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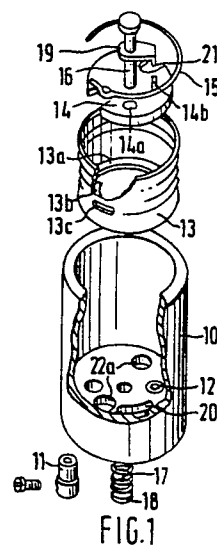
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(54) **Electrical sockets.**

(57) A safety electrical socket with circumferential separation of supply and plug contacts brought into engagement only by insertion of a plug, there being a restraint on the sleeve such that the torque required on the plug to initiate rotation of the sleeve away from the safe position is greater than that required to initiate return of the sleeve to the safe position from the live position.



### ELECTRICAL SOCKETS

The invention relates to electrical sockets, particularly screwed sockets to receive components, such for example as Edison screw lamps or continental European fuse holders, which have externally screw-threaded, centre contact-carrying plugs to engage the sockets.

It will be appreciated that, when a lamp or other electrical component is removed from a socket, actually or potentially live parts of the socket can be touched unless some protective arrangement is provided. Numerous protective arrangements have been proposed but they are uncertain in action or uneconomic to produce. No such arrangement has yet come into use.

Among the prior proposals are those of Morison, U.S. Patent Specification No. 3 895 195 who shows radially moving contacts in one design and in two other designs axially moving plug-receiving sleeves, one screwed and moved by the plug and the other raised against a spring when an inserted plug bottoms on a fixed centre contact. Other proposals are those of Ceader in U.S. Patent Specification No. 2 158 851, with contacts flexed into position by an inserted plug; those of Lucini (Elios Fabbrica) in German Patent Specification No. 2 553 610, where a retractable centre contact is used with side contacts which are masked by an insulating sleeve until an inserted plug turns it and allows the contacts to flex inwards through gaps in it; and those of Hultberg, German 2 903 087, where a contact-carrying shutter is in one embodiment driven sideways by engagement of an upwardly projecting wing with the base of a plug reaching its fully inserted position, and in another embodiment is rotated against an increasing spring pressure by two such wings carried round with the plug. All these proposals lack the simplicity of construction and certainty

of action that we have sought in combination with difficulty in accidental defeat of the safety provision.

The invention has for an object to provide an improved electrical screwed socket which is effective in action and economically produced and which is safe when not fitted with an electrical component.

The invention provides an electrical socket in which a plug-receiving sleeve within a socket body is rotated by a fully inserted plug through an arc of movement between a safe position at which supply contacts in the holder are inaccessible and are circumferentially separated from plug contacts associated with the sleeve, and a live position at which electrical connection of the supply contacts with the plug contacts is made, there being a restraint on the sleeve such that the torque required on the plug to initiate rotation of the sleeve away from the safe position is greater than that required to continue such rotation and also greater than the torque required to initiate return of the sleeve to the safe position from the live position.

Thus, and in particular where the plug simply engages the sleeve frictionally, the greater initiating torque requirement, giving a snap action away from the safe position, ensures that the engagement of the plug is firm before rotation takes place, and that subsequent removal of the plug is therefore impossible without bringing the sleeve back from the live to the safe position.

The invention is specifically applicable where the sleeve is internally screwed and there is an extension of one of the plug contacts to the axis of the socket for engagement with a centre contact of an inserted, correspondingly screwed plug, for example an Edison-screw lamp.

Conveniently the sleeve, which can be of full cylindrical or any other form receiving the plug, is closed by an insulating shutter with which the plug contacts are associated to

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move with the sleeve and specifically in such a construction the supply contacts may lie below the shutter, spaced from the axis of the holder for engagement with plug contacts which extend below the shutter from plug-engagement positions above it. Other arrangements of the contacts are however not excluded.

In one form of the invention the restraint is a spring-loaded catch operative between the sleeve and socket body to restrain rotation of the sleeve. In particular it may be in the form of a spring circlip fitted within the sleeve and provided with a detent which projects from the sleeve to enter a recess in the socket body corresponding to the safe position, the circlip flexing inward on movement of the sleeve away from that position. Conveniently such a circlip lies within the sleeve, expanded against it, and a portion of the circlip that extends from the detent in the direction of rotation away from the safe position is substantially shorter than a portion that extends in the opposite direction.

