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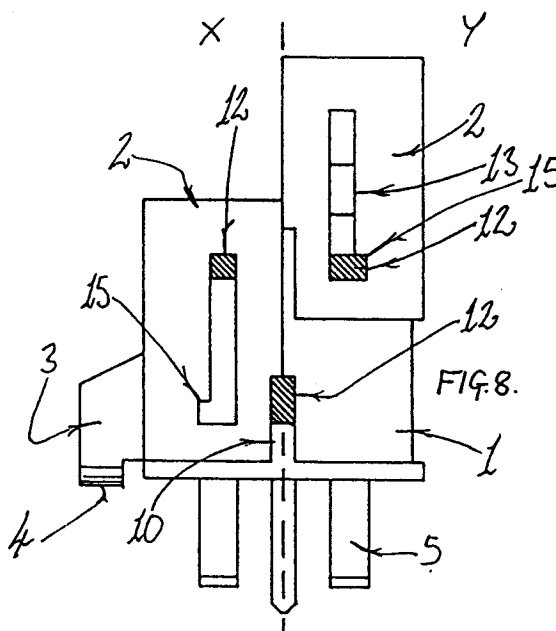
(11) Publication number:

0 481 142 A1

(12)

EUROPEAN PATENT APPLICATION(21) Application number: **90311470.0**(51) Int. Cl.⁵: **H01R 13/44**(22) Date of filing: **18.10.90**(43) Date of publication of application:
22.04.92 Bulletin 92/17(84) Designated Contracting States:
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KINGS PATENT AGENCY LIMITED 73
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London EC1M 3JB(GB)(54) **Protective cover for electrical connectors.**

(57) A safety cover for sheilding the pins of electrical connectors comprises a movable cover 2 on a female connector such as an adaptor or wall socket, which has slots 13 therein for reception of pins of a male connector such as a plug, the slots have parts 15 which enable the pins 12 to enter or be withdrawn through the cover, and parts of reduced width which engage notches 16 in the pins when the cover is moved to a latching position. The cover carries a magnetic device 4 to operate a switch 7 when the cover is in the latching position. The cover may be lockable into the latching position. For an adaptor, the cover may be a sleeve 2, whilst for a wall socket it may be a flanged plate.

**EP 0 481 142 A1**

The present invention relates to protective safety covers for shielding the pins of electrical connectors such as plugs and adaptors and wall sockets.

Known two and three pin plugs are proven and effective devices for connecting electrical appliances of all types to wall sockets and adaptor units. With increasing emphasis on the importance of safety in electrical appliances in general use within the home, two and three pin plug and socket connectors have been criticised because conventional pugs and adaptor units work loose from pin apertures leaving pins partially exposed to risk contact with a potentially letal electrical charge.

Partial disconnection of the pins of plugs and/or adaptors could also lead to serious accidents occurring in the home or work place with appliances starting and stopping haphazardly due to the resulting faulty and loose connections of the pins within the pin apertures.

To try to overcome the first problem, and reduce the risk of exposed pins being touched while live, manufacturers are now producing plugs and adaptors with pins which are partially shrouded adjacent the plug body by a thin layer of plastics material. Although exposed pins are now somewhat safer as a result of this improvement, the problem of plugs and adaptors working loose often while being tampered with by active children etc, to cause partial disconnection of appliances remains.

An object of the present invention is to provide a plug or adaptor unit which is designed so that it is nearly impossible for it to work loose or be disconnected from dangerous sources of electricity by unauthorised persons.

According to the invention, a safety cover for a female electrical connector is provided, the connector being adapted to receive the pins of a male electrical connection device, to protect the interface between the male and female connector devices, the cover having slots with notches which interact with and lock the pins of the male electrical connector within pin receiving apertures, and means for actuating a power supply switch, the cover being movable between a pin latching position and a pin releasing position.

Preferably, the cover includes a generally planar member with a slot for each pin, at least some of the slots having a portion of cross-section corresponding to the greatest cross-section of the respective pins, to enable the pin to pass therethrough in the released position of the cover, and another portion of reduced width, for engagement with a notch in the pin, to prevent the pin from passing through the slot in the latching position of the cover.

The means for actuating a power supply switch may com comprise a magnet carried by the cover,

which operates the switch which is located within the female connection device, when the cover is moved into the latching position.

For use on an adaptor body, the cover may be in the form of a sleeve, while for use on a wall socket panel, the the cover may be a flanged plate.

The reduced width parts of the slots may be formed with a bevelled edge, for engaging with angled lateral protrusions on the pins.

A lockable latch may be provided, as may a combination lock for retaining the cover in the latching position.

Several preferred embodiments of the invention will now be described, with reference to the accompanying drawings, wherein:-

Fig. 1 to 3 are a sequence of side views of a two-way adaptor with a slidable safety cover, with plugs attached;

Fig. 4 is a front view of the adaptor of Figs 1 to 3, with the plugs removed;

Fig. 5 is a front view of the adaptor of Fig. 4, with the safety cover removed;

Fig. 6 is a top view of the adaptor of Fig 5;

Fig. 7 is a bottom view of the adaptor of Figs 1 and 3 with the plugs removed;

Fig. 8 is a top view of the adaptor of Fig. 7;

Fig. 9 is a top view of a three pin plug;

Fig. 10 is a front view of a three-way adaptor with a slidable safety cover, and plugs attached;

Fig. 11 is a top view of Fig. 10 with the top plug removed;

Fig. 12 is a side view of the adaptor of Figs. 10 and 11 with the safety cover in position 'Y' of Fig. 11;

Fig. 13 is a side view of Fig. 12, with the safety cover in position 'X' of Fig. 11;

Figs. 14 to 16 are front views of a safety cover for a wall socket plate;

Fig. 17 is a longitudinal section on line A-A of Fig. 14;

Fig. 18 is a side view of Fig. 16;

Fig. 19 is a top view of Figs. 14 to 16;

Fig. 20 is a side view of a shaft member;

Fig. 21 is a front view of a combination disc;

Fig. 22 is a top view of a three pin plug;

Fig. 23 is a top view of an adapter with a safety cover attached;

Fig. 24 is a side view of Fig. 23;

Fig. 25 is a longitudinal section on line A-A of Fig. 23;

Fig. 26 is a longitudinal section along line B-B of Fig. 23;

Fig. 27 is a front view (enlarged) of a plug pin;

Fig. 28 is a side view of Fig. 27

Fig. 29 is a longitudinal section on line B-B of Fig. 23 with a plug attached to the safety cover;

Fig. 30 is a front view of a wall socket front plate;

Fig. 31 is a rear view of Fig. 30;

Fig. 32 is a transverse section along line B-B of Fig. 30;

Fig. 33 is a longitudinal section along line A-A of Figs. 30 and 31;

Fig. 34 is a front view of an inner plate unit and retaining collar;

Fig. 35 is a front view of the retaining collar of Fig. 34;

Fig. 36 is a top view of the inner plate unit of Fig. 34;

Fig. 37 is a bottom view of Fig. 36;

Fig. 38 is a longitudinal section through a portion of the front plate of Fig. 30, with a plug;

Fig. 39 is a perspective view of a transverse section through the front plate of Fig. 30, with a plug;

Fig. 40 is a front view of another type of wall socket unit.

Fig. 41 is fig. 40 with front plate removed.

Fig. 42 is another front view of fig. 40.

Fig. 43 is fig. 42 with front plate removed.

Fig. 44 is a longitudinal section of fig. 40 and a side view of a plug.

Fig. 45 is a transverse section of fig. 40 or 42 together with a top view of a plug.

Fig. 46 is two side views of the socket unit in figs. 40 to 45.

Referring first to figs. 1 to 13 of the drawings, a safety cover 2 mounted on an electrical socket adaptor 1 is used to connect a plurality of plugs 6 to a single wall socket. 9. The cover 2 is a slidable and adjustable sleeve which can be moved between positions x and y as illustrated in Figs. 7, 8, and 11, so that notches 15 formed in the edges of slots 13 can be moved relative to the conventional pin receiving apertures 12 of the adaptor body 1.

A two-way adaptor unit 1, having top and front loaded pin apertures 12 is illustrated in Figs. 1 - 9. The pins 5 of the top plug 6 can be inserted or removed only when the notches 15 are aligned with the pin apertures 12, and the cover 2 is in position y.

The front loaded plug 6 can be inserted or removed only when the horizontal slots, shown in Fig. 7 are clear of the front wall of the adaptor unit 1, and while the cover is in position y. These horizontal slots 13 have bevelled outer edges 14 which effectively widen access for ease of insertion of the plug pins 5 therein. Insertion or removal of the pins 5 of the top or front loaded plugs 6 is impossible while the cover is in position x with the pin apertures 12 and the notches 15 out of alignment, and while the horizontal slots 13 overlie the bottom wall of the adaptor.

Longitudinal ribs 11 are formed on the front wall of the two-way adaptor 1 which cooperate with vertical extensions of the horizontal slots 13, and

are flush with the front outer surface of the cover 2 when it is in position x.

The top loaded plug 6 is connected to the adaptor 1 by inserting its pins 5 into the receiving apertures 12 in the usual way, through the slots 13.

On the other hand, the front loaded plug 6 is connected to the adapter unit 1 by sliding it upwardly against the front wall of the cover 2 while in position y so that the plug's pins 5 pass side-on through the horizontal slots 13 and upwardly until they are automatically aligned with the pin apertures 12 in the front of the adaptor 1. When the pins 5 of a top loaded plug 6 are fully inserted within the pin apertures 12, it may be supported in a horizontal position parallel with the top outer surfaces of the adaptor 1 and cover 2 by a small protrusion 10 while the cover is in position y.

Notches 16 are formed in the sides of the line and neutral pins 5 of plugs 6, and the edges of the slots 13 key the notches of the front loaded plug as it is moved upwardly against the front wall of the extended cover 2.

The slots 13 of the top loaded plug 6 key with the notches 16 as the cover 2 is slid into position x.

All three plugs 6 of the three-way adaptor 1 illustrated in Figs. 10 to 13 are top and side loaded as described above. Furthermore a staple 17 extends from the front of the three-way adaptor 1 and outwardly through the front wall of the cover 2 when in position x.

