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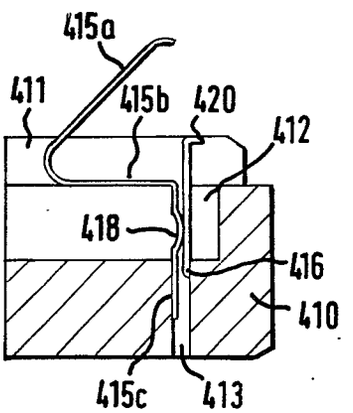
## (54) Electrical sockets.

(57) An electrical socket insulating body (410) receiving a contact having one end (415a) formed of a spring finger for engagement with an inserted plug, the other end of the contact being designed so that it comprises a portion cooperating with the body for retaining said contact in said body and for receiving a corresponding conductor (421). The other end may comprise two separate parts (415, 416) received in a common bore (413) of the body. One of the parts (416) defines a guillotine slot piercing the insulation of the conductor. The other part (415, 418) resiliently urges the first part (416) against the body for retaining said first part (416) and insuring electrical contact.

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# ELECTRICAL SOCKETS

The invention relates to electrical sockets and inserts therefor. It is described chiefly in relation to B.C. (bayonet-cap) lamp holders but is not restricted to them being useful in E.S. (Edison-screw) lamp holders for example.

In U.K. Patent Specification No. 1 430 384 there is described a lampholder in which spring fingers extend as contacts across the plug receiving socket of a bayonet holder and then into a lateral part of the holder where conductors are received. This holder is intended for use within electric fires where electrical safety is easily provided for and it is of no consequence in such a context that the design is unrelated to that of lampholders generally.

In seeking to provide economically produced and yet electrically satisfactory electrical socket constructions and in particular lampholders suitable for domestic use we have adopted spring finger contacts in such sockets or in inserts therefor, the assembled sockets having i) a body with an upward facing aperture for reception of a plug ii) one or more axial bores or slots in an insulating portion of the body or insert which or each of which is for reception from above of a corresponding contact iii) correspondingly, one or more conductor-receiving bores or slots in the insulating portion each intersecting or constituted by a said axial bore and wherein iv) the or each contact has a spring finger shaped to extend within said aperture to engage an inserted plug, and a portion

shaped to resiliently engage and be retained in the said insulating portion and to receive a corresponding conductor.

Such a construction is readily adopted in single or double contact lampholders suitable as direct replacements for existing domestic designs, satisfying standards for current carrying capacity, clearances and the like. It can moreover consist of parts very economical to produce and assemble, for example in all-ceramic lampholders, or the well known type in which an insulating insert is received in a metal casing forming the 'body' above.

A contact may be received in the insulating portion by simple frictional engagement but is preferably shaped so that in the assembled socket a projecting tang or the like on the retaining portion of the contact engages below a downwardly directed face or abutment formed in insulating portion. Such a tang may engage by snap action or may be held in engagement indirectly by another portion of the contact flexed on insertion. Such other portion may in particular have the further function of resiliently retaining a conductor inserted between it and the insulating portion, or alternatively, a tang having this function alone may be present.

In a further construction, applicable particularly for a conductor entered through a separate bore or slot, the or each conductor is received by a guillotine slot formed in the retaining portion of the respective contact, that is to say a slot of such a width that the insulation of the conductor is cut at opposing points when conductor and slot engage, and the conductor itself is held firmly but without damage in the slot.

A socket or insert of this kind is readily made for prewiring, or wiring simultaneously with assembly, the or each contact engaging the conductor as it is inserted. Lampholders and inserts for use in them, so wired, are the subject of our published United Kingdom Patent Application No. 2 052 888 A, though of course the contact strips there have not the flexibility that is required in a B.C. holder nor do they resiliently engage the body of the holder.

In the guillotine construction it is found that, for some purposes at least, if a contact is made throughout from such thin metal as to be sufficiently springy to make good electrical contact with a plug, the area of electrical contact between the sides of the guillotine slot and the conductor may be too small, or the metal of the conductor may be damaged in the guillotining operation.

In a subsidiary feature, the present invention therefore seeks to avoid this difficulty by using different metal thicknesses for the spring finger and the guillotine slotted portion whilst at the same time not making assembly more difficult.

Conveniently this is achieved by having a two-part contact, one part being thinner and providing the spring finger, and the other part being thicker and having in it the guillotine slot. It is usually convenient for the two parts to be made separated, being adapted to be received in a common bore or slot in the insulating portion in a manner maintaining electrical contact between the two parts. The spring part may for instance be of spring steel and the thicker guillotine part of phosphor bronze.

Maintenance of contact of separate parts in the bore or slot may if desired be aided by deforming a limb of the spring part to provide one or more noses to press the guillotine part against the side of the bore or slot.

In assembly of a socket or insert as above, the end of an unbared cable is inserted to lie across the bore or slot, and conveniently through holes in both parts of the contact, and the guillotine part is then pressed fully into the slot to effect connection between the wire of the cable and the contact.

