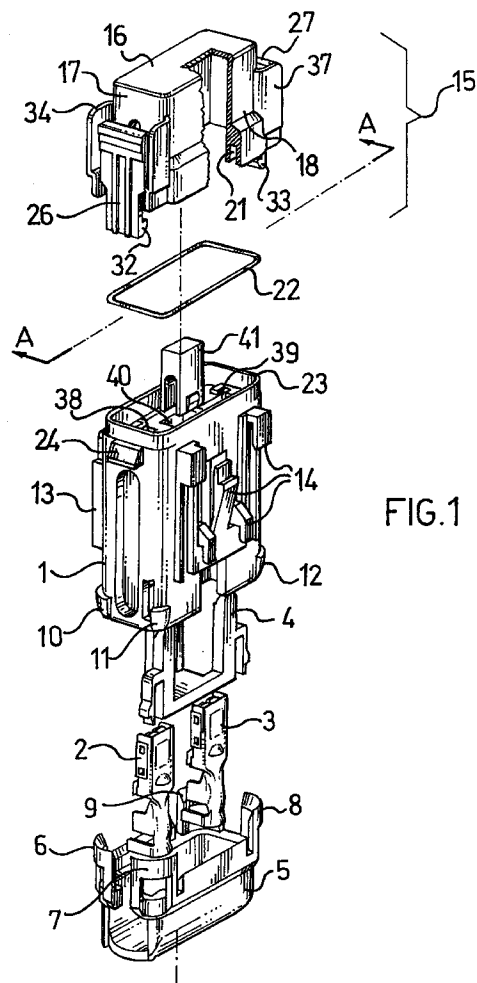
(30) Priority: 09.10.1995 IT MI950689 U

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(54) A splash-proof, modular fuse-holder with a cover-release protection

(57) In a splash-proof, modular fuse-holder a fuse-holder body (1) is closed by a removable cover (15) with the interposition of a seal (22) and the cover is engaged removably on the body by a pair of teeth (32, 33) each having a retaining side with a negative rake, cooperating with retaining teeth (24, 25) of the body (1) also each having a retaining side with a negative rake, the teeth of the cover being formed at the ends of two arms (26, 27) fixed to the cover and forming first-order levers which are biased towards the engagement position and are operable manually in order to release the cover, protective shields (34, 35, 36, 37) being disposed beside the levers to prevent adjacent fuse-holders from being opened accidentally. A coloured block (41) housed inside the body and visible when the cover is removed identifies, by its colour, the amperage of the fuse to be housed in the fuse-holder.



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Description

The present invention relates to a splash-proof, modular fuse-holder with a cover-release protection device, particularly for use in the automotive field. Splash-proof modular fuse holders for housing single fuses of the type with contact blades, which are used particularly in the automotive field, are known.

In these fuse-holders, a fuse housing in the fuse-holder body is closed by a removable cover with the interposition of a resilient seal.

The removable cover is engaged on the body by means of snap teeth which have to ensure firm engagement between the body and the cover without relative yielding (to ensure adequate compression of the seal) and, at the same time, must allow the cover to be removed easily from the body, possibly without the aid of a tool, in order to replace a burnt-out fuse or even simply to inspect the fuse.

Moreover, since these modular fuse-holders are generally coupled alongside other fuse-holders of the same type, it is desirable for the removal of one cover not to cause the release of the engagement teeth of the adjacent covers, even accidentally.

The solutions proposed up to now do not completely satisfy these somewhat conflicting requirements since, in order to favour firm engagement of the cover and an absence of yielding of the connections, it is necessary to use auxiliary tools to release the engagement teeth, with the risk of causing the release of adjacent connections.

Alternatively, in order to favour easy removability of the cover, the engagement teeth have retaining sides which have a positive rake and are not perpendicular to the direction of engagement and release so that the manual exertion of a suitable pulling force on the cover causes the teeth which, advantageously, are mounted on the ends of resilient tongues, to yield and be released.

This means that the connection can yield in the direction in which the seal is compressed, which adversely affects the imperviousness of the coupling between the body and the cover.

Moreover, in order to open the cover, it is necessary to exert a considerable gripping force manually and there is a risk of adjacent covers being displaced or opened.