A padlock 19 is attached to the staple 17 through a bore 18 after latching of the pins, preventing movement of the cover 2 and unauthorised insertion or removal of notched plug pins 5.

Both the two and three-way adaptors 1 described so far may be removably secured, adhered or fixed to wall socket plates 9 in a manner to be described below. The cover 2 may have a side bracket 3 supporting a magnet 4 which can be arranged to interact with a self adhesive metal pad 8 to automatically actuate a mains switch 7 in the wall socket plate 9.

In Figs. 14 to 22, an accessorial safety cover 103 is provided for use with an electrical wall socket plate 101. The cover 103 has an opening 109 for access to an on/off switch 102, and an opening 125 with a movable panel 104 having angled edges 116. The panel 104 is held against the outer surface of the wall socket plate 101 by matching inverted angled edges 116 of the opening 125 and is adjustable so that notches 108 formed within parallel slots 106 can be moved relative to corresponding pin apertures 107 in the wall socket plate 101.

Pins 124 of plugs 122, or of adaptor units, are inserted or removed when the notches 108 are aligned with the pin apertures 107, and insertion or removal of the pins 124 is impossible while the

apertures 107 and notches 108 are out of alignment, in the latching position.

Notches 123 are formed in the sides of the live and neutral pins 124 of the plugs or adaptors 122, and the edges of the slots 106 key with these when the panel notches 108 are moved. The panel 104 has a horizontal cylindrical protrusion 111 with a bore 120 formed axially therethrough, the bore having a longitudinal inner groove 121.

A plurality of combination discs 112 having corresponding axial bores 120 are rotatably mounted on a slidable shaft 113 housed within the cylindrical protrusion 111.

Notches 121 formed within the disc bores 120 interact with spaced tongues 119 on the shaft 113 having gaps 118 therebetween to allow free rotary movement of the discs 112 while they are being manipulated to select a predetermined combination number or code from a sequence of digits or other symbols applied to the peripheries of the discs.

Selection of the correct predetermined multi-digit number or code aligns the notches 121 within the combination disc bores 120 with the shaft tongues 119 to allow movement of the shaft 113 while locking or unlocking the panel 104 to form a low security locking device which is sufficient to control access to the pin apertures 107.

The shaft 113 is manipulated by finger pressure applied to a knob 114 extending perpendicularly to the side thereof through a slot 115 formed in the wall of the cylindrical protrusion 111. A protrusion 110 with three equally spaced bores 117 is formed on the outer surface of the cover 103 to receive the end of the shaft 113 when extended, to lock the panel 104 in any one of three positions to open or close access to pin apertures 107 or to lock plug 122 pins 124 to the wall socket 101 which is secured to a wall box by machine screws 105.

In Figs. 23 to 29, the live and neutral pins 205 of the three pin electrical plug 202 and multi-way adaptor 201 shown have modified insulating shrouds 206 comprising a thin wall of suitable hard wearing plastics material formed with two square lateral protrusions 208 and two corresponding angled lateral protrusions 207 as shown in Fig. 27.

The square protrusions 208 increase the overall width of the pins 205 and serve to locate them accurately within openings(not shown) formed in the base of adaptor units 201 and plugs 202, enlarged specifically to allow the angled protrusions 207 to pass therethrough in factory assembly.

A safety cover 203, in the form of a box comprising four side walls and an end wall, is attached to and encases the adaptor 201 but is adjustable thereon in an extending and retracting fashion, perpendicular to the base of the adaptor. A

plurality of parallel slots 210 and 211 are formed in three of the side walls of the cover 203, and three walls of the adaptor 201 have a plurality of matching pin apertures 209.

The angled protrusions 207 of the pins 205 are inverted relative to the base of the adaptor 201 and plugs 202, as shown in Fig. 23, to form anchors which interact and key with corresponding angled surfaces 214 formed along the slots 210, as shown in Fig. 29.

Deliberate movement of the cover 203 alters the position of notches 212 formed in the edges of slots 210, relative to the pin apertures 209. The range of movement of the cover 203 is governed by the pins 204 and 205 which have been partially received within the pin apertures 209 through the slots 210 and 211 in the cover.

For example, movement of the safety cover 203 in the direction of arrow 216 automatically aligns the notches 212 with corresponding pin apertures 209, as shown in Fig. 24, when the ends of the slots 210 and 211 abutt firmly against the pins 204 and 205 which can then be fully sleeved.

Thereafter, movement of the cover 203 in the direction of arrow 215, as shown in Fig. 23, until the opposite ends of the slots 210 and 211 abutt against the fully sleeved pins 204 and 205, causes the inverted angled protrusions 207, which have passed through the notches 212 to interact and key with the matching angled surface edges 214 of the slots 210 thus locking the live and neutral pins 205 of one or more plugs 202 into the adaptor 201 so that they cannot work loose or be easily unsleeved by children.

It is envisaged that the wall socket safety cover described above may have slots 210 with angled surface edges 214. The disconnection of adaptors 201 and/or plugs 202 fitted with the pins 205 is impossible once the angled protrusions 207 thereof have keyed with the angled surface edges 214. Furthermore, the adaptor being secured to a wall socket plate having a safety cover similar to that described above is a bulkier product than a plug 202, therefore, for additional anchorage to a shortened slot of the wall socket cover, a notch 213 may be formed on the earth pin 204 of the adaptor 201.

To release the pins 204 and 205 of the adaptor 201 and/or plugs 202, the steps described above are carried out in reverse sequence.

In Figs. 30 to 39, conventional pin apertures 303 are formed in an inner plate 302 having a plurality of outwardly extending lateral tongues 306. The tongues 306 are located within two parallel runners 317 forming parts of a retaining collar 320 which holds the inner plate 302 against the inner surface of the front plate 301. The retaining collar 320 has bores 329 and is removably secured to the front plate 301 by machine screws 310

passed therethrough which are fastened into corresponding screw threaded brass inserts 328 built into the front plate inner surface, Standard pin aperture clips and a shutter mechanism are housed within a chamber formed by a casing 309 which is removably attached and fastened with machine screws 310 to the back of the inner plate 302.

The aforementioned clips (not shown) extend downwards and out of the casing 309 in the form of contact pins 318. The inner plate unit 308 is slidable within the runners 317 in a parallel plane to the front plate 301 so that the pin apertures 303 can be moved relative to notches 305 formed in the edges of parallel slots 304.

Insulating shrouds 324 for live and neutral pins 323 of a plug 322 or adaptor unit have angled lateral projections 325. The pins 323 (including earth) are inserted or removed when the pin apertures 303 are aligned with the notches 305. While being inserted into a pin aperture 303 via a slot 304, the earth pin of a plug or adaptor 322 strikes a hooked extension of the retaining collar 320 forming a flexible catch arm 321.

The tip of the catch 321 engages and latches into an aperture 307 in the top of the casing 309 to lock the inner plate 308 with the pin apertures 303 aligned with the notches 305 ready for insertion of the pins 323 Of a plug or adaptor 322.

The earth pin 323 causes the catch 321 to disengage the aperture 307 and release the inner plate 308 so that the plug or adaptor 322, with pins 323 fully inserted, can be moved downwardly against the outer surface of the front plate 301 while the angled protrusions 325 of the pins simultaneously key with correspondingly angled edges 311 of the slots 304.

The plug or adaptor 322 is thus locked into the front plate 301 while the inner plate 308 is simultaneously moved downwardly until the contact pins 318 are inserted into corresponding apertures 316 of a junction box 312 to receive power when it is locked and safe. A reversal of the above sequence is carried out to remove power automatically from the plug or adaptor 322 to unlock and safely remove the latter.

The junction box 312 is an elongated component attached to the inside surface of the front plate 301, and a brass terminal 314 is located in each end thereof to receive live and neutral mains wires. The said wires are secured therein by machine screws 315. A one piece earth strap 313 extends from the junction box 312 and is also secured to the inner surface of the front plate 301. The earth strap 313 has a terminal 314 for receiving an earth wire which is secured therein by a machine screw 315. Thereafter, this front plate 301 is secured to a wall box by two machine screws

326 in the conventional way before being safe and ready for use.

In Figs .40. to .46, A continental european plug and socket is depicted wherein pin apertures 403 and an earth pin 423 are formed in an inner socket having a plurality of lateral tongues as previously described. The tongues 406 are located within two parallel runners 417 forming vertical portions of a retaining collar which holds the inner plate against the inner surface of the back plate 424. A plurality of tiny hooks 413 are formed around the periphery of the retaining collar which are latched into corresponding bevelled catches 420 in the back plate 424 during assembly. Pin aperture clips are located within the inner plate and these together with the base of the earth pin are extended downwardly in the form of secondary clips within a plurality of oblong pin apertures designated as 416. The inner plate unit, generally designated as 408, is slidable within the runners 417 in a plane parallel to the front plate 401 so that the pin apertures 403 can be moved relative to the notches 405 formed in the edges of the slots 404, as shown in figs .40. and .42. A notch 425 is formed in the live and neutral plug pins 423, as shown in figs .44. and .45. The pins 423 are inserted or removed only when the pin apertures 403 are aligned with the notches 405 as shown in fig .40.