The new constructions may be applied in simple holders but are particularly adapted to safety holders having a plug-receiving sleeve within the socket body, rotated by a fully inserted plug between a safe position at which supply contacts in the holder (constituted by spring fingers as above) 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. Conveniently the plug contacts are carried by an insulating shutter moving with the sleeve, the spring fingers lying below the shutter for contact with the plug contacts in the live position.

Our United Kingdom patent specification No. 2 001 485 A for example describes and claims a bayonet socket having a pair of upwardly spring biassed contacts electrically engageable by contacts on the end of a cylindrical plug when received appropriately oriented in a corresponding recess in the socket, wherein there is provided a shutter which is disposed across the recess and which is rotatable

on the axis of the socket by engagement of the bayonet pins of the plug (when turned as for insertion or removal) with a sleeve disposed in the recess and carrying the shutter, the rotation being between an 'on' position at which the contacts on the plug electrically engage the socket contacts and an 'off' position at which the socket contacts are insulatingly covered by the shutter.

The present invention may be applied to such a socket, two spring fingers as above lying below the shutter to constitute the supply contacts. In the above constructions engagement of the contacts of the present invention with the plug is thus indirect.

The application of the present invention in several exemplary embodiments is now described in relation to the drawings, wherein:-

Fig. 1 is a sketch of a lampholder in axial section with a B.C. lamp above,

Fig. 2 is a part plan of the same lampholder,

Fig.3 is a part section view on the line Y-Y of Fig. 2,

Figs. 4a, 4b and 4c show three alternative forms of plug-contact finger,

Figs. 5 to 7 show three alternative forms of retaining portion as seen in an axial section of the holder (left), from below (centre), and in elevation (right, Figs. 6 and 7 only),

Fig. 8 is a safety design, shown exploded with the upper parts in perspective view and the lower part in section on a larger scale,

Fig. 9 is a sketch of an insert similar to the lower part of the Fig. 8 design, received in a 'candle' holder,

Fig.10 is a part view of a guillotine design, shown exploded,

Fig. 11 is a plan of a further insert for a lampholder,

Figs. 12a and 12b are elevations of one part of a contact or connector for use with the insert of Fig. 11,

Figs. 13a and 13b are corresponding elevations of a second part of the contact, and

Figs. 14a and 14b are sections illustrating two stages in assembly of a contact to the insert.

In Fig. 1 the base of a B.C. lamp is shown above a holder which has a body 1, moulded in conventional ceramic material, with bayonet slots 2. The contact pads 5 of a fully entered lamp, at the end of the circumferential travel of the bayonet pins 4, engage the outer ends 6 of contact (spring) fingers forming part of spring contact strips (contacts) 7 received in the body. Axial contact-receiving bores generally indicated at 8 (Fig. 3) have narrow locating portions 9 (Fig. 2) extending into the body from above to receive wings 10 (Figs. 1 and 3) of the contact strips. Extending into the body from below is a portion 11 of the bore 8 which receives a retaining tang 12 formed integrally with the contact strip and engaging beneath a downwardly directed face 13. Extending right through the body is a portion 14 of the bore 8 which receives a conductor-retaining tang 15 and also tang 12 during loading (insertion) of the contact strip.
Tang 15 like tang 12 is formed integrally with the contact strip and is bent upwards as seen in Fig. 1. The shaping of tang 15 is such as to press the bared part of an inserted conductor 16 against the body of a holder and

dig into it on any pull being exerted. (The drawing shows the parts with greater separation than exists in the assembled state.)

The alternative contact strips shown in Fig. 4 are represented in an outline of the upper part of the holder of Figs. 1 to 3, Fig. 4a shows a design where the contact finger returns on itself to provide greater travel, the body being hollowed out at 21 in a slot giving lateral location; Fig. 4b a dog leg extension 22 of the contact finger to give greater length of flexure; and Fig. 4c a similar dog leg together with a coil spring 23 to improve location and give greater contact pressure than may conveniently be available from a spring strip alone. This coil spring enters the bore 24 in the holder body and is located above by a retainer tang 25.

The retaining portion seen in Fig. 5 is similar to that of Figs. 1 to 3, having tangs 12' and 15', the former engaging below a face 13' and the latter holding a conductor 16'. The corresponding tangs in Figs. 6 and 7 are respectively referenced as 12", 12"' and 15", 15"'; tangs 12", 15" and 15"' are pressed out of the body of the contact strip and tang 12"' is constituted by a folded end of the contact strip.

In all the designs the contact strip snaps into place after being entered from above. Tang 12 in Figs. 1 to 3 for example flexes towards the plane of the main part of the strip until it reaches bore portion 11, tang 15 being essentially unflexed meanwhile and the whole strip being tilted for initial entry. Tang 12' in Fig. 5 flexes towards the main part of the strip, tang 15'

being unflexed; both tang 12" and tang 15" flex in Fig. 6; and tang 15"' alone in Fig. 7. Whichever design is adopted the contact strip as a whole is held firmly in place once inserted. In the design of Figs. 1 to 3 the wings 10 engage the body preventing both tilting and further inward movement, and similarly in Fig. 4a, while in the other Figs. the lower part of the dog leg 22 sketched in Figs. 4b and 4c are more clearly drawn in Fig. 7 engages the body.

