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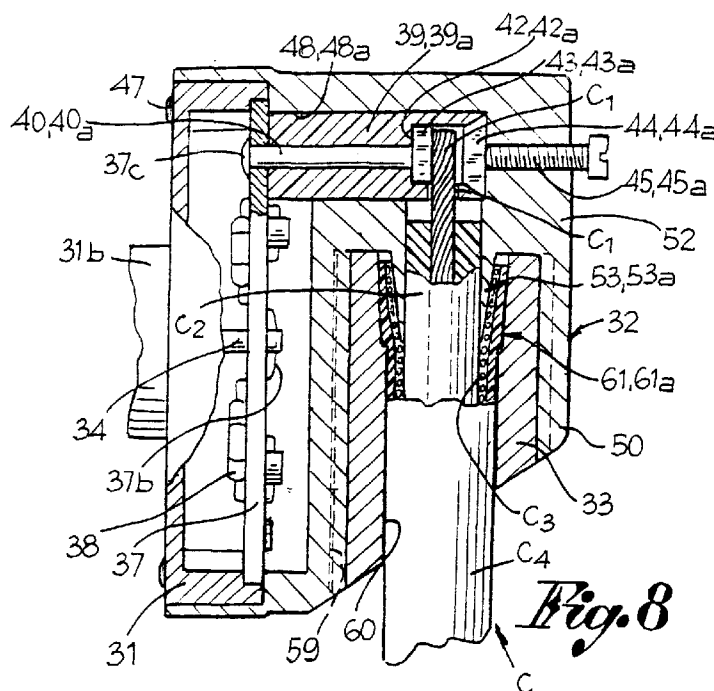
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(54) **Screened connection structure for particular use with multi-cable plugs and sockets having a coaxial net mesh screen**

(57) This screened connection in the field of television aerial systems, extended to amplified trigger boxes, dividers, attenuators, shunts, centralized systems, distribution sockets attenuated or not, cables with coaxial reticular screening, having the characteristic of establishing the electrical contact between the typical coaxial net mesh screen and the final clutch element by slipping a truncated cone in electro-conducting material, pierced

axially to create a sharp edge, between the sheath around the central conductor and the aforementioned coaxial net mesh; thereby distancing said mesh concentrically from the central conductor and putting it under pressure from a female truncated cone which presses on the typical insulating sheath around the coaxial net mesh, exerting this pressure by means of screws on a sliding block which contains the aforementioned female truncated cone.

**Fig. 8****EP 0 854 540 A2**

Description

This invention concerns a connection structure, particularly for connections with one or more electrical cables of the coaxial reticular screen type.

It can be applied to the creation of single or multiple plugs and sockets, forward couplers, connection devices, equalizers, shunts, trigger boxes, consumer system sockets, tandem distribution in the field of television systems with high-frequency distribution.

It is well-known that coaxial electrical cables, particularly those meant to carry high-frequency signals, for example, the shielded cables of television aeriels or those adapted to transmit microphone signals, require adequate protection, namely, a correct screening from the electromagnetic waves always present in the cable and the environment, and which often cause disturbance and/or alteration both of the signal and the environment.

Protection against the electromagnetic waves in the environment normally consists of a braided wire or mesh, formed of thin copper threads, which completely surrounds the electrical conductor that transports the signal and which is insulated from the conductor by an insulating sheath, placed concentrically around the conductor. Another insulating sheath is then placed around the mesh itself.

The purpose of the reticular mesh is to allow the central conductor to transfer the signal running along it without dispersion towards the exterior, whilst at the same time not being affected by the outward environment.

It is also known that electrical conductors which are close together influence one another, because of the variations in the electrical and electromagnetic fields which they themselves have generated. For this reason, it is very important that the screening mesh of the coaxial cable be at a constant distance from the cables inside so as to maintain that constant impedance, characteristic of the coaxial cable.

The necessity for a correct connection with other devices is even more evident in the case of plugs and sockets etc. which are intended to accept multi-cable connections with mesh screening, because the more connections there are the more losses that accumulate.

There are already various types of multiple and screened connections for plugs and sockets that contain several cables with a coaxial reticular screening. In some cases these connections have been created with a separate grip; first uncovering the central cable and the external braided wire and then using clamps with a screw grip, which deforms the coaxial shape of the cable by crushing it or by using more complicated structures without screws, but which are not always able to guarantee the necessary stability of the contacts long-term.

This invention aims to create a connecting structure for sockets, plugs and similar devices where a connection of one or more coaxial screened cables is required, while strictly respecting the regular coaxial nature of the screen relative to the central conductor and with long-term efficacy and stability.

tion of one or more coaxial screened cables is required, while strictly respecting the regular coaxial nature of the screen relative to the central conductor and with long-term efficacy and stability.

A further aim is the creation of a connecting structure similar to the above, which will be structurally simple, easy to assemble and competitively priced with regard to those currently available.

These aims and their relative advantages can be achieved by a connecting structure, particularly for multicable sockets with coaxial reticular screening, according to revendication 1. The revendications below refer to particular aspects of the invention.