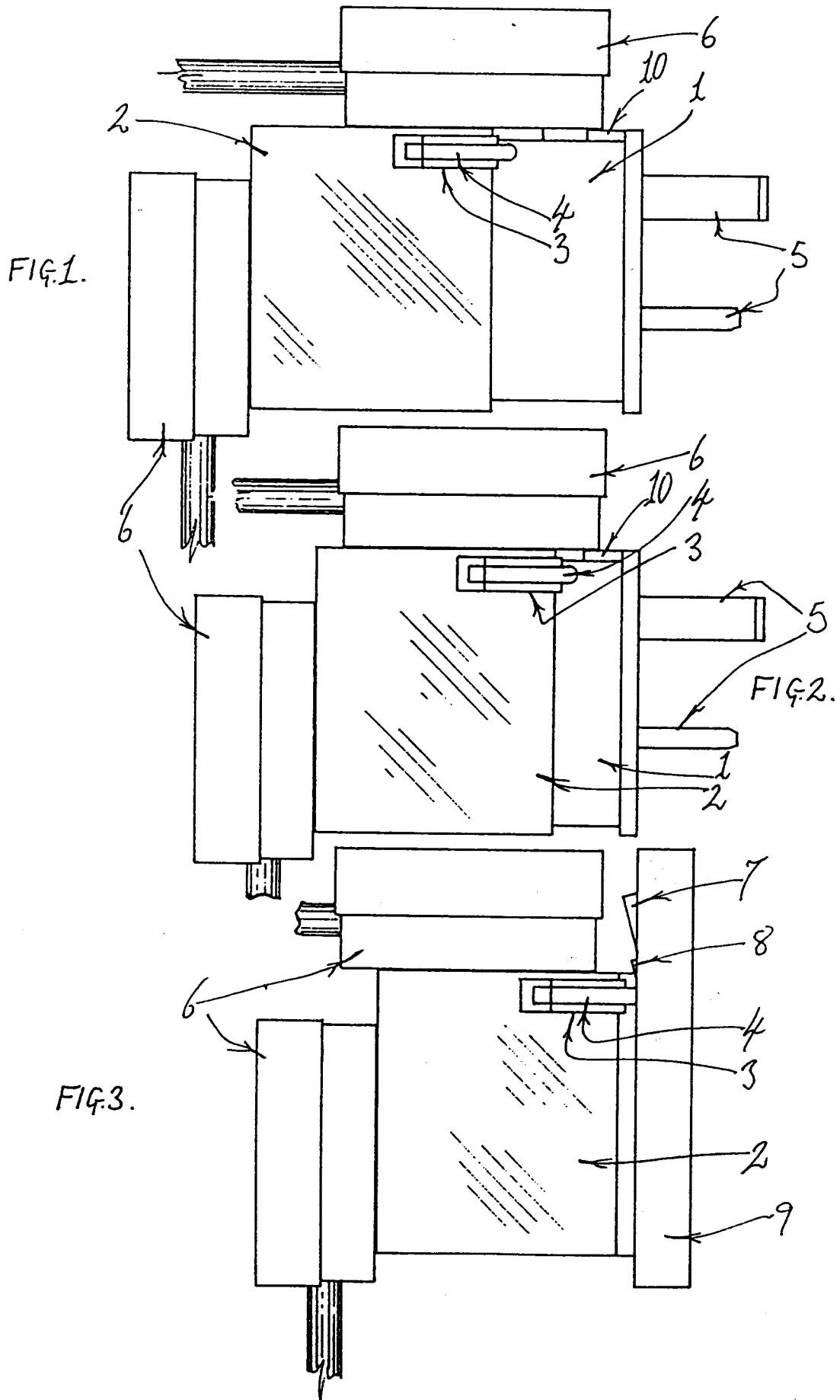
A magnet 421 attached to the top portion of the retaining collar 420 interacts with a metal pad 407 located on the top of the inner plate unit 408 and serves to hold and secure the unit 408 in position with the pin apertures 403 constantly aligned with the notches 405 ready for insertion of the pins of both the plug and socket. The plug 422, with pins 423 fully inserted, can then be moved downwardly against the outer surface of the front plate 401, causing the magnet 421 and metal pad 407 to disengage, while the notches 425 of the pins 423 at the same time key with the edges of the front plate slots 404.

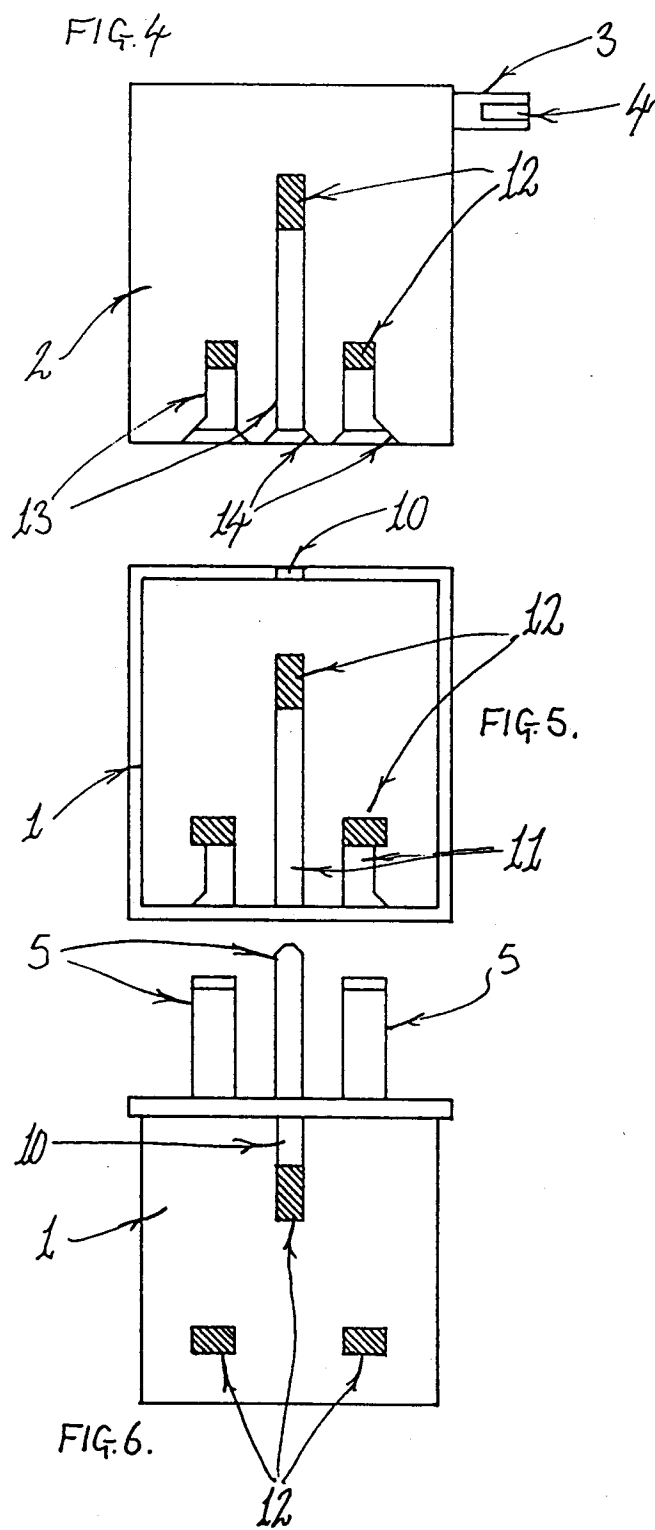
The downward movement of the inner plate 408 and fully inserted plug 422 is simultaneous. Therefore as the plug 422 is locked into the front plate 401, the contact pins 418 extending upwardly from a junction box portion of the retaining collar designated as 412 are automatically inserted into the corresponding oblong apertures 416 formed in the inner plate 408 so that the plug 422 will only receive power when it is locked and safe. Two machine screws 426 426 secure the front and back plates together, and to release the pins 423, the steps described above are carried out in reverse sequence.

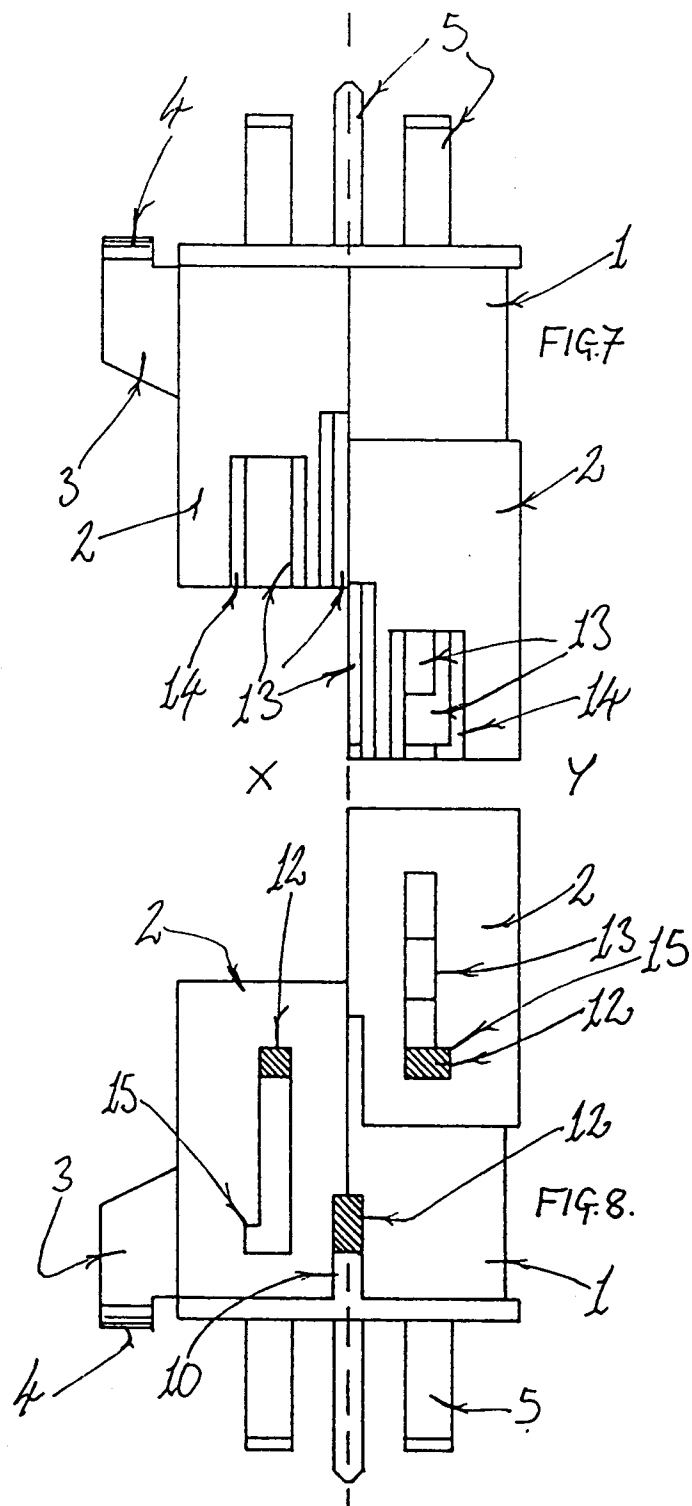
Live, neutral and earth mains electric wires are attached to terminals within the junction box 412 and are secured therein by machine screws 415.