In Fig. 8 a safety version of the holder is shown in which the body is divided into two parts, a lower part corresponding to that of Figs. 1 to 3 but without the plug-receiving socket, and an upper part 106 received on a shoulder 114 of the lower part 115, which is otherwise referenced as before. The upper part has a bayonet pin entry 108 and circumferential slot 108'. It receives a sleeve 105 and a shutter 103 which lies over the contacts of the lower part. The shutter has two conductive studs 104 passing through it giving electrical connection between the contact pads of a lamp and the spring contact strips 7 when the shutter is appropriately oriented (as seen in Fig. 8 it is in the 'off' position).

Notches 109 in the upper edge of the sleeve allow entry of the bayonet pins and ensure that the sleeve is carried round as the lamp is inserted and moved to the 'on' or contact position. The sleeve in turn moves the shutter by engagement of projections 113 on the shutter in notches 112 in the base of the sleeve. The shutter is free to move axially over a sufficient distance to accommodate the "in, twist and return" action of the lamp

in the bayonet slots, and rides on the spring fingers, as indicated by arrows, from the 'off' position at which the studs 104 are clear of the spring fingers, to the 'on' position at which they contact the portions 6 and complete the electrical connection. Positive end positions are given by projections 111 on the upper body (one of which is seen in the Fig.) engaging 'off' notches 110 and 'on' notches 110' in the upper edge of the sleeve, the pressure of the spring fingers ensuring engagement.

The operation of the safety shutter as such is described in more detail in our earlier specification No. 2 001 485 A, to which reference may be made.

The construction of Fig. 9 needs little description, the insert 201 snapping into a male-threaded 'candle' holder 202 and being otherwise as shown in detail in the lower body 115 of Fig.8.

In Fig. 10 an insert is again shown, as a part view of a body 301 having a transverse slot 302 to receive a conductor 303 against faces 304 and 305. It is held there by a guillotine contact strip 306 having arms 307, which arms pass over the conductor and are received in slots 308 in the body 301. As it reaches its fully inserted position the contact strip cuts the insulation of the conductor by the action of shoulders 309, and the narrow portion 310 of the guillotine slot enters firm electrical contact with the metallic part of the conductor. At the same time bent portions 311 of the arms 307, flattened during insertion, spring back and engage downward facing shoulders (not seen) in the insert, ensuring firm retention of the contact strip as a whole.

In Figs. 11 to 14 the insert is a body 410 pressed from a conventional ceramic using a mould with withdrawable pins. The body 410 (Fig. 11) is designed for connection of two conductors and to receive correspondingly two connectors (contacts). For this purpose, the body has two channels (slots) 411 extending in parallel across its top and centrally of each channel bottom a recess 412 extending from one end of the channel to a blind end almost across the insert. The body also has associated with each channel 411 and recess 412 a slot or bore 413 which extends through the depth of the insert and across the width of the channel 411, and which intersects the recess 412 near its blind end. The body has depthwise rebates 414 into which the channels 411 and recesses 412 open.

Each connector comprises two pieces or parts 415, 416. The piece 415 (Figs. 12a, 12b) is formed conveniently from spring steel strip, e.g. having a thickness of 0.25 mm, and is hook-shaped having a limb 415a extending at an angle from one end of and over a wider mid-portion 415b, and a limb 415c extending from the opposite end of the portion 415b at right angles to it and away from the limb 415a. The limb 415a affords the spring finger. The limb 415c has in it a hole 417 and the portions of the limb at each side of the hole are joggled to form noses 418 the purposes of which will appear below.

The piece 416 is conveniently of phosphor bronze, e.g. 0.5 mm thick, and has in it a key-hole slot 419, the edges 419a of which act as guillotine blades. The end of

the piece 416 adjacent the narrow part of the key-hole slot is bent over to provide a tang 420.

In assembly, the pieces 415, 416 of each connector are inserted from the top of the insert 410 into the slot 413. The mid-portion 415b of the piece 415 is positioned to lie on the base of channel 411 and the limb 415a projects above the insert. In this position the hole 417 is aligned with the recess 412. The piece 416 is positioned so that the wider portion of the key-hole slot 419 is also aligned with the recess and with the guillotine edges well clear of the bottom of the recess.

To fit a conductor, the unbared end of an insulated cable 421 is inserted in the recess 412 so as to pass through the holes 417, 419 (Fig. 14a), and thereafter the piece 416 is pressed down until the tang 420 rests on the bottom of channel 411 (Fig. 14b); thereby the guillotine edges 419a cut through the insulation of the cable and the sides of the narrower part of the key-hole slot 419 make firm contact with the wire of the cable.

In both the positions of Figs. 14a and 14b, the noses 418 press firmly on the piece 416 ensuring that there is good electrical contact between the pieces 415, 416 and that the pieces are retained in the slot 413. Further, once the conductor cable 421 is guillotined, the cable is firmly retained and also assists to prevent detachment of the pieces of the connector 415, 416.