A further recess in the socket body may be provided, corresponding to the live position and giving a positive switch action.

It is observed, even where there is a notch at each end of the movement, that the above arrangement gives a considerable resistance to rotation away from the safe position, it is thought due to a tendency of the circlip to expand against the sleeve on initial rotation, due to the direction of the force exerted on the detent, whereas on reverse rotation the force is in the opposite direction and the circlip tends to contract away from the sleeve making flexing of the circlip easier.

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By suitable design and selection of the circlip strength in adopting the invention, such a high torque can be required to move the sleeve from the safe position that manual rotation of the sleeve from this position in the absence of a screwed-in plug is virtually impossible.

In another form of the invention, the catch is in the form of a leaf spring secured at one end to the sleeve or to the socket body and with a detent at the free end, the detent projecting into a recess formed in the body or sleeve as the case may be, at a position corresponding to the safe position of the holder.

In such sockets too a further recess may be formed in the body or sleeve as the case may be at a position corresponding to the live position of the holder. The recesses, particularly where formed in the sleeve, can be in the form of through slots.

Conveniently the leaf spring is disposed within the sleeve and extends away from the position at which it is secured, in the direction of movement of the sleeve away from the safe position.

In a further construction the spring-loaded catch is in the form of a circlip or other spring member disposed externally of the sleeve in engagement with the body and having at a position away from the position of said engagement an inwardly directed detent which engages a recess in the sleeve at the safe position but rides out of the recess onto the surface of the sleeve

on movement of the sleeve away from the safe position. The spring member may but need not be positively fixed against rotation relative to the

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body rather than simply extending round in frictional engagement with it.

Optionally, as before, the detent engages a further, smaller recess in the sleeve at the live position.

Preferably with an externally disposed spring member a projection on the body, lying between the position of engagement with the body and the position of the detent, engages the spring member as it rides out of the recess corresponding to the safe position. The position of and hence forces on the spring member and in particular the detent are thus controlled to give the desired restraint.

However a leaf spring is disposed, the angle formed by the detent with the main part of the spring, and the angle formed between the edge of the recess engaged by the detent and the detent itself, are designed to help the safety action. It is ensured that a component of force sufficient to cause the detent to leave the recess when moving away from the safe position can be developed only when a firm force engaging the plug in the sleeve has been applied to the plug. Likewise the force required to leave a recess at the live position/ <sup>can be controlled.</sup> For example, if the face of a detent and the edge (face) of the recess engaged by it are both in a radial plane, the detent can leave the recess only when the applied force is enough to distort the spring and alter the angle at which the detent lies so that a radial displacing force is applied to it, inwards or outwards as the case may be. The same principle applies to the circlips (where the detent is

conveniently formed as a "hump" within the length of the circlip by bending the spring wire or the like that it is made of), but the flexing movement of the circlip as a whole, as described, is thought to be the more important factor. A spring wire circlip can be stronger as a spring than a leaf spring of generally similar dimensions.

In all forms, the differential restraint effect may be enhanced by suitable shaping of the recesses.

Some constructions of socket as shown in the accompanying drawings will now be described by way of example.

In the drawings:-

Fig. 1 is an exploded view of one form of socket;

Fig. 2 is a section through the socket with the parts in the live position;

Fig. 3 is an axial view of the parts in the live position and shows the line of section 2-2 of Fig. 2;

Fig. 4 is a view corresponding to Fig. 3 with the parts in the safe position;

Figs. 5 to 7 are an exploded view and views corresponding to Figs. 3 and 4 respectively showing a second catch construction; and

Figs. 8 and 9 are axial views of a socket with a third catch construction, respectively in the 'off' (safe) and the 'on' (live) positions.

The socket illustrated in Figs. 1 to 4 comprises a cup-shaped body or casing 10 of insulating material, e.g.

of ceramic, the base of which is fitted with a pair of fixed conductor-receiving terminals 11, 12 providing live contacts offset from the casing axis, a metal sleeve 13 which has a screw thread formed in it to receive the plug of a threaded component, e.g. an Edison screw lamp, and an insulating disc 14 which is keyed to the sleeve and sits on a flange 13a at the lower end of the sleeve.