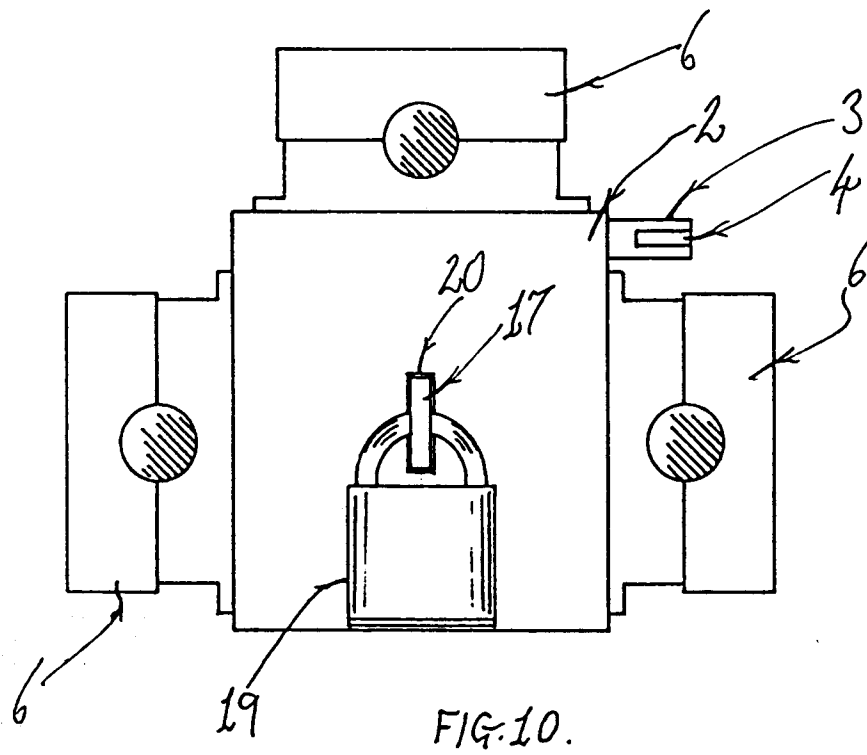
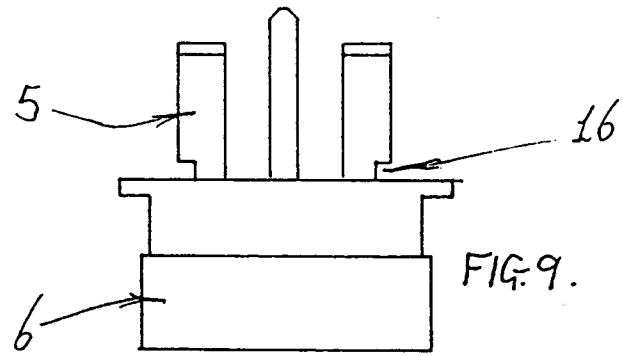
Claims

1. A safety cover for a female electrical connector device, the connector device being adapted to receive the pins of a male electrical connector device, to protect the interface between the male and female connector devices, the cover having slots with notches which interact with and lock the pins of the male electrical connector within pin receiving apertures, and means for actuating a power supply switch, the cover being movable between a pin latching position and a pin releasing position. 5 10
2. A cover according to Claim 1 wherein the cover includes a generally planar member with a slot for each pin, at least some of the slots being a portion of a cross-section corresponding to the greatest cross-section of the respective pins, to enable the pin to pass therethrough in the releasing position of the cover, and another portion of reduced width, for engagement with a notch in the pin, to prevent the pin from passing through the slot in the latching position of the cover. 15 20 25
3. A cover according to Claim 1 or 2 wherein the means for actuating a power supply switch comprises a magnet carried by the cover which operates the switch which is located within the female connecting device, when the cover is moved into the latching position. 30
4. A cover according to an preceding Claim wherein the cover is adapted for use on an adaptor body for receiving two or more plugs, the cover being in the form of a sleeve. 35
5. A cover according to any one of Claims 1 to 3 wherein the cover is adapted for use in a wall socket and comprises a flanged plate member. 40
6. A cover according to Claim 5, wherein the cover acts with a junction box to insert contact pins into the junction box on insertion and locking of a male connectors pins, to connect a power supply to the socket. 45
7. A cover according to Claim 6, further including a latch which automatically releases the pins from the junction box when the pins of the male connector are withdrawn from the socket. 50
8. A cover according to Claim 2, wherein the reduced width parts of the respective slots are formed with a bevelled edge, for engaging with angled lateral protrusions on the pins. 55
9. A cover according to any preceding Claim, including a lockable latch for retaining the cover in the latched position.
10. A cover according to Claim 9 including a combination of coded rotatable discs, which must be rotated into predetermined positions to release the lock.









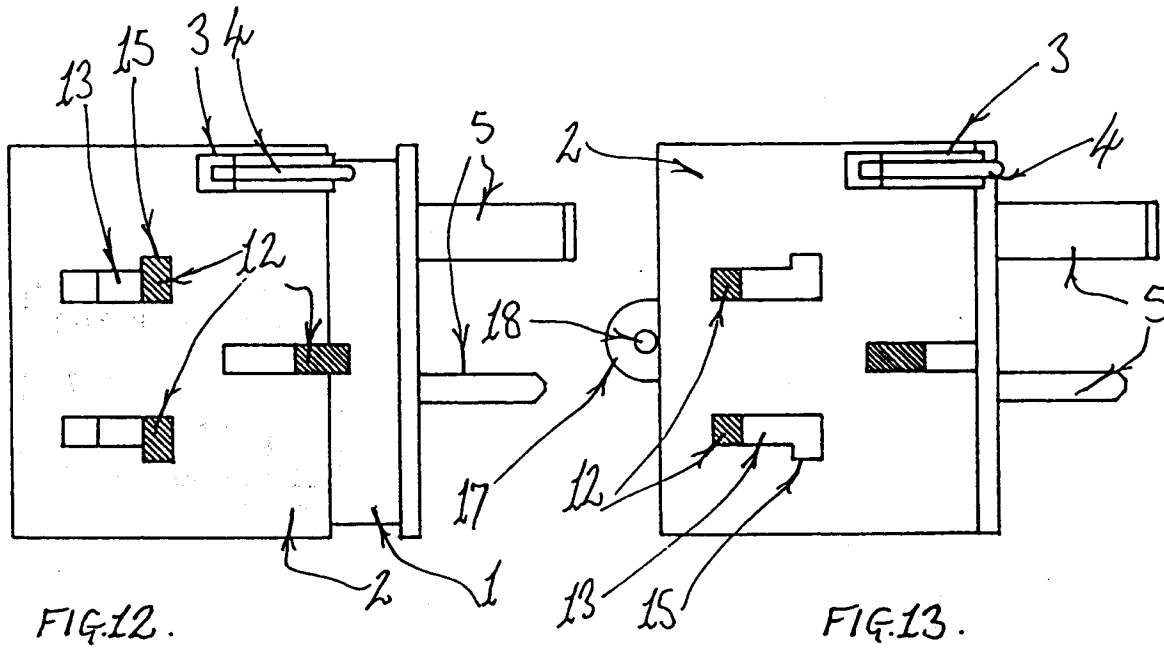
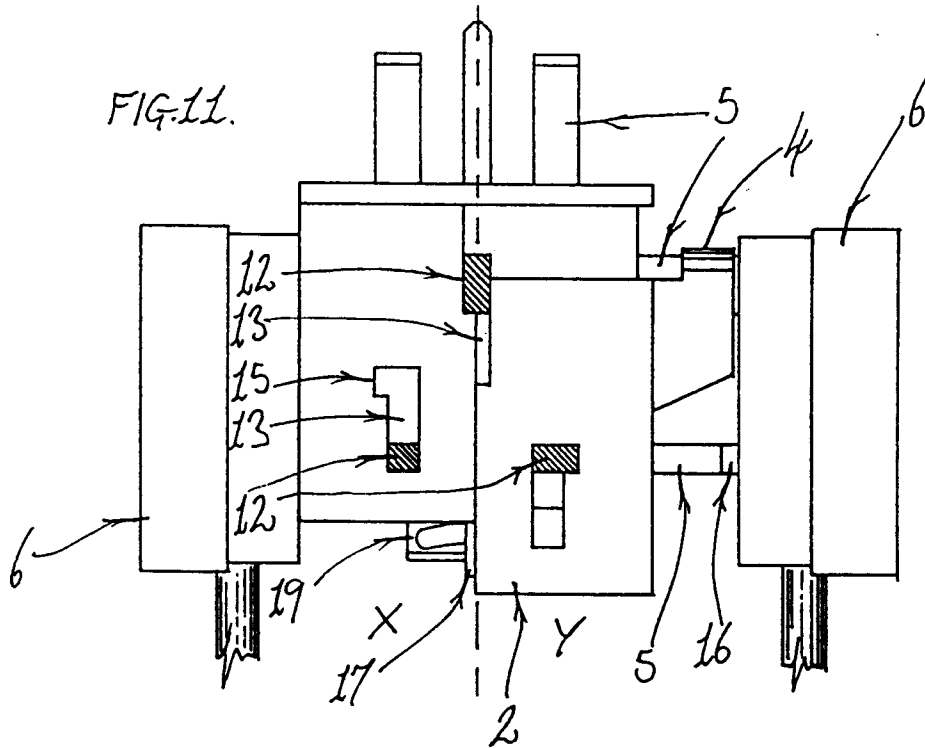


FIG. 14.