In use of the insert, it is held within the socket body of a lampholder and the free ends of the limbs 415a which will be substantially at centres 422 (Fig. 11) act as spring fingers to engage contacts on an inserted lamp.

It will be appreciated that the connector arrangement has a number of advantages in relation to pre-wired lampholders. The arrangement allows the contact-engaging portion of the connector to be of suitable spring metal at the same time as obtaining an increased area of contact between the wire core of the cable and the guillotine piece by the use of thicker metal for the latter. At the same time the risk of severing the cable wire due to forming the guillotine edges in the thin spring metal is avoided.

A further advantage is that arrangement avoids the necessity, after the guillotining operation has been performed, of deforming metal pieces to retain them in position thereby simplifying assembly.

This connector arrangement like the others is not only applicable with advantage to lampholders and the like with inserts as just described, but can also be applied to lampholders wholly of insulating material whether B.C. or Edison-screw, and safety holders such as described above.

CLAIMS

1. An electrical socket, having a body with an upward facing aperture for reception of a plug, or an insert for such a socket, wherein there are provided i) one or more axial bores or slots in an insulating portion of the body or insert each for reception from above of a corresponding contact, ii) correspondingly, one or more conductor-receiving bores or slots in said insulating portion each intersecting or constituted by a said axial bore, and wherein iii) the or each contact has a spring finger shaped to extend within said aperture to engage an inserted plug and a portion shaped to resiliently engage and be retained in said insulating portion and to receive a corresponding conductor.

2. A socket or insert according to claim 1 wherein the or each contact is in simple resilient frictional engagement with the insulating portion.

3. A socket or insert according to claim 1 wherein the or each contact is shaped so that in the assembled socket a projecting part of the retaining portion of the contact engages below a downwardly directed face or abutment formed in the insulating portion.

4. A socket or insert according to any preceding claim wherein the or each conductor is received by a guillotine slot formed in the retaining portion of the respective contact, that is to say a slot of such a width

that the insulation of the conductor is cut at opposing points where the conductor and slot engage and the conductor itself is held firmly but without damage in the slot.

5. A socket or insert according to claim 4, wherein the or each contact engages the conductor during insertion into the socket or insert.

6. A socket or insert according to claim 4 or claim 5 having the or each contact in two parts, one part being thinner and providing the spring finger and the other part being thicker and having in it the guillotine slot.

7. A socket or insert according to claim 6 wherein the two parts of the or each contact are made separately, being adapted to be received in a common bore or slot in the insulating portion in a manner maintaining electrical contact between the two parts.

8. A socket according to any preceding claim having a plug-receiving sleeve within the socket body, rotated by a fully inserted plug between a safe position at which supply contacts in the holder (constituted by spring fingers as above) 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.

9. A socket according to claim 8 wherein the plug contacts are carried by an insulating shutter moving with the sleeve, the spring fingers lying below the shutter for contact with the plug contacts in the live position.

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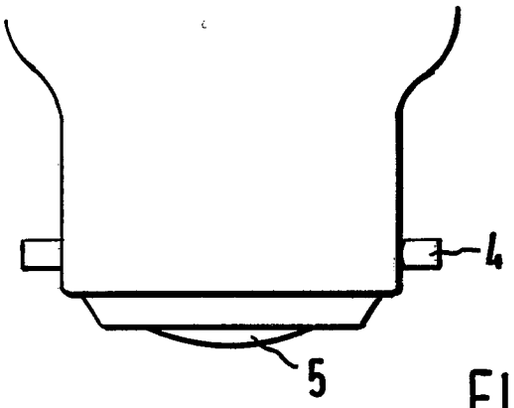
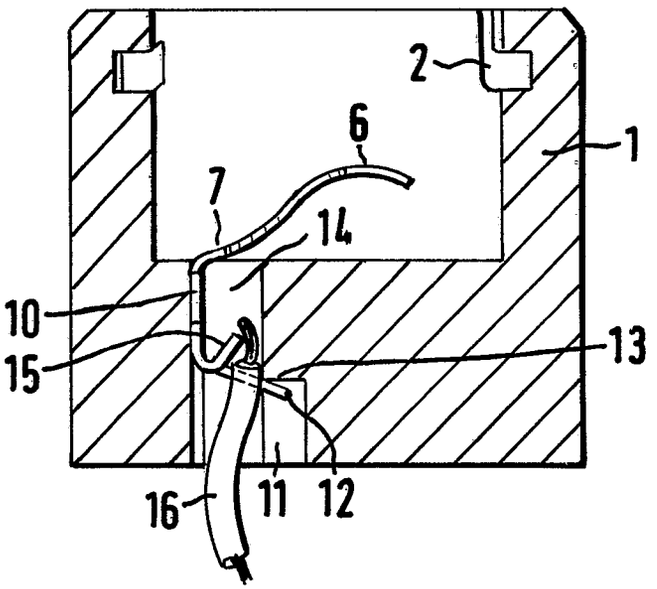