The invention will be described in greater detail with reference to the enclosed approximate but not restrictive designs.

Fig. 1 shows a section of the coaxial cable with reticular screening;

Fig.2 shows an example of a plug connected to a coaxial cable according to the invention, seen in cross-section indicated by the arrows II-II in Fig.3; Fig.3 shows a view of the plug in Fig.1, without block or grip carriage;

Fig.4 shows, in an exploded perspective view, the components of another example of plug incorporating the screened connecting structure;

Fig.5 shows, in perspective, the assembled plug, without coaxial cables;

Fig.6 shows, partly in perspective and partly in cross-section, the same socket as Fig.5;

Fig.7 shows a section of the socket indicated by the line VI-VI in Fig.6;

Fig.8 shows another section of the socket indicated by line VII-VII in Fig.6;

Fig.9 shows the same section as Fig.8 but highlighting the clamping of the bare conducting section of the cable to the conductor, which crosses the insulator bushes.

Fig.10 shows, still in section, a variation in the means of blocking the cable and fixing the single wire conductor to the contact which joins the circuitry, and

Fig. 11 shows a way of fixing the printed circuit plate between two bodies, which are fixed in turn.

Fig. 1 illustrates a coaxial cable C, made in the way described, by a central single-wire conductor C1, surrounded by an intermediary insulating sheath C2, around which there is wound a braided wire or reticular mesh shield C3, externally surrounded and protected by the external insulating sheath C4.

Referring to an initial version of the invention in Figs 2 and 3, a plug 1 for connecting at least one coaxial cable C, comprises a main body 2 with two cavities 3 and 4 placed at right angles.

A cavity 3 is placed so as to allow the insertion of a structure 5 in electro-insulating carrier material, held in-

ternally, a copper strip 6 equipped with an elasticated aperture 8, intended to receive and hold the copper single wire C1 of the coaxial cable C.

Structure 5 is pierced with holes that will accommodate the standing pins 7B and 7D of a metallic base 7 from which emerges a tubular cylinder 7C, set so as to receive the contact of the external tubular zone of a plug's earth, or viceversa. The function of the pins 7B and 7D is to distance the metallic base 7 from the parallel base of the structure 5, where there are circuit tracks (not represented) with possible condensers and seams ensuring the correct passage of the two currents, which are, respectively, useful and harmful, or shielding. Consequently, the latter are prevented from causing impedances in the useful circuitry.

The two parts 5 and 7 are fastened together by the beading 7A.

Numbers 10 and 11 indicate the soft soldering used to join the copper strip 6 and a pin 12 to the common circuitry.

The other cavity 4 of the body 2 is furnished with a bottom 13 from which protrudes a truncated cone 14 with an axial hole 15, and terminating in a sharp edge 16. The hole 15 has the same standardized diameter as the intermediary insulating sheath C2 of the coaxial cable C, in such a way that the circular sharp edge skims the external surface of the said insulating sheath and slips between this and the conducting braided wire or mesh C3, which, in this way, is forced to widen and rest against the external surface of the truncated cone 14.

This occurs when the end of the copper single-wire C1 is forcibly inserted by hand into the elasticated aperture 8.

Before introducing the single-wire C1 and the subsequent widening of the mesh against the truncated cone 14, a clamping carriage or block 20 is slipped over the external sheath C4 of the cable C, having a hole with a diameter slightly greater than the external sheath C4. Towards the bottom of cavity 4, the base of the said hole terminates in a conical cavity with an inclination equal to that of the truncated cone 14, so that the sliding of the block or carriage 20 within the cavity 4 causes the end 21 of the external sheath C4 to be crushed centripetally against the external surface of the truncated cone 14, with the electro-conducting mesh or braided wire in-between. The latter will, therefore, be correctly positioned in close contact with the cone 14. The sliding of the block or carriage, possibly assisted by runners 24, will be forced and regulated by at least one screw device. In Fig.2, the shape of a screw with that purpose is represented by the broken lines and indicated by the number 22. On the other hand, in Fig.3, the number 23 indicates a central hole in the main body 2, in which the screw 22 will be used. Screwing it onto a lead screw of the block 20 will determine the nature of the sliding, by pressing the electro-conducting mesh or braided wire C3 against the truncated cone 14.

In another version illustrated in Figs 4-9, the plug

which encloses the connecting structure is practically composed of two box-shaped bodies, indicated by the numbers 31 and 32, and by a clamping block or carriage 33.

The body 31 has the form of a small quadrangular tray on the bottom 31a of which there is designed a small chute or tube 31b which is intended for inserting into a normal plug for coaxial cables.

A metallic pivot-pin, coaxial to the tube 31a, is isolated from body 31 by means of an insulator bush 35.

The box-shaped body 31 is then fitted internally with distance spacers 36 (figure 4) for a panel or plate 37, in insulating material, supporting a normal printed circuit 38 for the decodification of in-coming signals and furnished centrally with a hole 37a to allow the end of the pivot-pin 34 to pass. The said pivot-pin is firmly welded to the plate as shown by 37b in figures 7 and 9. Furthermore, this plate will have earth contacts, designed to rest on the corresponding contacts inside the body.