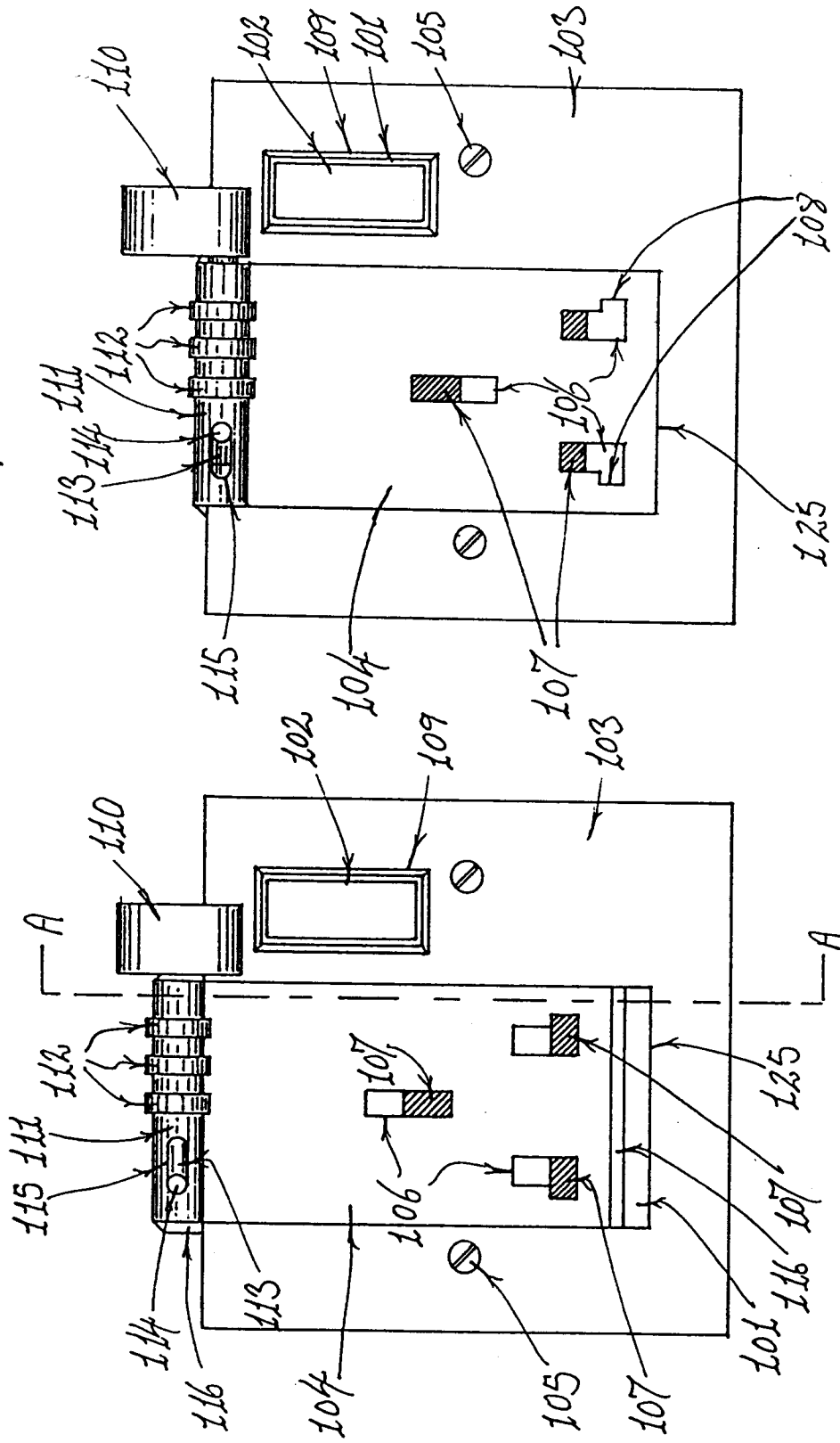
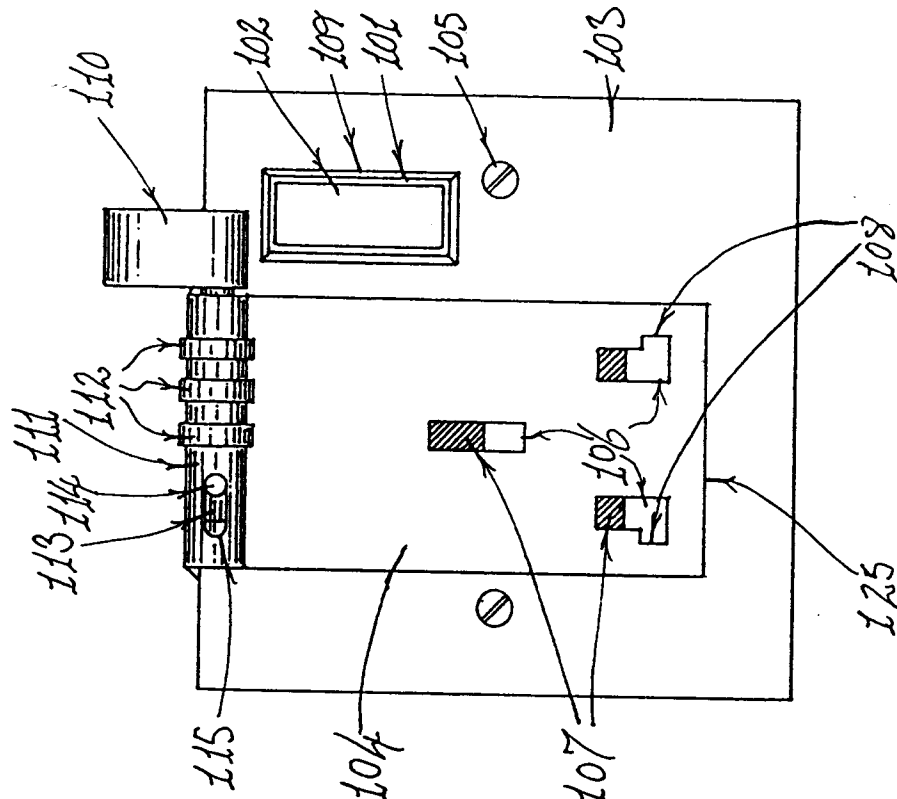
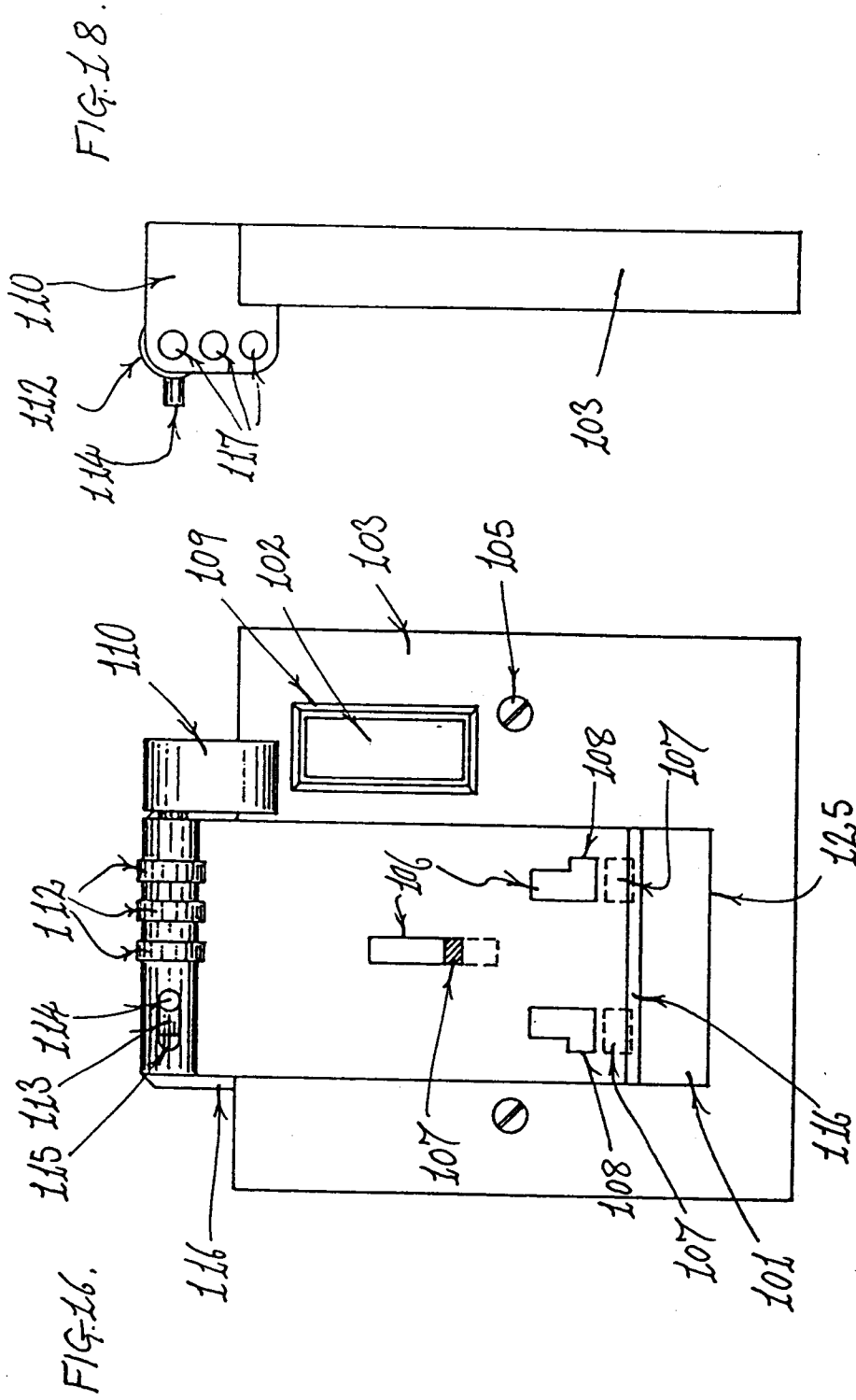
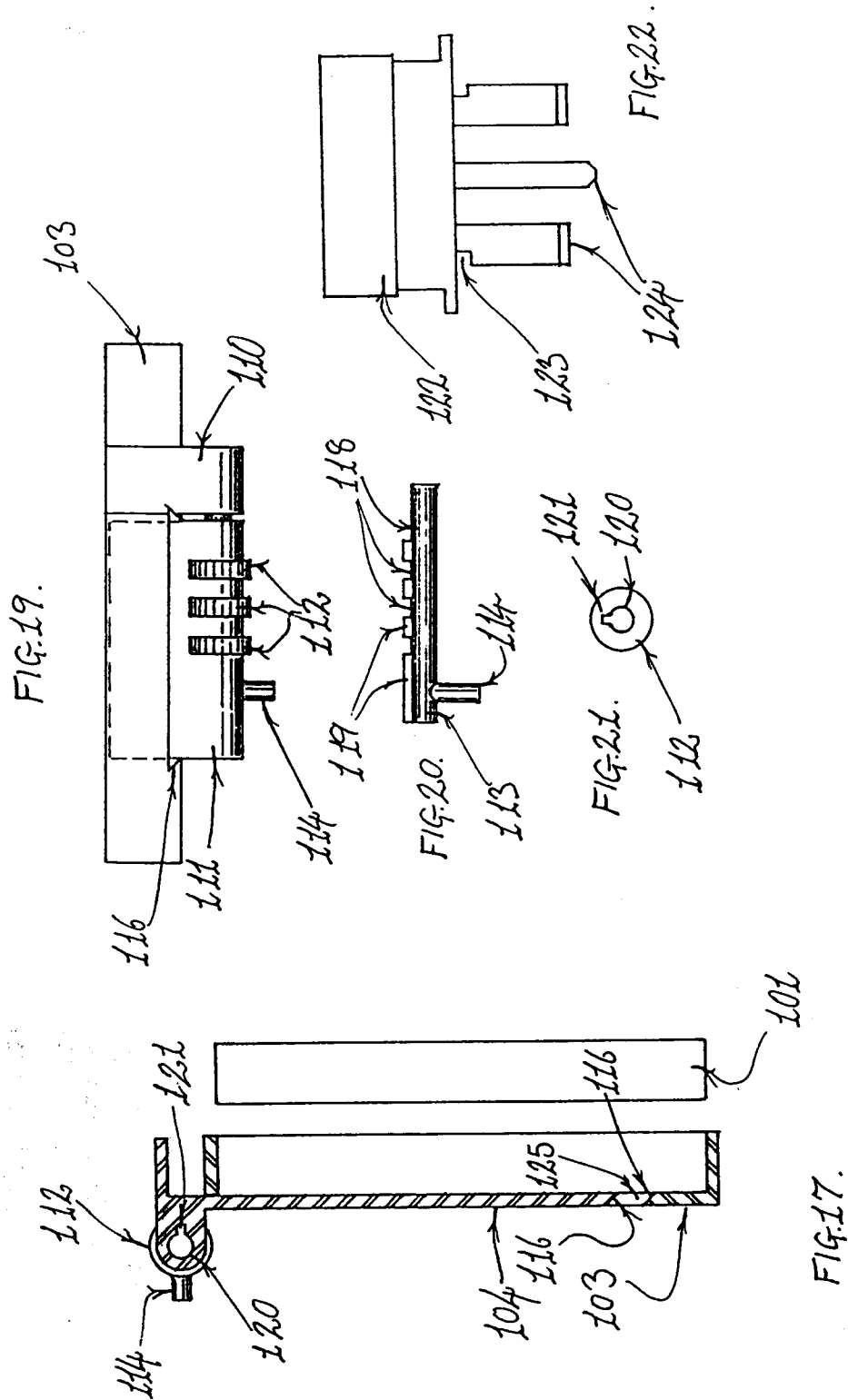
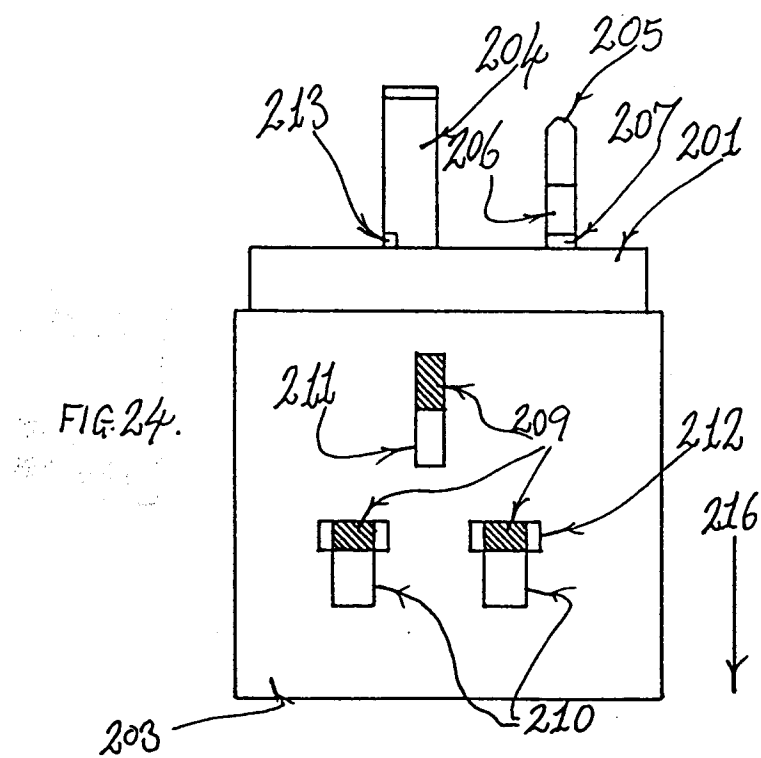
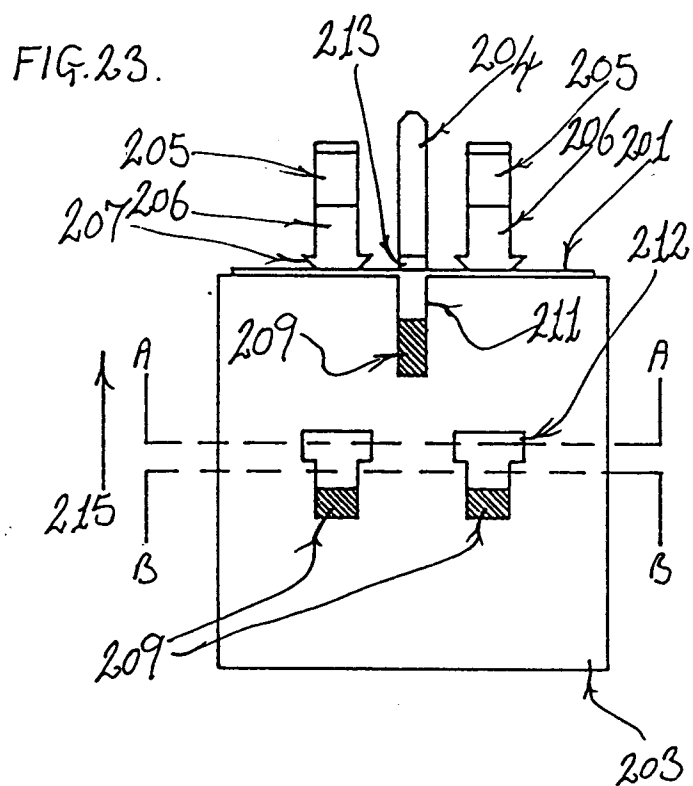