FIG.1



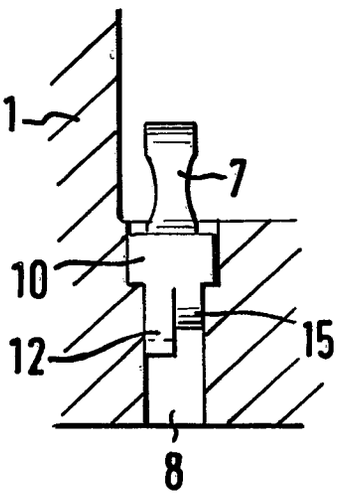




FIG.3

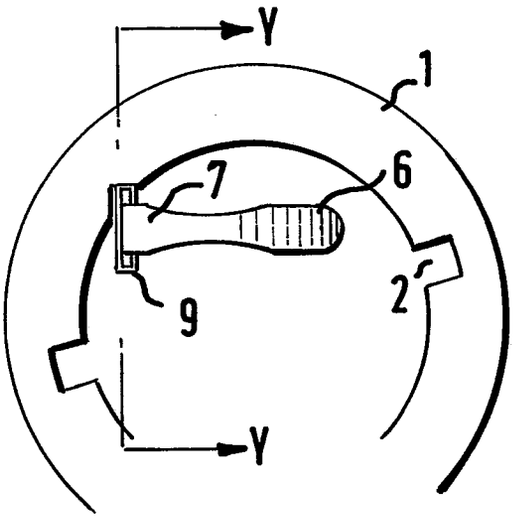



FIG.2

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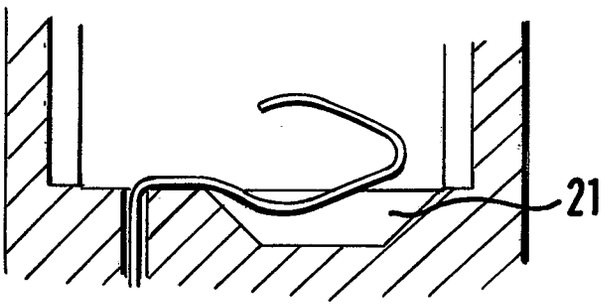
FIG.4

A

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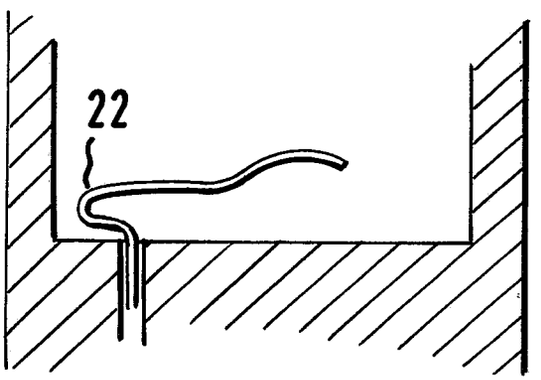


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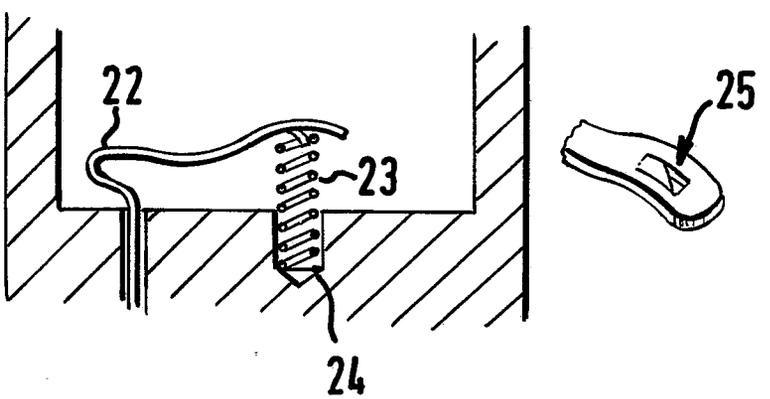