A rivet 16 forming the central contact to be engaged by the contact pad of the inserted plug bears on the disc 14 and extends through the base of the casing to receive a spring 17 and washer 18 which are retained by peening over the rivet end, the disc 14 thus being maintained against the flange 13a.

The rivet 16 serves as a pivot about which the disc and sleeve can rotate to a limited extent as determined by a peg 14a projecting from the undersurface of the disc into an arcuate slot 20 in the base of the casing 10.

The rivet 16 carries a conductive tab 19 the free end of which projects through a slot 14b in the disc 14 to co-operate with the live terminal 11. The sleeve 13 is formed with an inwardly-directed lug 13b to co-operate with the live terminal 12.

The disc/sleeve combination has safe and live positions as determined by the peg 14a and slot 20 and is restrained against movement from these positions by a catch arrangement which is such that a greater torque is needed to overcome it in moving from the safe position(Fig. 4) than in moving from the live position(Fig. 3).

In this construction, the catch arrangement makes use



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of a circlip 15, which is fitted in the sleeve 13 above the disc 14, to provide a spring and a detent 15a to project through a slot 13c in the sleeve 13 into recesses 10a and 10 b formed internally of the casing.

It will be observed that the detent 15a is close to that end of the circlip 15 which leads in the clockwise direction and that the greater part of the circlip extends in contact with the sleeve in the anticlockwise direction from the detent 15a. Also the recesses are shaped so that greater torque is required to disengage the detent 15a from recess 10a than from recess 10b.

It is found in practice that, in turning the disc/sleeve combination clockwise, the circlip 15 tends to expand and tighten against the sleeve before being forced to flex, so providing a greater restraint to disengagement of the detent that when turning in the anticlockwise direction when the circlip tends to contract and flex easily. The shapes of the recesses 10a, 10b enhance this effect.

In use, when a lamp is not fitted in the holder, the parts are in the safe position of Fig. 4 and have (i) the detent 15a in recess 10a, (ii) the conductive tab 19 angularly spaced from live terminal 11, and (iii) lug 13b angularly spaced from terminal 12. Thus neither the central contact rivet 16 nor the sleeve 13 is connected to a live contact and moreover the live terminals 11, 12 are covered by the insulating disc 14 and so cannot be manually contacted.

On fitting a lamp, only limited torque is applied to the sleeve 13 as the lamp is screwed in, but when the lamp

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contact cap engages the central contact 16 a greater torque can be applied through the lamp sufficient to overcome the relatively great restraint needed to retract the detent 15a from the recess 10a so freeing the disc/sleeve combination to rotate clockwise to the live position (Figs. 2 and 3).

In the live position (Fig. 3), (i) the detent 15a is engaged in recess 10b, (ii) conductive tab 19 is in contact with terminal 11, and (iii) lug 13b is in contact with terminal 12.

On removing the lamp, anticlockwise rotation of the disc/sleeve combination is achieved by the lesser torque needed to disengage the detent 15a from the recess 10b which torque nevertheless is insufficient to allow unscrewing of the lamp. A sufficient torque for unscrewing can be applied only when the stop 14a reaches the end of the slot 20 and the detent 15a is once again engaged in the recess 10a.

The torques required for moving the disc/sleeve combination from the live and safe positions can be controlled in manufacture as a function of the strength of circlip 15 and the relative dimensions of the recesses 10a and 10b, and it can be readily arranged that the torque required to move from the safe position cannot be applied to the sleeve except through a fully screwed-in lamp.

The strength of spring 17 is selected to ensure good electrical contact between the tab 19 and the lug 13b and terminals 11, 12 respectively.

In Fig. 4, there are shown screws 22 by which the socket can be secured, these screws passing through

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holes 22a (Fig. 1) in the base of the casing 10 and being accessible through cut-outs 21 in the disc 14 only when the socket parts are in the safe position. This incorporation of fixing screw holes, which can be at the standard spacing, is a useful feature in a safety socket, made possible by the present construction.

In the construction of Figs. 5 to 7, a modified construction of catch is shown (other parts being as in Figs. 1 to 4) in which, instead of the circlip 15, there is provided an arcuate leaf spring 25 which is secured to the sleeve 13 by a rivet 26 and has its free end 25a bent outwards to provide a detent to engage recesses 10c, 10d in the body 10.