The present invention remedies these limitations and provides a splash-proof, modular fuse-holder with a body closed by a cover which is coupled to the body in a coupling plane and is engaged firmly on the body by means of pairs of engagement teeth, the teeth having retaining sides with a zero or negative rake relative to the coupling plane and being formed, respectively, on opposed sides of the body and on first ends of two first-order levers which are fixed to the cover and are preferably integral therewith and which act as resilient clamps which can be opened by manual action exerted on the second ends of the levers to bring them close together.

When the clamps are opened, the engagement teeth are released and enable the cover to be removed easily.

Advantageously, protective shields are disposed beside the power arms of the levers and prevent accidental operation of the clamps or operation of the adjacent clamps when several fuse-holder modules are fitted side by side.

A further requirement for modular fuse-holders is to distinguish the fuse-holder by using a colour which identifies the rating of the fuse which the fuse-holder is intended to house.

To satisfy this requirement it has been proposed to make fuse-holders with coloured bodies, which involves considerable stock-control and fitting problems for the installer and, instead of assisting the user in the replacement of a burnt-out fuse, causes confusion, particularly if several modules of the same colour are present.

Moreover, with regard to the installation of the modules in motor-vehicle engine compartments, external distinguishing of the modules with several colours conflicts with the need to have a uniform grey colour in the engine compartment and to have few or no coloured components which could distract attention during inspection, maintenance and/or repairs.

In addition, the accumulation of dirt and dust on the external walls of the modules may mask the external colour connotation.

In order to satisfy this need, the present invention advantageously provides a modular fuse-holder in which a coloured block is housed irreversibly inside the fuse-holder body and is visible only when the cover has been opened and the fuse has been removed from the fuse-holder body.

The characteristics and advantages of the invention will become clearer from the following description given with reference to the appended drawings, in which:

Figure 1 is an exploded, perspective view of a preferred embodiment of the fuse-holder according to the present invention,

Figure 2 is a section taken on the line A-A of Figure 1 showing the cover of the fuse-holder of Figure 1 and a portion of the fuse-holder body,

Figure 3 is a section taken on the line B-B of Figure 2 showing the fuse-holder cover of Figure 1,

Figure 4 is a section taken on the line A-A of Figure 1 showing a variant of the fuse-holder cover according to the present invention,

Figure 5 is a perspective view of the fuse-holder cover of Figure 1 and a portion of the fuse-holder body, showing a variant of the cover-release device, and

Figure 6 is a perspective view of the fuse-holder cover of Figure 1 and a portion of the fuse-holder body, showing a further variant of the cover-release device.

With reference to Figures 1, 2 and 3, a modular fuse-holder according to the present invention comprises a generally rectangular, parallelepipedal body 1 of insulating plastics material inside which suitable housings are formed for clamps 2, 3 for electrical contact with the electrical terminals of a fuse, particularly blade terminals of a blade fuse, not shown, and for a secondary clamping element or "secondary lock" 4 of known type which ensures that the contact clamps are irremovable once they are fitted in the body.

The housings for the clamps 2, 3 and for the "secondary lock" are accessible from a lower wall of the body 1 closed by a lower cover 5 of plastics material which is engaged on the body 1 by the coupling of resilient engagement eyes 6, 7, 8, 9 with corresponding engagement teeth 10, 11, 12, formed on the peripheral wall of the body.

Engagement teeth and slots, generally indicated 13, 14, are formed on two opposed faces of the peripheral wall of the body 1 for the juxtaposition and mutual engagement of several fuse-holder modules, in known manner.

The body 1 is closed at the top by a removable cover 15 which is also of generally rectangular, parallelepipedal shape, is hollow, and is open at the bottom and which has a top wall 16 and two pairs of opposed peripheral walls 17, 18, 19, 20, clearly visible in Figures 2 and 3.

The lower free edges of the peripheral walls have an annular recess 21 in which a resilient seal 22, preferably an "O-ring" is engaged.

The lower edges of the peripheral walls of the cover are coupled with a lip 23 which is formed on the upper wall of the body 1 and engages in the annular recess 21 to compress the seal 22 and ensure that the coupling is impervious to spray.