FIG. 15.









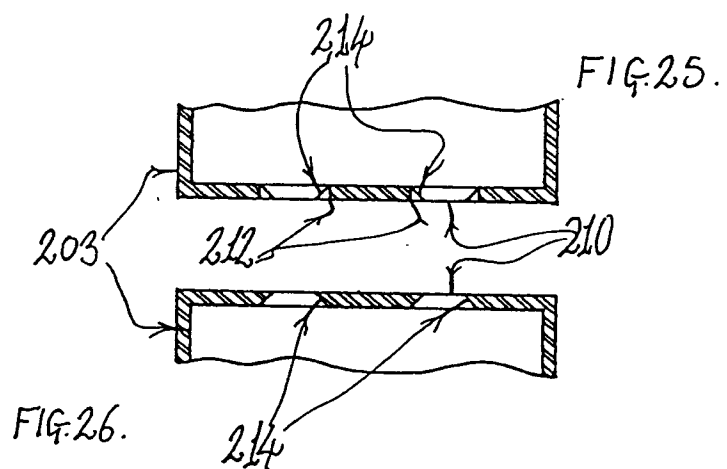


FIG. 29.

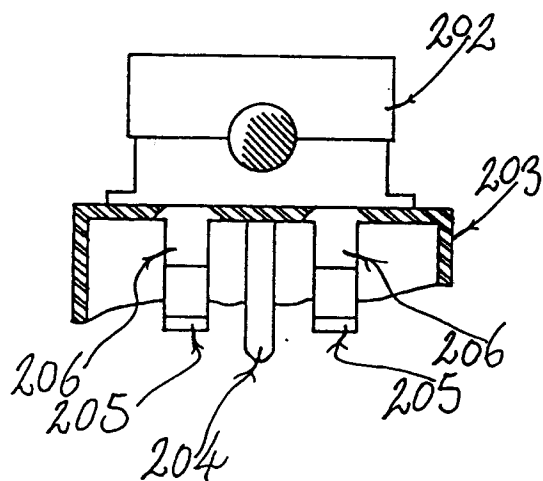


FIG. 27.

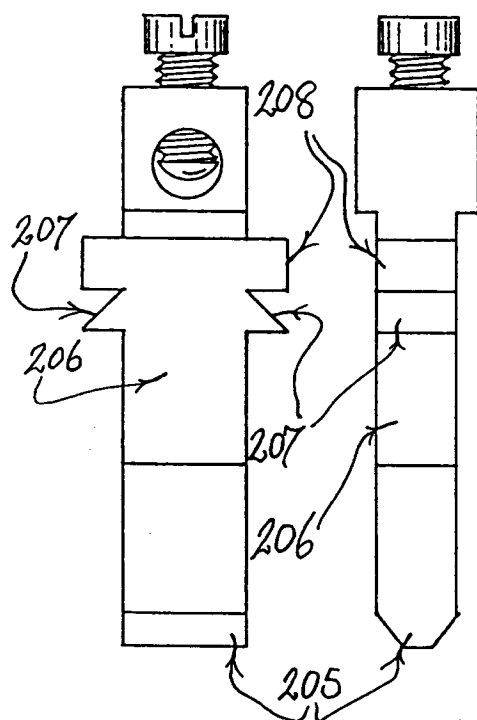


FIG. 28.