FIG.5

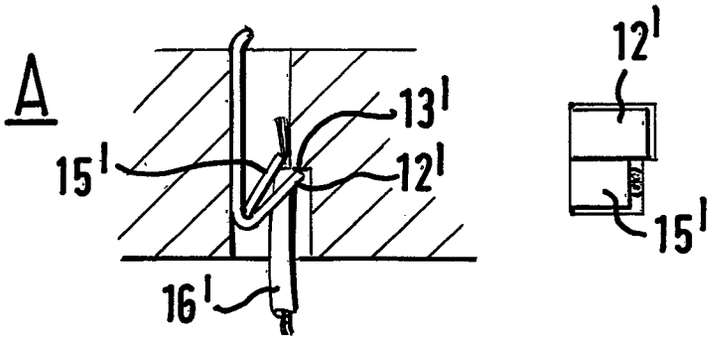



FIG.6

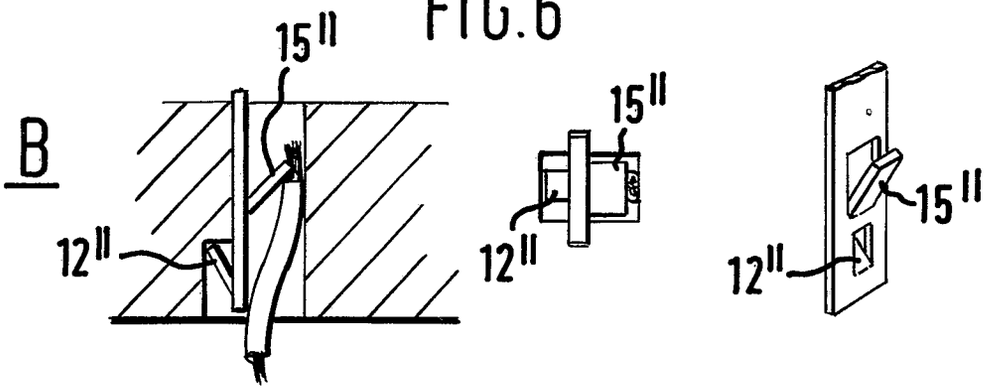
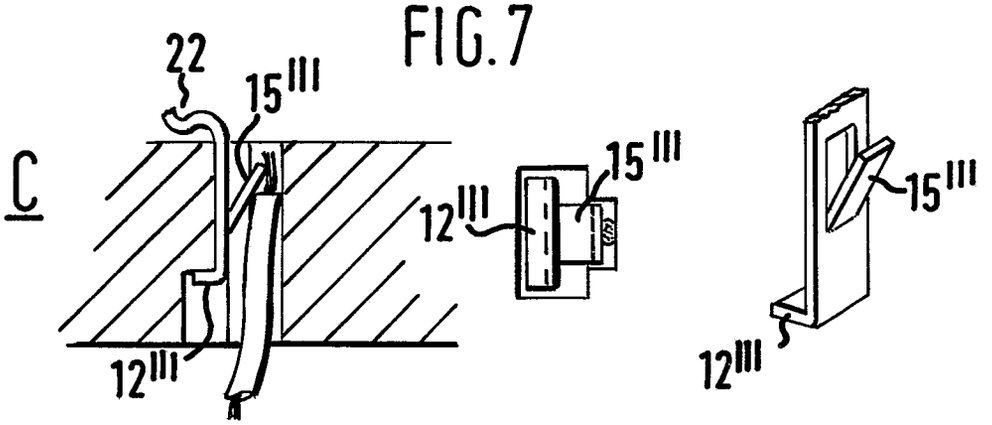
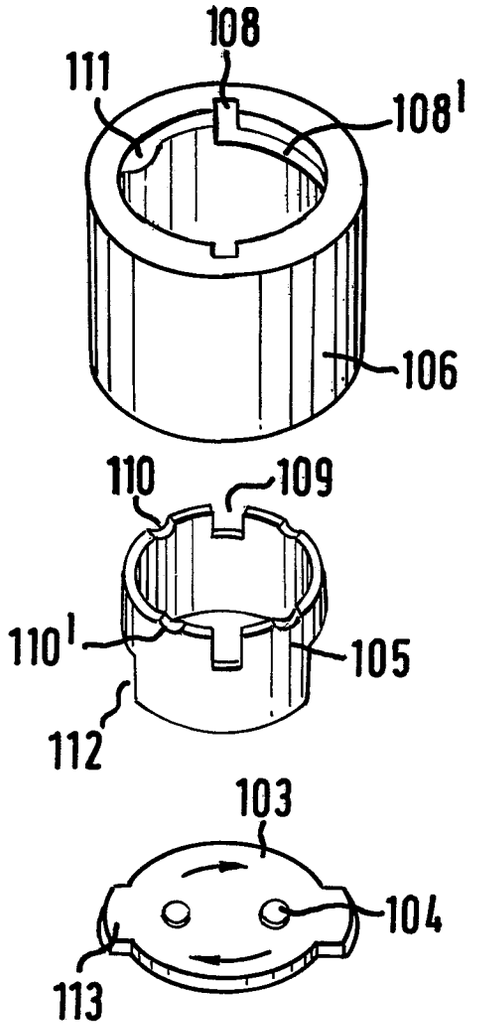



FIG.7

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111
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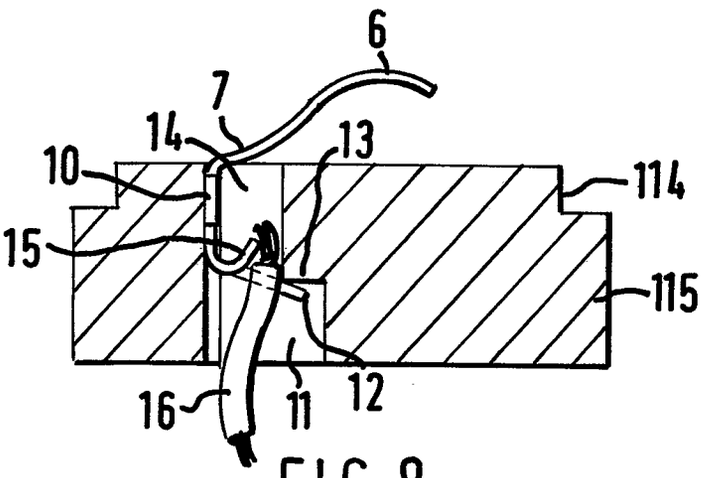
103
104
113