The body and the cover 15 thus coupled in the plane of the seal, which is defined below as the coupling plane, form a splash-proof housing for a fuse, not shown.

To ensure that the cover 15 is engaged firmly on the body 1 and, at the same time, to enable it to be removed easily in a direction perpendicular to the coupling plane without the aid of tools, the body 1 has two engagement teeth 24 and 25 on two opposed faces of the peripheral wall (naturally not those intended to be disposed beside other fuse-holder modules), close to the lip 23.

The cover 15 in turn has two fairly stiff arms 26 and 27 extending in a direction perpendicular to the coupling plane on two opposed peripheral walls 17, 19.

The two arms are preferably moulded integrally with the cover 15 from plastics material and each is connected to the walls of the cover in an intermediate position of the arm by a pair of projecting brackets or

supports 28, 29, 30, 31, also of plastics material.

Each of the two arms 26, 27 with the respective projecting supports in practice forms a first-order lever the fulcrum of which is provided by the projecting support which has dimensions such as to ensure suitable resilience upon bending.

The lever has a stable rest position defined by the projecting support when it is not subject to bending stress but action exerted on one or other end of the lever in a direction perpendicular to the direction in which its arms extend causes bending of the projecting support and pivoting of the lever.

The lower ends of the arms 26, 27 extend from the cover beyond the plane of the coupling between the cover and body 1 and have respective engagement teeth 32, 33 which engage respective engagement teeth 24, 25 of the body.

As is clearly shown in Figure 2, each of the teeth 24, 25, 32, 33 has a retaining side which preferably has a negative rake relative to the coupling plane with a rake angle α of between 0 and 10°.

The opposite sides of the two teeth, on the other hand, are advantageously inclined with a positive rake to form a stress-raising surface which allows the two teeth to be superimposed gradually by the movement of the cover 15 towards the body 1.

The interference between the teeth 24, 25 and 32, 33, respectively, causes arms 26, 27 to pivot with resilient bending of the support brackets 28, 29, 30, 31 until, as the teeth 32, 33 pass over the teeth 24, 25, they allow the brackets 28, 29, 30 and 31 and the arms 26, 27 to resume their rest positions, ensuring firm mutual engagement between the pairs of teeth 24, 32 and 25, 33.

Firm engagement between the body 1 and the cover 15 is thus achieved simply by the exertion on the cover of a force which tends to bring it closer to the body, opposing the reaction exerted by the interposed compressed seal.

The operation is extremely easy and requires no tools.

The cover 15 is released from the body 1, however, by the exertion on the two opposite ends of the arms 26 and 27 to those provided with the engagement teeth 30, 31, of a force which tends to bring these two ends close together.

This level of force can easily be exerted manually without tools and with one hand if the two ends are gripped between a thumb and forefinger.

A bending moment is thus transmitted to the brackets supporting the arms and causes the arms to pivot and release the teeth. In short, the two arms 26, 27 behave like a resilient clamp.

To prevent this release action exerted on the arms of a cover from accidentally releasing the covers of juxtaposed modules, the cover 15 advantageously has shields 34, 35, 36, 37 disposed in pairs beside the two arms 25, 26 for preventing manual pressure simultaneously being exerted on two arms of adjacent modules.

As shown in Figure 1, in addition to holes 38, 39 for the insertion of contact blades of the fuse, the body 1 also has a prismatic housing 40 interposed between the holes 38, 39 on its upper wall, inside the lip 23, for a plate 41 of coloured plastics material which has resilient tongues with snap teeth and which engages irreversibly in the housing 40.

When the fuse-holder is open and the fuse has been removed, the plate identifies the rating of the fuse to be housed in the fuse-holder and, clearly, since it is housed in the fuse housing, it is protected from dust and dirt and is visible only when the fuse-holder is open.

The foregoing description relates solely to a preferred embodiment of the invention and, clearly, many variations may be applied.

For example, instead of being formed integrally with the cover, the engagement and release clamps may be formed as separate elements with resilient tongues acting as leaf springs for biasing the clamps towards the engagement position.

This embodiment is shown in Figure 4.

The arms or clamps 42, 43, which are wholly equivalent to the arms 26, 27 of Figure 2, have pins 44, 45 disposed in intermediate positions of the arms and engaging in corresponding holes in the lateral shields 46, 47 (or equivalent supports) forming a hinge connection.