The spring 25 extends from the rivet 25a in the clockwise direction and so acts in the same way as the circlip 15.

Like the recesses 10a, 10b, the recesses 10c, 10d are shaped to make disengagement from the recess 10d, engaged by the detent in the live position easier than disengagement from recess 10c corresponding to the safe position.

In an alternative construction, the leaf spring is secured in the casing and is arranged to engage slots in the sleeve.

In Figs. 8 and 9 a pressed ceramic body 110 has within it a metal sleeve 111 which has an internal Edison screw and is closed by an insulating shutter or disc 112 secured to the sleeve or at least retaining it by engagement with a part of the sleeve passing below the shutter. Below this disc, fixed in the body, are supply

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contacts 113 and 114 formed to receive conductors in the usual way. Centrally of the shutter is a rivet 115 passing through the shutter and through the body, and holding the shutter and hence the sleeve in place by means of a coil spring passed over the rivet to bear on the underside of the body and itself held in place by a washer retained by peening over the end of the rivet. (The spring is at the back of the body as seen in the Figs. and hence is not shown).

Under the head of the rivet 115 is a plug contact strip 116 which extends radially of the shutter and then through an axial aperture therein to make electrical connection with the supply contact 113 in the live position of the holder, and thus provide electrical connection with the centre contact of a plug through the contact strip and the rivet head. Connection to the plug through the screw thereof is completed through an extension 117 of the sleeve 111 situated below the shutter to contact supply contact 114 in the live position of the holder. Firm electrical contact is ensured in both instances by the force exerted by the coil spring referred to earlier, through the rivet 115.

Control of the movements of the sleeve is provided by a leaf spring 118 received in and effectively fixed at a notch 119 in the body and having at the end remote from its fixing point a detent 120. This detent is received in the sleeve in a recess or aperture 121 at the safe position of the holder but on movement of the sleeve, clockwise as seen, by a fully inserted plug, rides out of the aperture once sufficient force has been exerted

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and thereafter bears on the outer surface of the sleeve until the live position is reached. It will thus be appreciated that the plug on insertion must enter fully firm engagement with the sleeve before the sleeve can be moved towards the live position, and that on return of the sleeve to the safe position for removal of the plug the sleeve will necessarily be carried back to the safe position. It is not possible for the frictional force of the detent 120 on the outside of the sleeve to hold the sleeve and allow the plug to be unscrewed before the detent has re-entered the recess 121, though once the detent is in the recess, applied force tends to wrap the spring 118 more firmly round the outside of the sleeve and hold it firmly while the plug is unscrewed.

At 122 is provided a projection engaging the spring as it rides out of the groove, so that a firm force has to be applied to the sleeve before the radial face of the recess that engages the detent can flex the spring slightly and exert an outward force on the detent.

If a switching action is required in any of the sockets a switch of known type can be interposed between input terminals and the terminals 11, 12 or 113, 114 for routine operation of the socket.

CLAIMS

1. An electrical socket in which a plug-receiving sleeve within a socket body is rotated by a fully inserted plug through an arc of movement between a safe position at which supply contacts in the holder are inaccessible and are circumferentially separated from plug contacts associated with the sleeve, and a live position at which electrical connection of the supply contacts with the plug contacts is made, there being a restraint on the sleeve such that the torque required on the plug to initiate rotation of the sleeve away from the safe position is greater than that required to continue such rotation and also greater than the torque required to initiate return of the sleeve to the safe position from the live position.

2. A socket according to claim 1, wherein the sleeve is internally screwed and there is an extension of one of the plug contacts to the axis of the socket for engagement with a centre contact of an inserted, correspondingly screwed plug.

3. A socket according to claim 1 or 2, wherein the sleeve is closed by an insulating shutter with which the plug contacts are associated to move with the sleeve.

4. A socket according to claim 3, wherein the supply contacts lie below the shutter, spaced from the axis of the holder for engagement with plug contacts which extend below the shutter from plug-engagement positions above it.

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5. A socket according to claim 1, 2, 3 or 4, wherein the restraint is a spring-loaded catch operative between the sleeve and socket body to restrain rotation of the sleeve.