6
7
14
13
10
114
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115
16
11
12

FIG.8

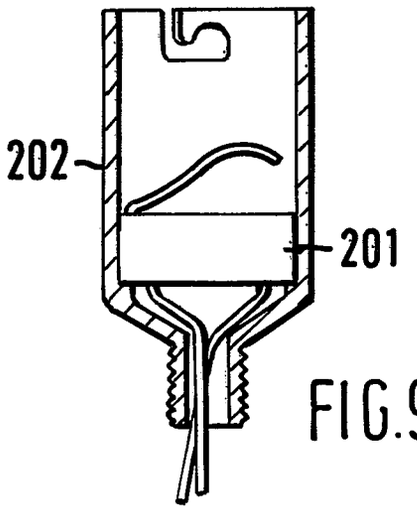



FIG.9

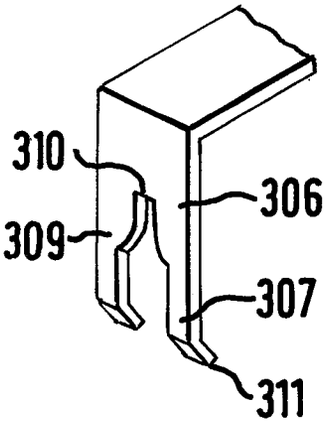
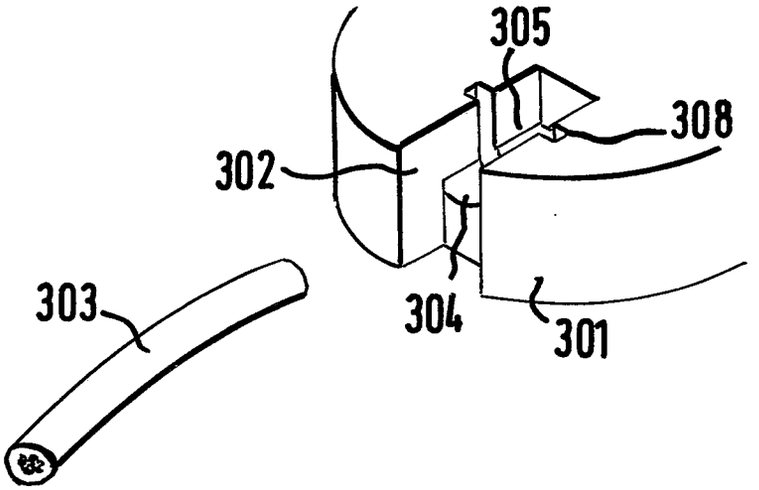