The free ends of resilient tongues 46, 47 formed integrally with the arms 42, 43 bear against the walls of the cover and act as leaf springs for biasing the arms towards the engagement position.

A further improvement which may be applied consists of the provision of an interlocking system which ensures that the engagement teeth of the cover and of the body are aligned in the direction of insertion and, at the same time, prevents the engaged cover from being displaced relative to the body in the coupling plane.

This is in addition to the alignment which is intrinsically ensured, with a certain amount of play, by the lip of the body engaged in the recess housing the seal in the cover.

Since alignment is ensured in different planes which are quite far apart, the interlocking alignment system also prevents relative rotation between the engaged body and cover which could be brought about by incorrect handling.

A preferred embodiment of the interlocking system is shown in Figure 5; each of the engagement teeth on the fuse-holder body 1 is formed by a pair of adjacent teeth separated by a mortice.

The engagement tooth 24 formed by the two teeth 24A, 24B, separated by a mortice 48 and disposed on a side wall of the body 1, are clearly visible in Figure 5.

A corresponding pair of engagement teeth, not visible, is formed on the opposite wall of the body 1.

The engagement teeth 32, 33 formed on the ends of the arms 26, 27 of the cover in turn have, on the retaining side, a tenon which engages in the corresponding mortice and ensures precise coupling of the

teeth. One of these tenons, indicated 49 and associated with the tooth 33, is visible in Figure 5.

Clearly, the same effect may be achieved by a reciprocal arrangement, that is, by the provision of double teeth 32, 33 with an intermediate mortice and the provision of a tenon projecting on the retaining side of the teeth such as the tooth 24 of the body.

A further variant which achieves the same effect is shown in Figure 6, where the teeth 32, 33 of the cover 15 have sides 50, 51, 52, 53 which are disposed beside the teeth of the body when the cover is engaged.

A reciprocal arrangement may also be used in this embodiment, that is, tabs may be provided extending at the lateral ends of the teeth such as the tooth 24 of the body 1, the tabs being disposed beside the teeth of the cover when the cover is engaged but not preventing translation relative to the teeth of the body.

Claims

1. A splash-proof, modular fuse-holder comprising a body (1) and a removable cover (15) forming a fuse housing which is impervious to spray owing to the interposition and compression of a seal (22) in a coupling plane between the body (1) and the cover (15), the cover (15) being removable from the body (1) by translation in a direction perpendicular to the coupling plane, characterized in that the body (1) comprises:
 - at least one pair of first engagement teeth (24, 25) formed on opposed walls of the body and having a retaining side with a zero or negative rake relative to the coupling plane, and in that the cover comprises:
 - at least one pair of first-order levers (26, 27, 42, 43) with respective power arms and resistance arms, pivoted on the cover (15) and having second teeth (32, 33) at the ends of the resistance arm for mutual engagement with the first teeth (24, 25), the second engagement teeth (32, 33) having retaining sides with a zero or negative rake relative to the coupling plane and
 - resilient biasing means (28, 29, 30, 31, 46, 47) for biasing the pair of levers (26, 27, 42, 43) towards a rest and engagement position so that the mutual engagement of the first (24, 25) and second (32, 33) teeth ensures firm engagement of the cover (15) on the body (1), and a force exerted on the two power arms of the levers and tending to bring them close together brings about disengagement of the teeth and enables the cover to be removed.
2. A splash-proof modular fuse-holder comprising a body (1) and a removable cover (15) forming a fuse housing which is impervious to spray owing to the

interposition and compression of a seal (22) in a coupling plane between the body and the cover, the cover being removable from the body by translation in a direction perpendicular to the coupling plane, characterized in that,

the body (1) comprises a pair of first engagement teeth (24, 25) formed on opposed sides of the body (1) and having a zero or negative rake relative to the coupling plane, and in that the cover (15) comprises a pair of rigid arms (26, 27) extending in a direction perpendicular to the coupling plane, formed integrally with the cover (15) and connected, in an intermediate position of the arms, to two opposite walls of the cover by resilient brackets (28, 29, 30, 31) projecting from the walls, the arms (26, 27) having first and second free ends and each having, at the first free end, a second engagement tooth (32, 33) cooperating with one of the first teeth (24, 25) for mutual engagement, the second tooth (32, 33) having a retaining side with a zero or negative rake relative to the coupling plane, the arms (26, 27) forming, with the resilient projecting brackets, (28, 29, 30, 31), a pair of first-order levers with a rest position of mutual engagement of the first and second teeth imposed by the resilient brackets, the arms being operable to open and release the first and second teeth by action exerted on the second ends of the arms bringing the second free ends of the arms close together.