6. A socket according to claim 5, wherein the spring-loaded catch is in the form of a spring circlip fitted within the sleeve and provided with a detent which projects from the sleeve to enter a recess in the socket body corresponding to the safe position, the circlip flexing inward on movement of the sleeve away from that position.

7. A socket according to claim 6, wherein the circlip lies within the sleeve, expanded against it, and a portion of the circlip that extends from the detent in the direction of rotation away from the safe position is substantially shorter than a portion that extends in the opposite direction.

8. A socket according to claim 6 or 7, wherein there is a further recess in the body corresponding to the live position.

9. A socket according to claim 5, wherein the spring-loaded catch is in the form of a leaf spring secured at one end to the sleeve or to the socket body and with a detent at the free end, the detent projecting into a recess formed in the body or sleeve as the case

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may be at a position corresponding to the safe position of the holder.

10. A socket according to claim 9, wherein a further recess is formed in the body or sleeve as the case may be at a position corresponding to the live position of the holder.

11. A socket according to claim 9 or 10, wherein the leaf spring is disposed within the sleeve and extends away from the position at which it is secured, in the direction of movement of the sleeve away from the safe position.

12. A socket according to claim 5, wherein the spring-loaded catch is in the form of a circlip or other spring member disposed externally of the sleeve in engagement with the body and having at a position away from the position of said engagement an inwardly directed detent which engages a recess in the sleeve at the safe position but rides out of the recess onto the surface of the sleeve on movement of the sleeve away from the safe position.

13. A socket according to claim 12, wherein said spring member is fixed against rotation relative to the body rather than simply being in frictional engagement with it.



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14. A socket according to claim 12 or 13, wherein the detent engages a further, smaller recess in the sleeve at the live position.

15. A socket according to claim 12, 13 or 14, wherein a projection on the body, lying between the position of engagement with the body and the position of the detent, engages the spring member as it rides out of the recess corresponding to the safe position.