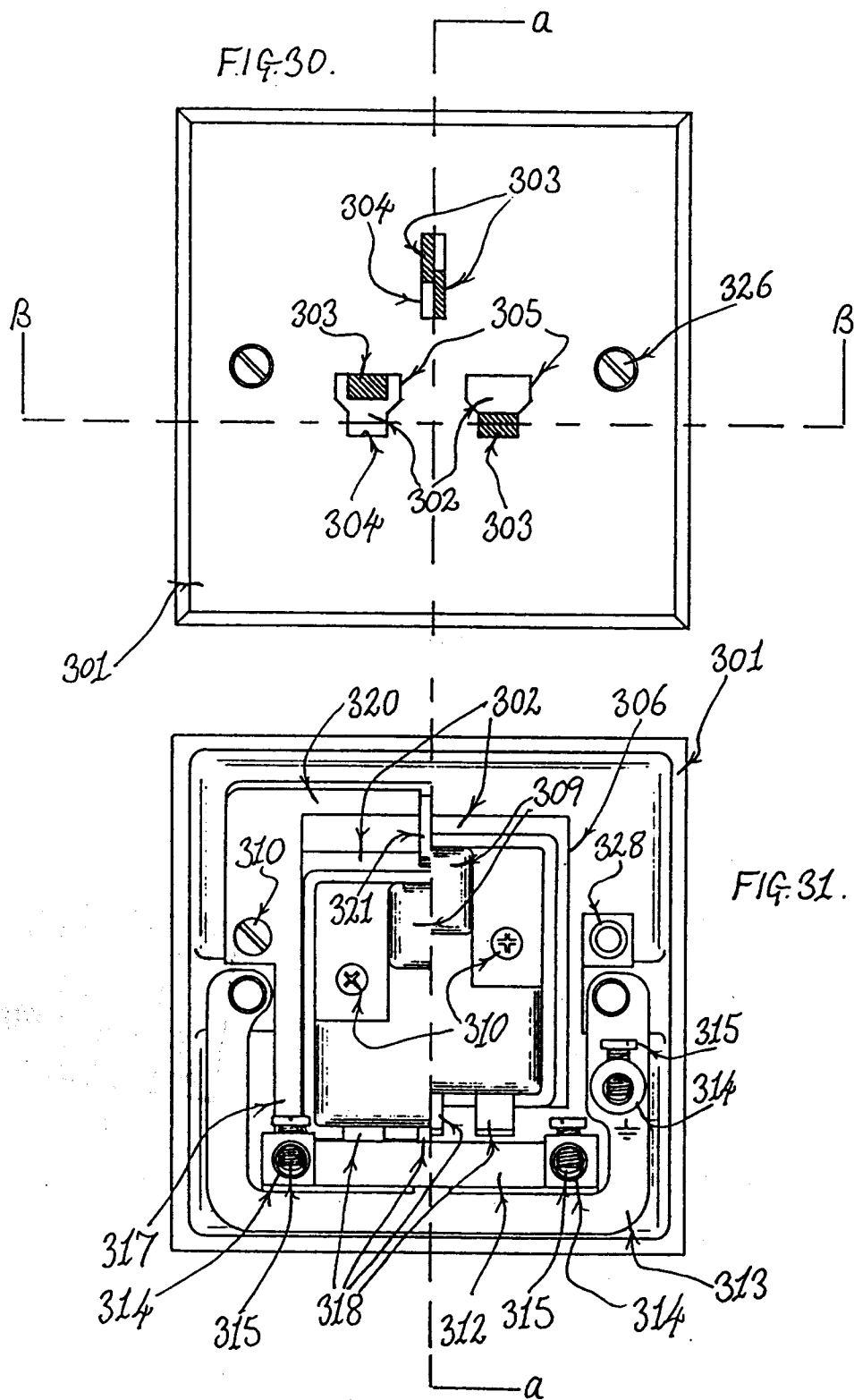


FIG. 32.

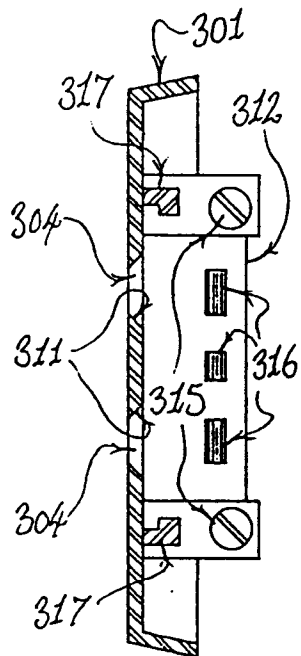


FIG. 33.

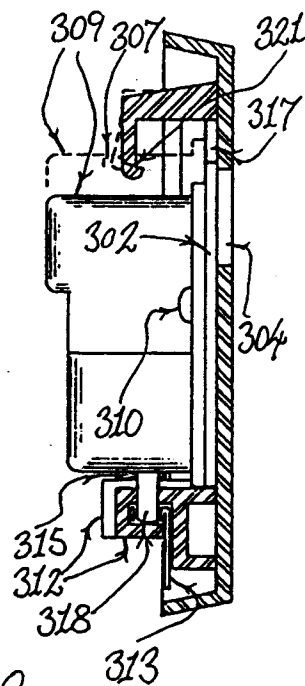


FIG. 34.

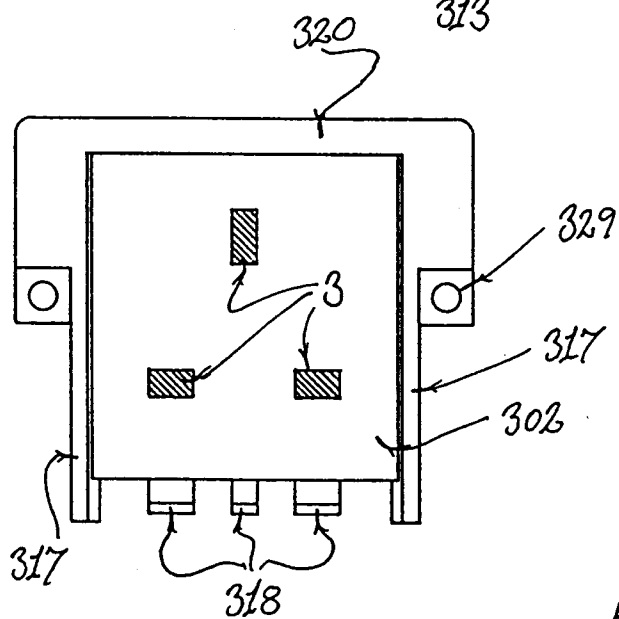


FIG. 35.

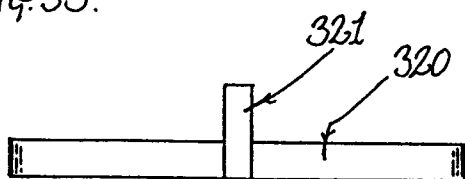
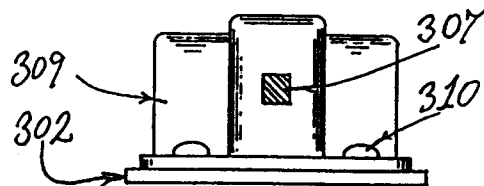


FIG. 36



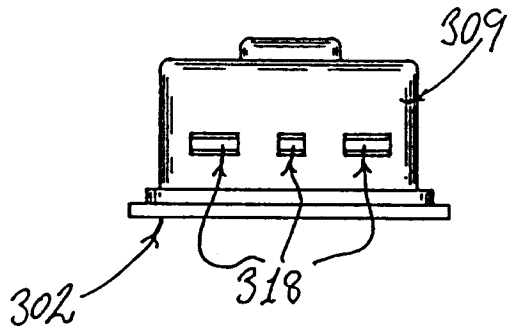


FIG. 37.