3. A fuse-holder according to Claim 1 or Claim 2, in which the cover (15) comprises two pairs of protective shields (34, 35, 36, 37) fixed to the cover and disposed beside the arms.

4. A fuse-holder according to any one of Claims 1, 2 and 3, in which the body (1) comprises an element (41) of plastics material fitted in the body with a head exposed inside the housing, the plastics material being coloured with a colour indicative of the amperage of the fuse to be fitted in the fuse-holder.

5. A fuse-holder according to any one of Claims 1, 2, 3 and 4, in which the first (24, 25) and second (32, 33) teeth have interlocking means (48, 49, 50, 51, 52, 53) for ensuring mutual alignment of the first and second teeth in the direction of insertion.

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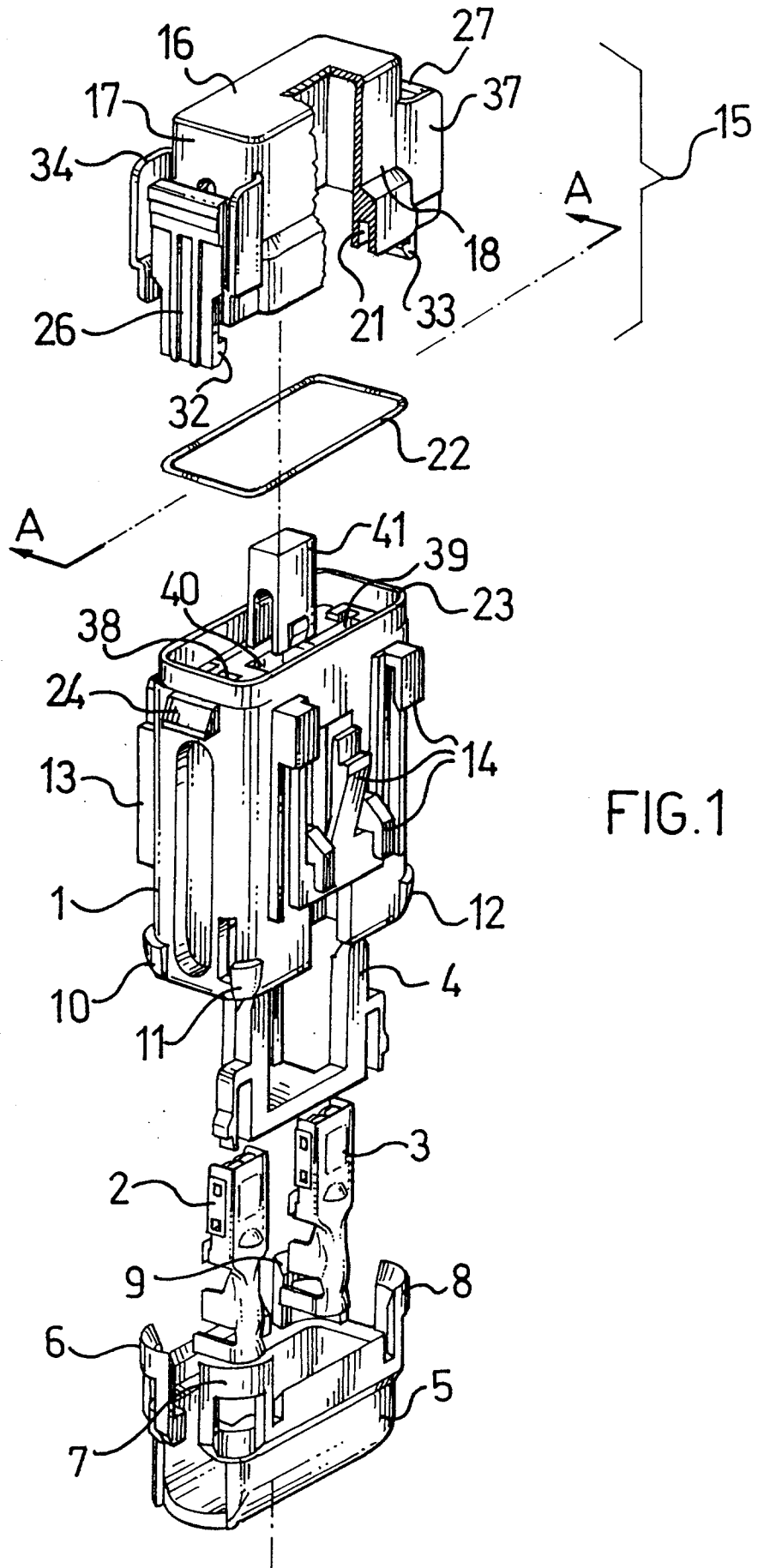
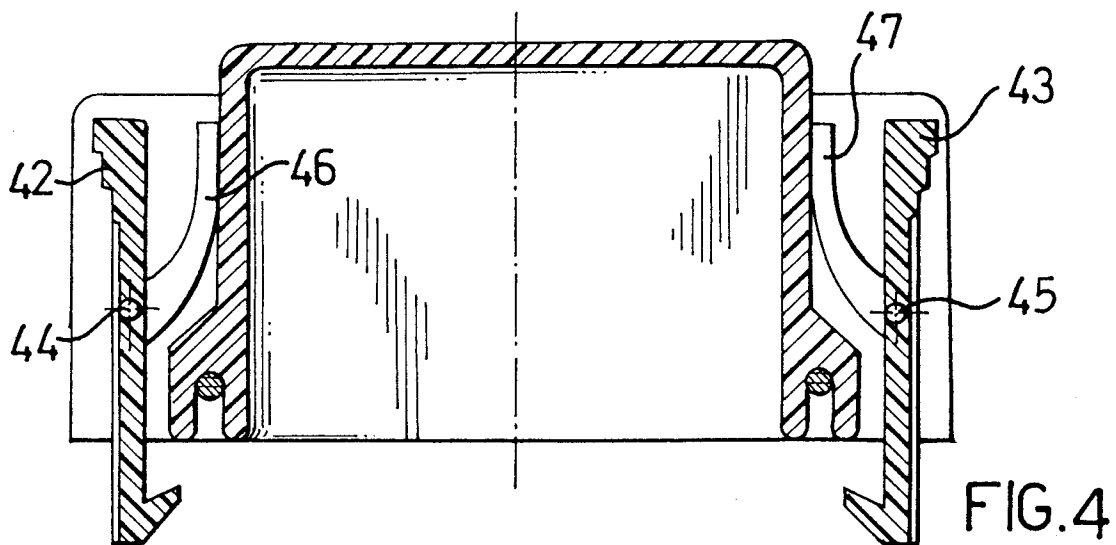
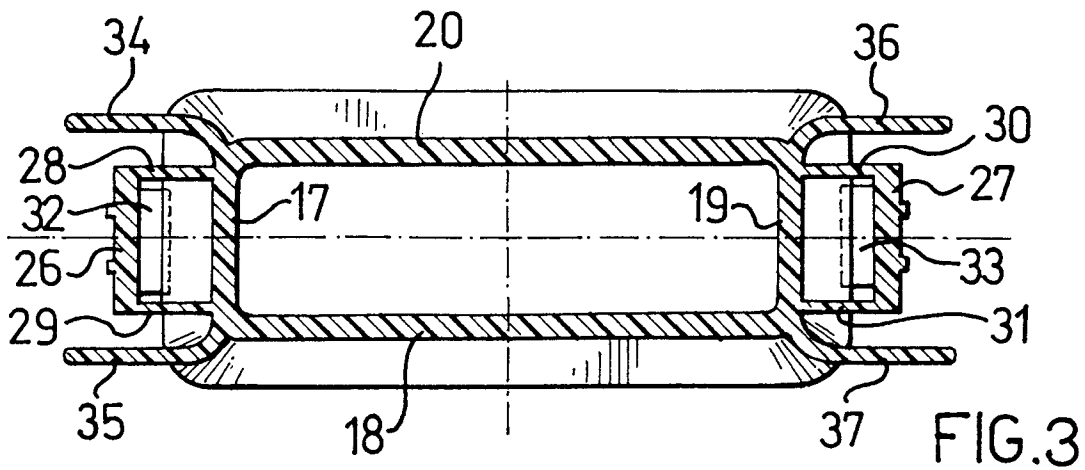
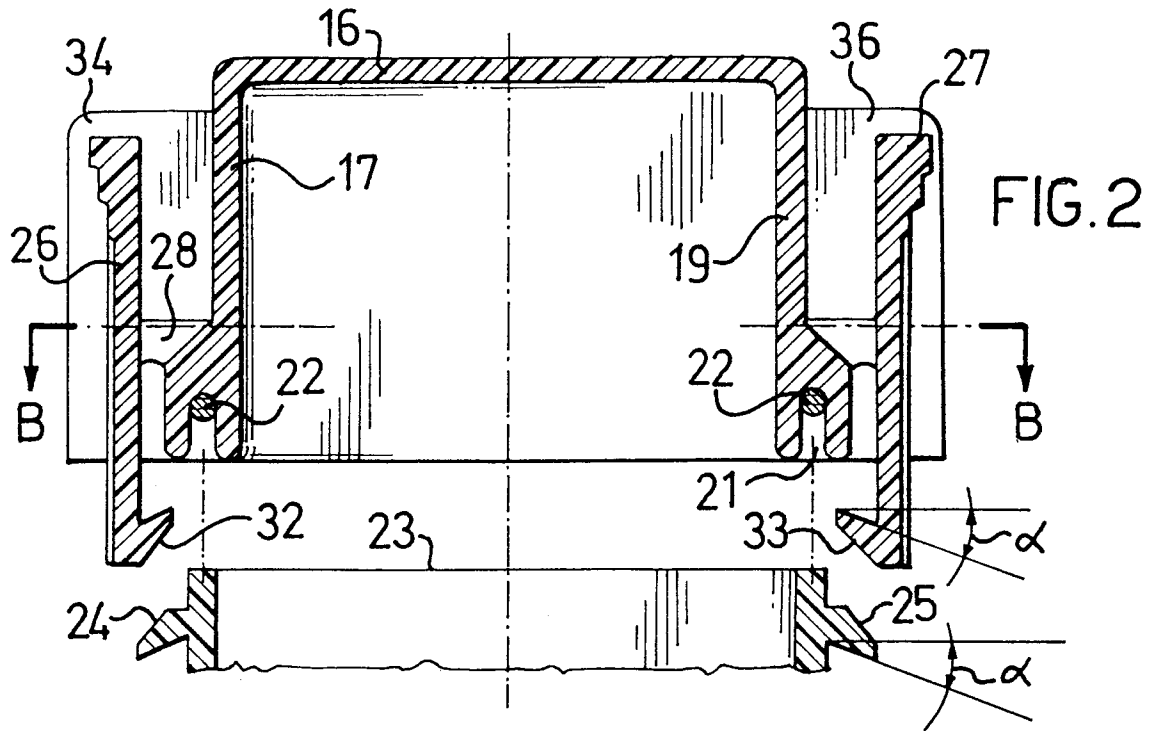