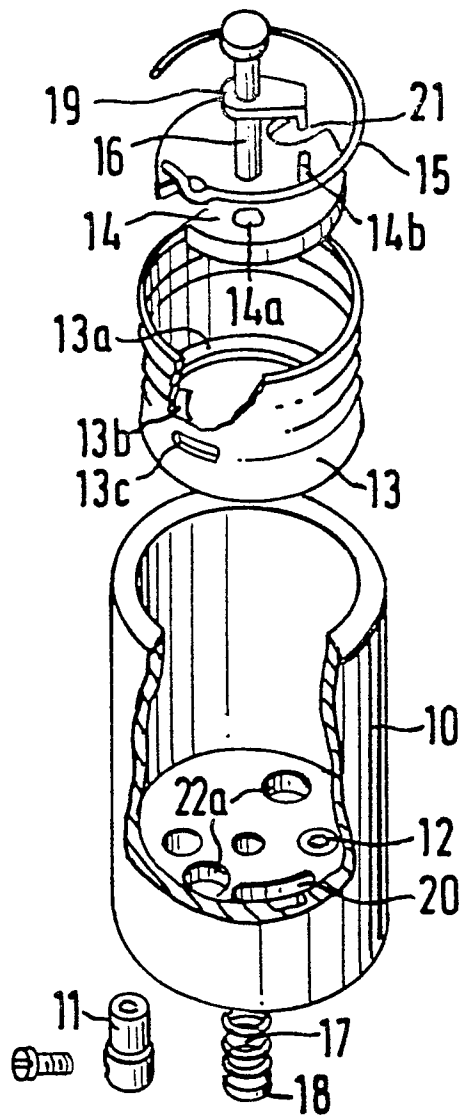


FIG. 1

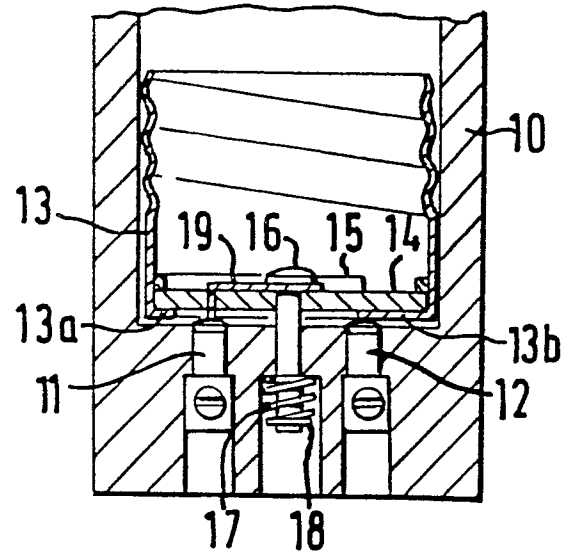


FIG. 2

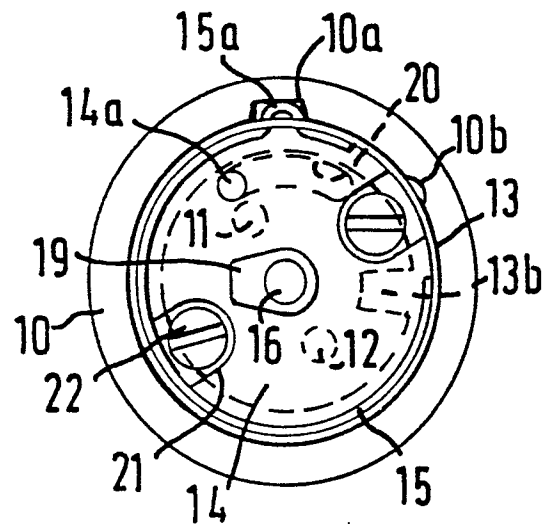


FIG. 4

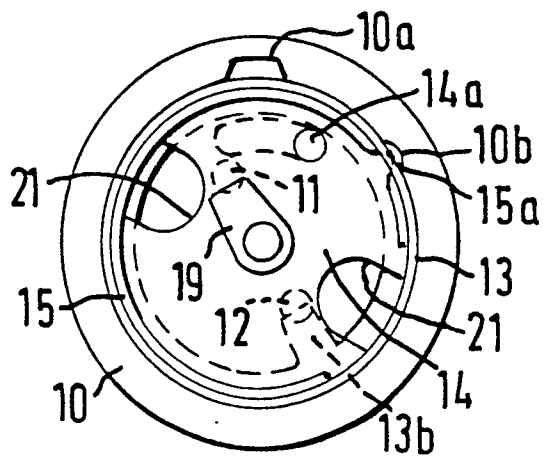


FIG. 3

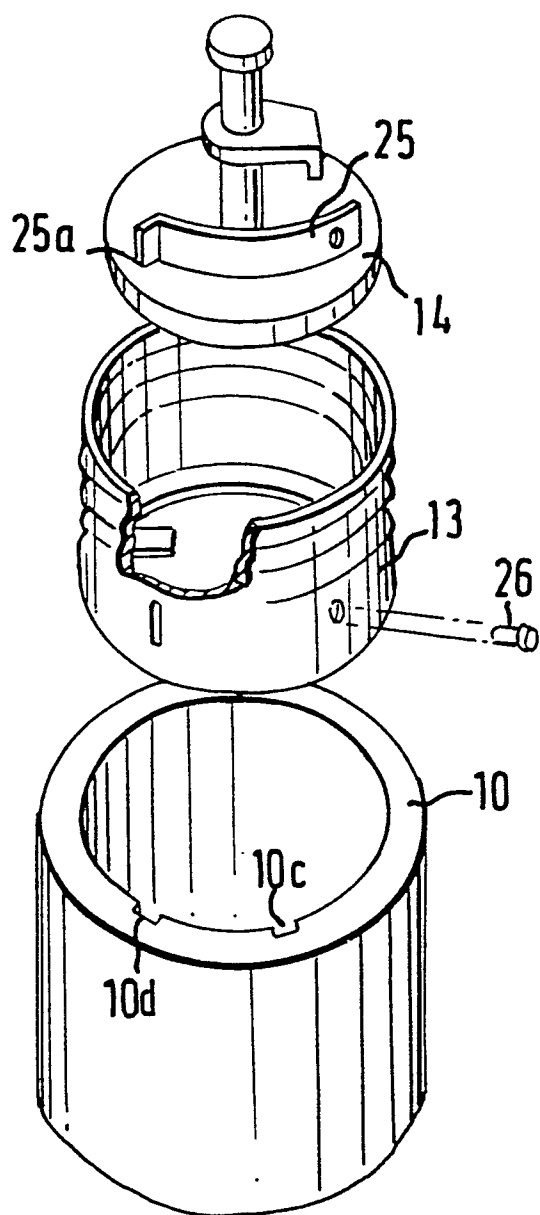