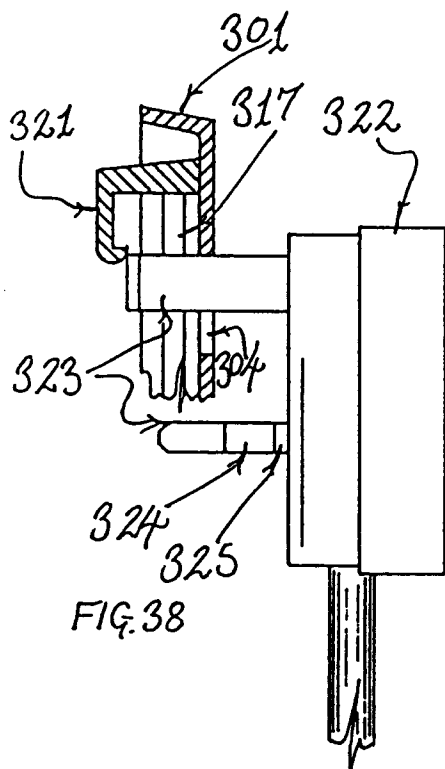


FIG. 38

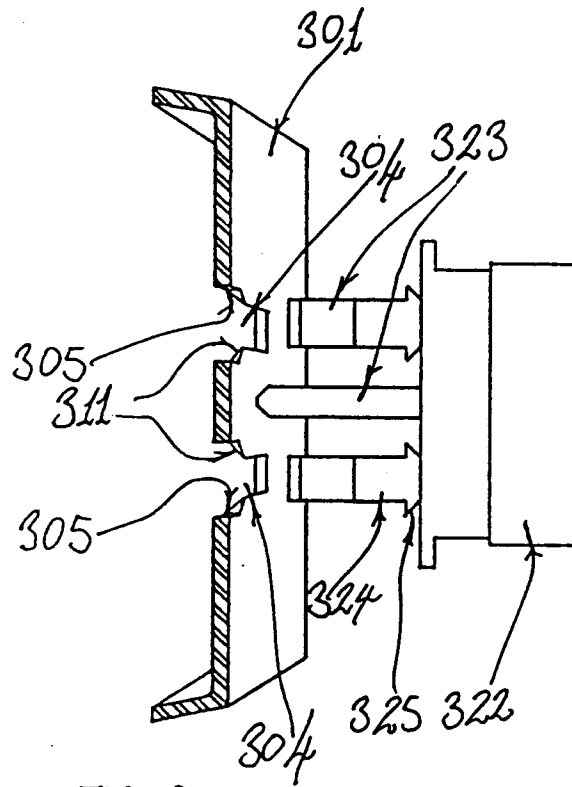
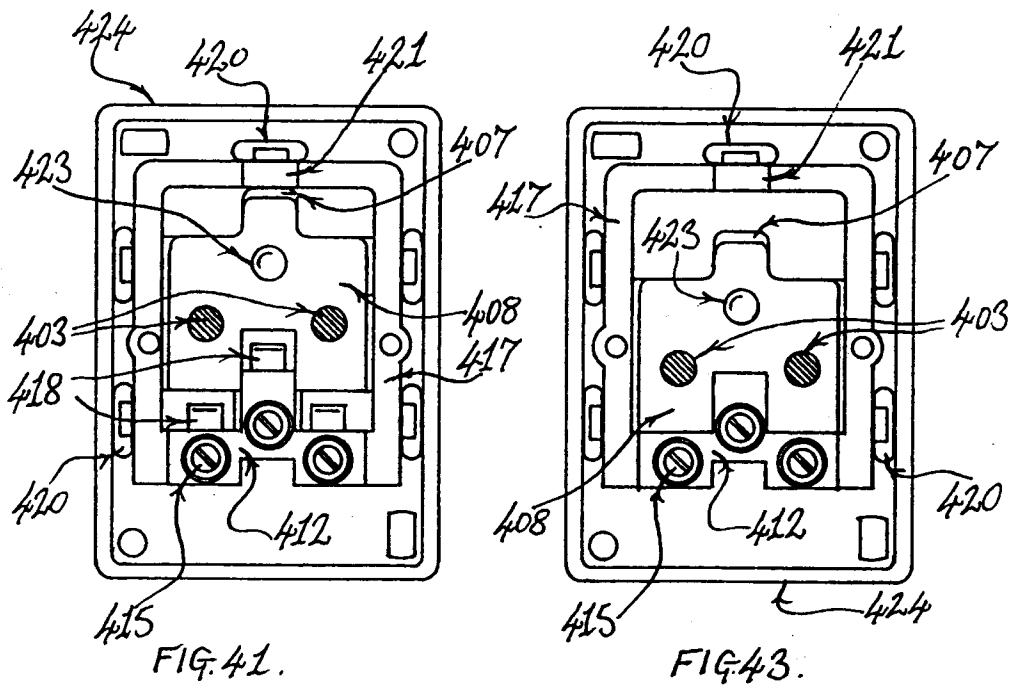
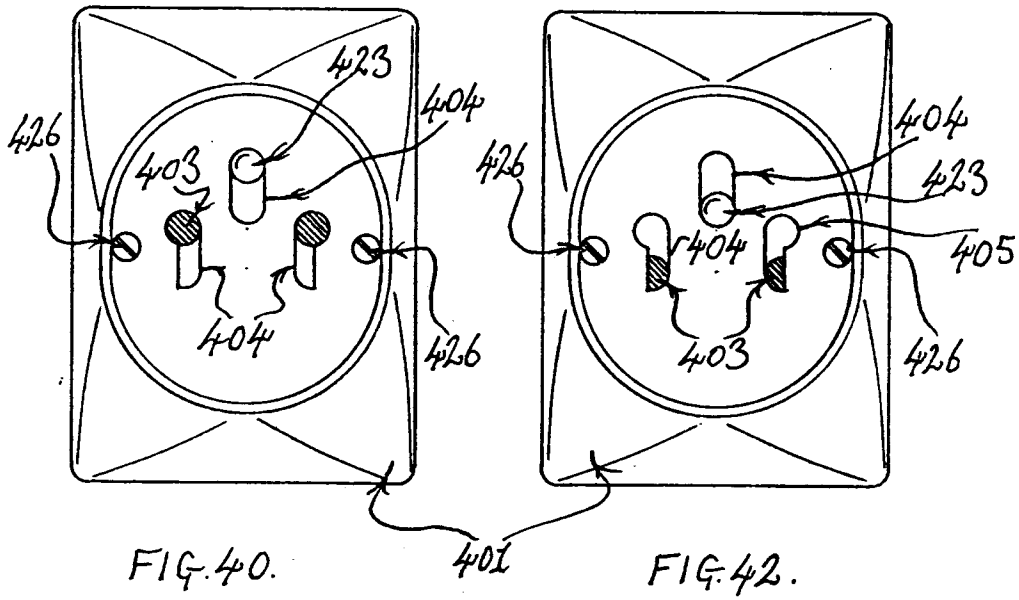
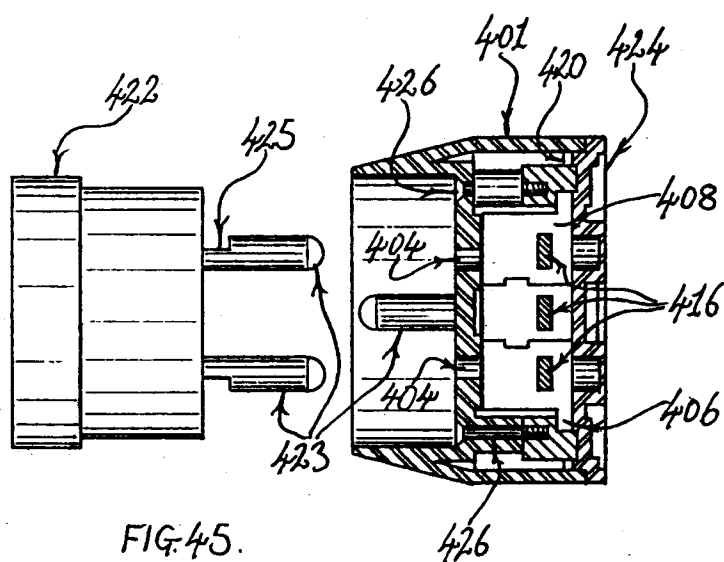
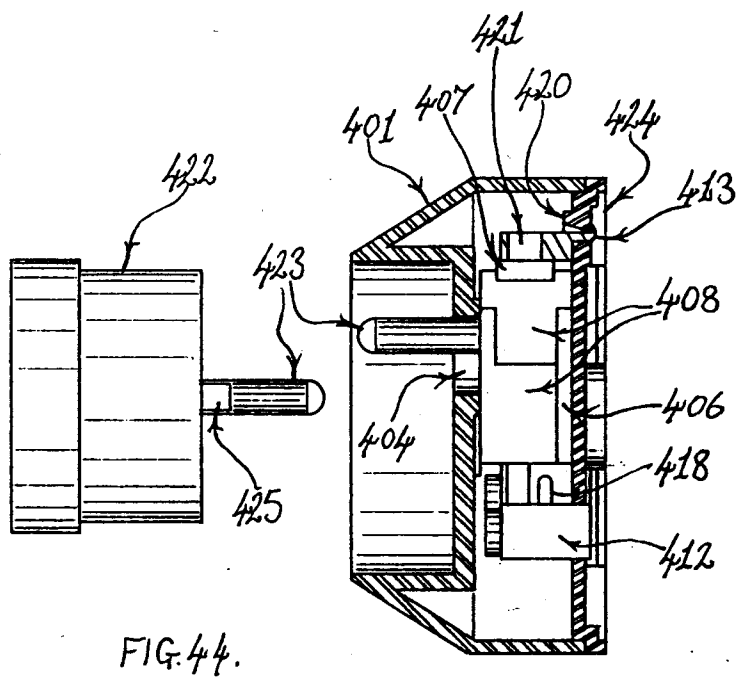


FIG. 39.





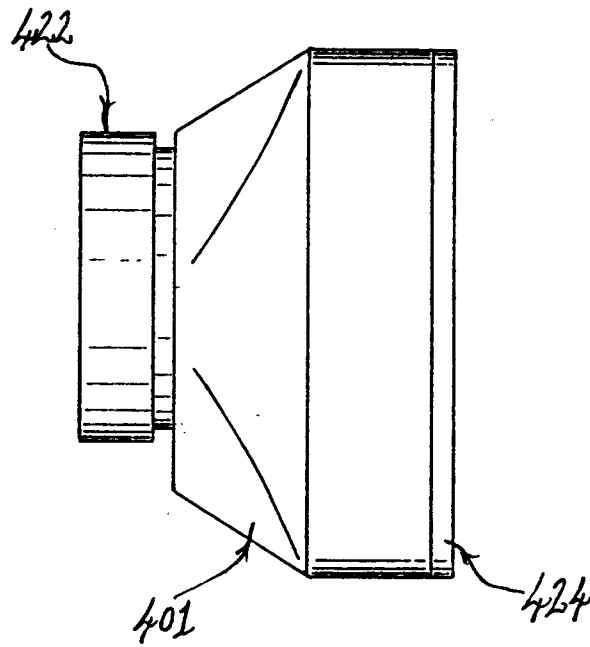
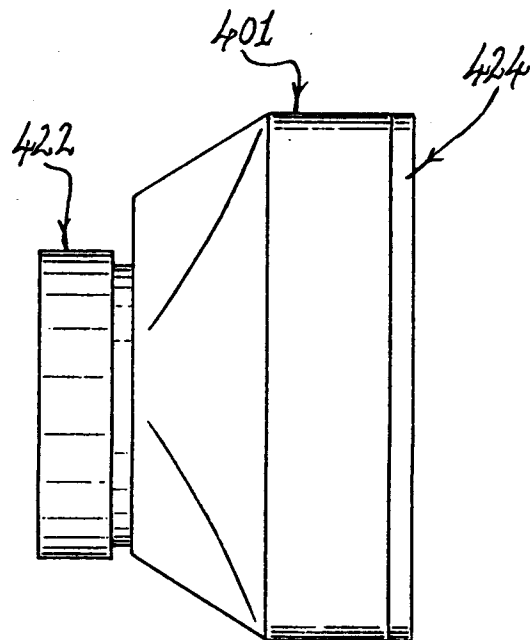


FIG. 46.





European
Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 31 1470

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)
Y,A	DE-C-702 778 (F.KLÖCKNER KOM.-GES.) * page 2, lines 6 - 31; figure 1 * - - -	1,2	H 01 R 13/44
Y,A	FR-A-2 438 928 (D'ANNA SERGE-ANGE) * claims 1-4; figures 1-4 * - - -	1,3,4	
A	GB-A-2 140 224 (BRAND-REX CO.) * abstract; figure 2 * - - -	1	
E	GB-A-2 230 657 (K.HARRIS) * the whole document * - - - - -	1-10	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			H 01 R
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of search 17 June 91	Examiner HORAK A.L.
CATEGORY OF CITED DOCUMENTS 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 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			