FIG.10



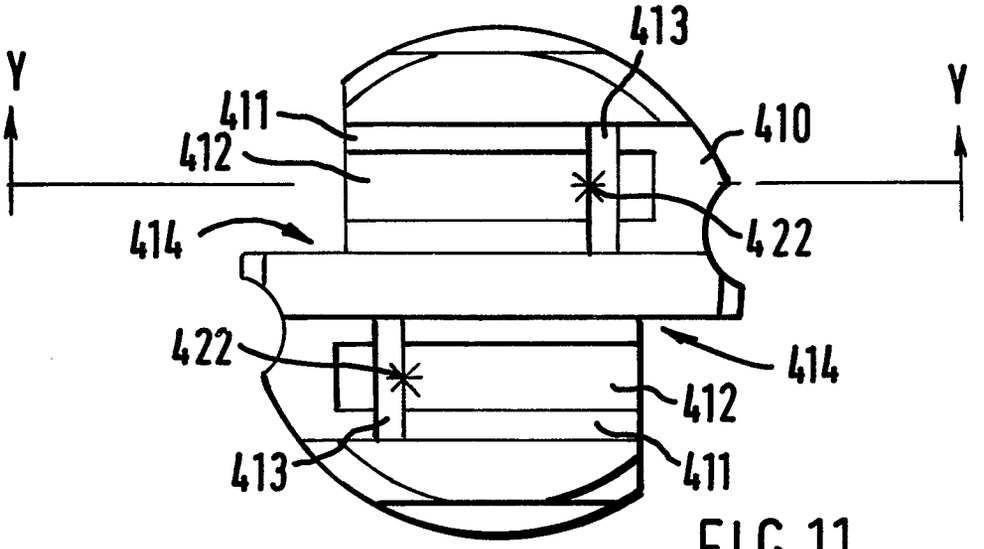



FIG.11

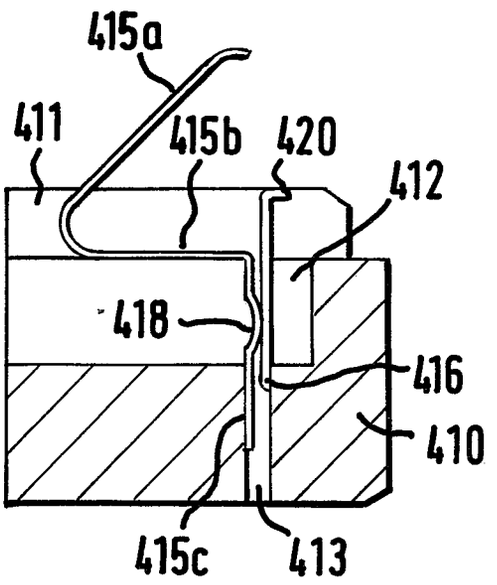



FIG.14a

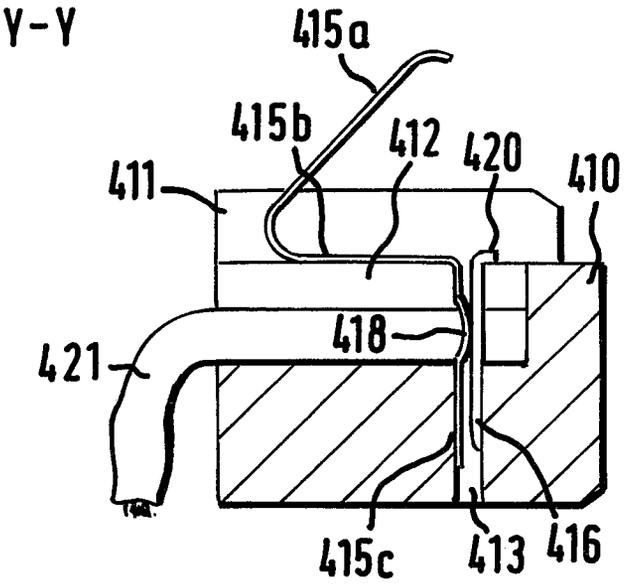



FIG.14b

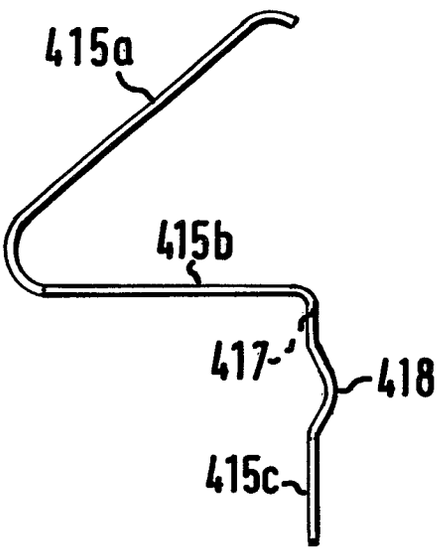



FIG.12a

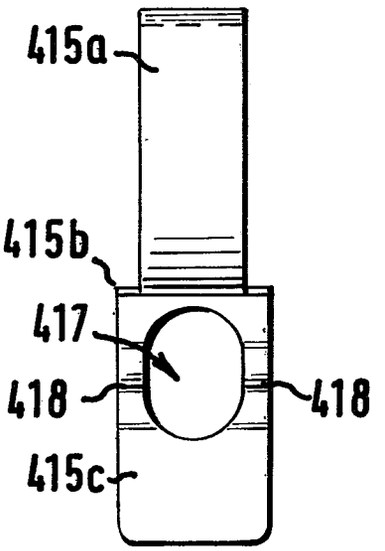



FIG.12b

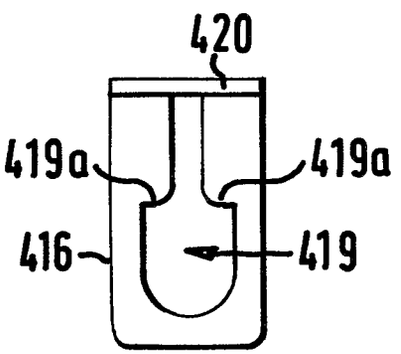



FIG.13a

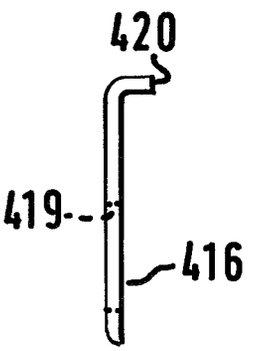



FIG.13b

European Patent Office

# EUROPEAN SEARCH REPORT

0053488
Application number
EP 81 30 5601

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim |
|---|---|---|
| X | FR - A - 2 351 516 (L'EBENOID)<br>* page 3, line 11 to page 4, line 18 * | 1,2 |
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| | FR - A - 2 236 292 (G.M.T. S.A.)<br>* page 2, lines 1-38; page 3, lines 15-38 * | 1-4 |
| | DE - A - 2 141 350 (J. ERNSTING)<br>* page 7, line 6 to page 8, line 29 * | 1,4,5 |
| | US - A - 3 920 305 (W.J. SCOTT)<br>* abstract; column 2, line 17 to line 29 * | 4,5 |
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CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)

H 01 R 4/48

TECHNICAL FIELDS SEARCHED (Int.Cl. 3)

H 01 R 4/48
4/24
33/22
33/46
4/50

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
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L: document cited for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| The Hague | 27.01.1982 | MOBOUCK |

EPO Form 1503.1 06.78