FIG. 5

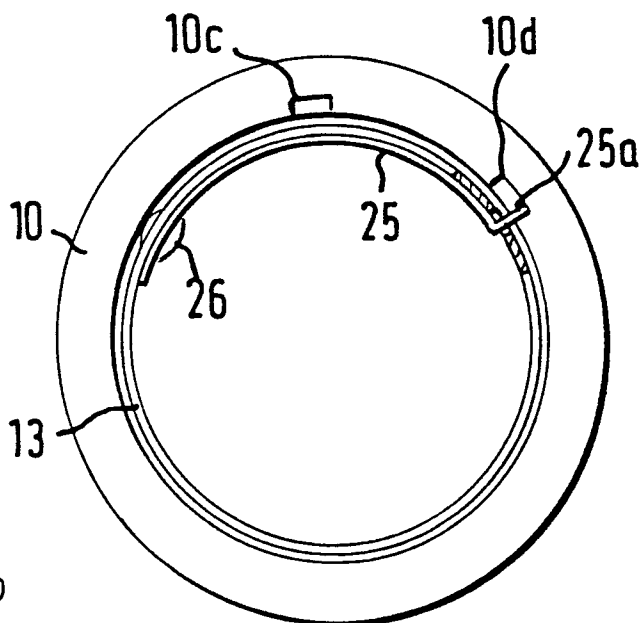


FIG. 6

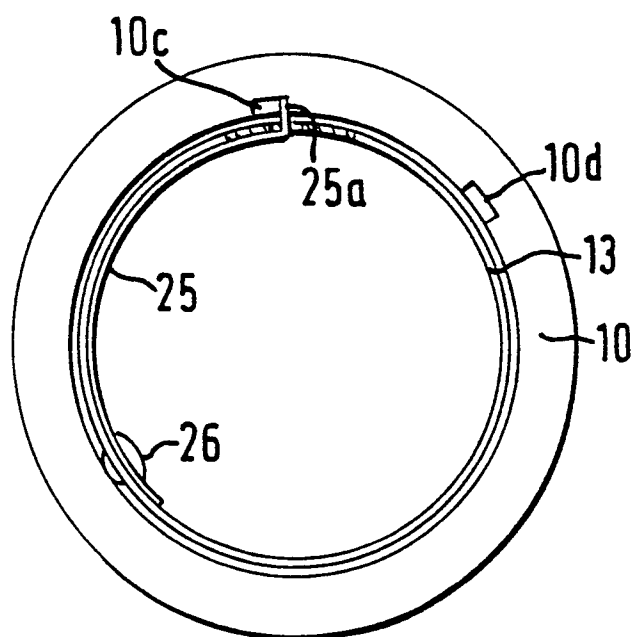


FIG. 7

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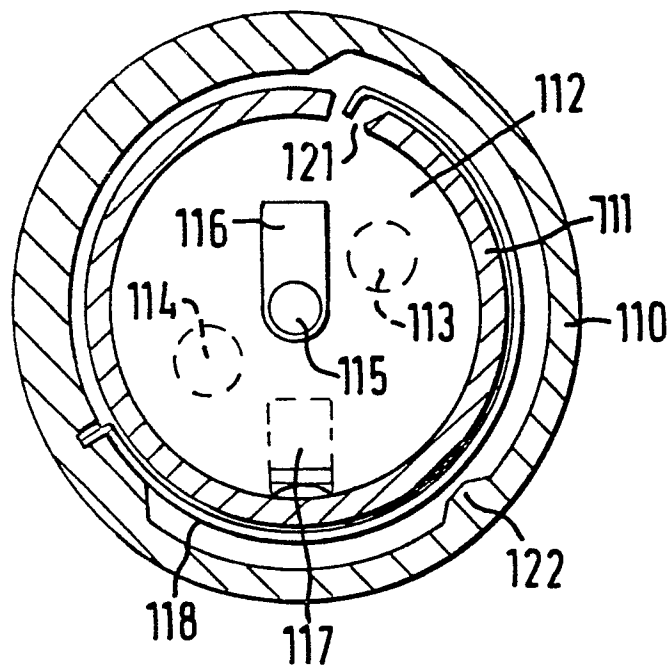