FIG.1



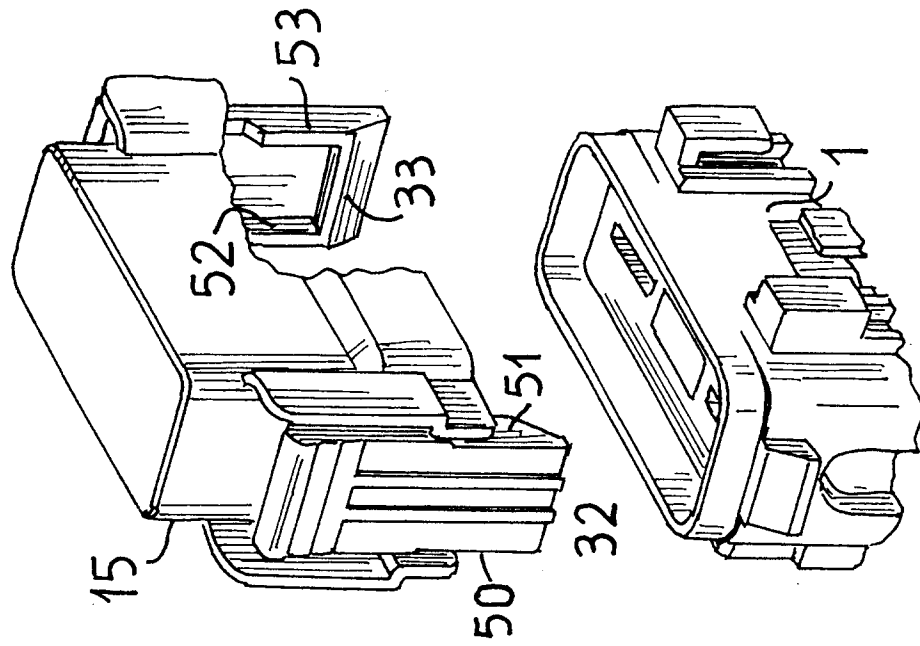


FIG. 5

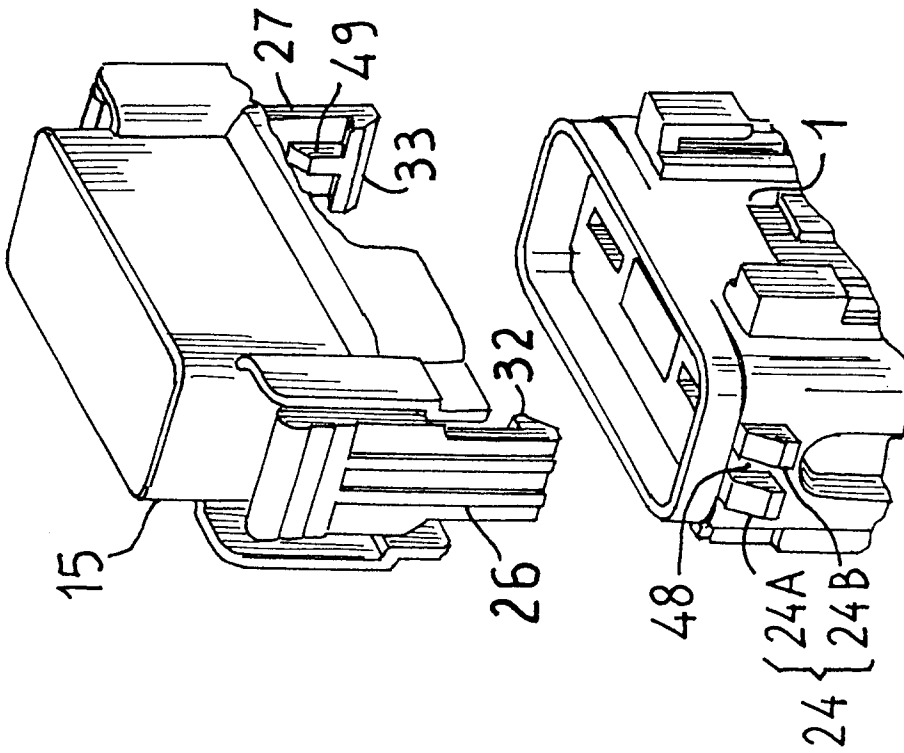


FIG. 6



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EUROPEAN SEARCH REPORT

Application Number
EP 96 20 1679

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The present search report has been drawn up for all claims				
Place of search		Date of completion of the search	Examiner	
THE HAGUE		20 December 1996	Desmet, W	
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>				

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EUROPEAN SEARCH REPORT

Application Number
EP 96 20 1679

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.6)
A	EP-A-0 462 868 (LABINAL) 27 December 1991 * abstract; figures * ---	1,2	
A	GB-A-1 163 085 (PLESSEY COMPANY) 4 September 1969 * the whole document * -----	1,2,5	
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Place of search THE HAGUE		Date of completion of the search 20 December 1996	Examiner Desmet, W
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