FIG. 8

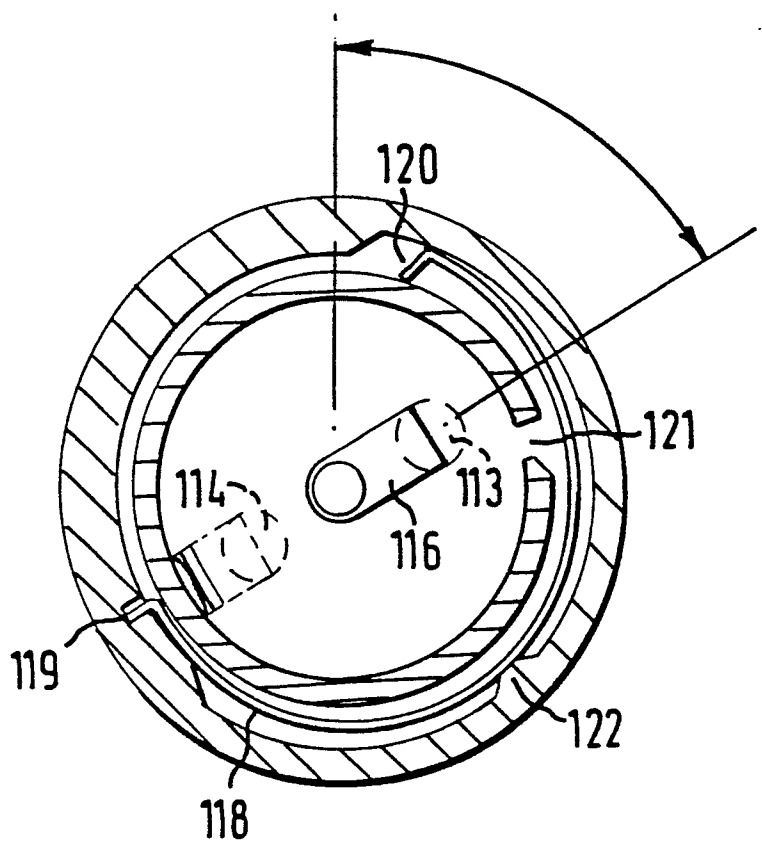


FIG. 9

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# EUROPEAN SEARCH REPORT

Application number

EP 80 30 4256

| DOCUMENTS CONSIDERED TO BE RELEVANT  |   |  | CLASSIFICATION OF THE APPLICATION (Int. Cl. <sup>3</sup> )   |
|--|---|--|--|
| Category   | Citation of document with indication, where appropriate, of relevant passages                 | Relevant to claim                              |  |
| A  | <u>US - A - 2 158 852</u> (CEADER)<br>* Page 2, right-hand column *<br>--                     | 1,3  | H 01 R 33/30   |
| AD   | <u>US - A - 3 895 195</u> (MORRISON)<br>* Column 5, lines 40-70; column 6, lines 1-58 *<br>-- | 1,3  |  |
| A  | <u>FR - A - 2 324 133</u> (LUCINI)<br>* Pages 2,3 *   | 1  | TECHNICAL FIELDS SEARCHED (Int. Cl. <sup>3</sup> )   |
| D  | & DE - A - 2 553 610<br>--  |  | H 01 R 33/30<br>33/36<br>33/54<br>33/60  |
| PD   | <u>DE - A - 2 903 087</u> (HULTBERG TORE)<br>* Pages 10-14 *<br>----                          | 1,4  |  |
|  |   |  | CATEGORY OF CITED DOCUMENTS  |
|  |   |  | X: particularly relevant<br>A: technological background<br>O: non-written disclosure<br>P: intermediate document<br>T: theory or principle underlying the invention<br>E: conflicting application<br>D: document cited in the application<br>L: citation for other reasons |
| <input checked="" type="checkbox"/> The present search report has been drawn up for all claims |   |  | &: member of the same patent family.<br>corresponding document   |
| Place of search<br>The Hague   |   | Date of completion of the search<br>06-03-1981 | Examiner<br>MOBOUCK  |