Two identical bushes 39-39a are fastened to the plate 37 which carries the printed circuit. Made in insulating material, they have a square or round cross-section and are parallel to one another, crossed axially by a section of metal conductor 40 and 40a respectively (figures 4, 8 and 9), these being welded to plate 37 and shorter in length than their respective bushes 39 and 39a, in order to create a square countersink 42 and 42a, respectively, at the ends of said bushes.

Within the countersinks 42, 42a there are inserted quadrangular or round metal heads, 43 and 43a respectively, in a single body or integral with the ends of the conductors 40, 40a, as well as a head in insulating material 44, 44a at the end of a screw 45, 45a inserted on a lead screw located coaxially in body 32 of the metallic plug. The heads 44, 44a in insulating material are essentially truncated pyramids in form with a quadrangular base, as can be clearly seen in figures 8 and 9, and are used to block the central single-wire C1 of the coaxial cable C.

It should be noted, however, that instead of the heads 44, 44a a catch 145 operated by a spring 146 - see Fig.10 - can be inserted between each screw 45, 45a, making it easier to block and unblock the single-wire C1 of cable C.

To help clarify Fig.4, it should be noted that the insulator bush 39 is partially cut away for the sole purpose of showing its metal head 43, whilst bush 39a reveals the truncated pyramid end of the countersink 42.

The main body 32 of the plug, preferably made from die-cast zinc-aluminium-magnesium alloy, like the lid 31, has an appendage in the form of a quadrangular frame 46, of the right size to enclose the metallic lid 31, which holds the plug tube and the printed circuit. The secure clamping of body 31 within the frame of body 32 is obtained by means of flanged pegs 47, integral with body 32 and inserted into the holes 47a placed in the corresponding positions in body 31.

In the upper part of body 32 there are two identical

square cavities 48, 48a (figure 4), placed so as to receive the parallel insulator bushes 39, 39a, and deep enough to take the ends of the above-mentioned blocking heads 43, 43a and 44, 44a.

Furthermore, as clearly shown in figure 4, in the metal body 32 there is a large quadrangular cavity, indicated by number 49, which opens on the opposite side to that containing the said bushes 39, 39a, thereby giving a wide fork with parallel sides 50 and 51, and a stepped bottom or base 52 (see figures 5 and 7).

From the bottom 52 there emerge two tubular appendages, preferably truncated cones 53, 53a, with their larger bases integral with the bottom 52 of the hollow body 32 and the smaller bases essentially sharp-edged.

Within the cavity 49 of the main body 2 it is possible to insert the block or carriage 33 (figure 1), equipped externally with two pairs of prismatic runners 59, to run within corresponding grooves on the faces of the two sides 53, 51 of body 32 (figure 6), and internally with two cylindrical cavities 60, each of a diameter sufficient to contain the coaxial cable C. More precisely, said cavities 60 are cylindrical up to the sharp edge of the said truncated-cone appendages 53, 53a, and then they become truncated-cone countersinks 61, 61a, able to contain the screening sheath C3 and the external insulating sheath C4 of the coaxial cable pressed between the said surface cones, as already described in relation to Fig. 2 in the first version. In this case, too, the stripped central conductor C1 is blocked by gripping it with the screw 45 against the fixed head 43, after which the carriage 33 is pushed completely inside the cavity 49, so enabling its countersunk surface 61 to block the screening sheath securely and concentrically against the truncated-cone appendage.

The carriage 33 is securely blocked within the cavity 49 by means of a screw 62 inserted in a hole 63 made in the body 32 of the plug and tightened inside a lead screw 64 suitably located in the carriage 33.

From the above description it should be clear that this screened connection structure, as described and illustrated here, can be modified and varied by structural and functional equivalents, without falling outside the protected limits of this invention. For example, the said appendages 53, 53a, rather than being perfect truncated cones, could be made in truncated pyramid form with a polygonal base or similar. Likewise, the insulating materials can be varied according to the use made of the coaxial cables, and the panel or plate which holds the printed circuit may even be omitted.

Furthermore, a similar result can be obtained, although in this case it means stripping part of the braided wire or net mesh, by making each part a truncated cone 53, 53a (as shown in Fig. 10), so that it can also take the braided wire or net mesh C3, when stripped, of cable C and piercing the said truncated-cone part until it reveals sections which contract with a pincer movement. Thus, when the clamping block or carriage 33 is pushed completely into the body 32, its countersunk part matches

perfectly with the truncated-cone part, tightening it firmly around the braided wire or mesh.

5 Claims

1. Screened connection structure for plugs and sockets with one or more coaxial cables of the coaxial reticular screen type for television aerial systems, amplified trigger boxes, dividers, attenuators, shunts, distribution sockets attenuated or not, characterized by establishing the electrical contact between the typical coaxial reticular mesh screen (18) and the final clutch element (7C), by slipping a truncated cone (14) in electro-conducting material, pierced axially (15) to define a cutting top (16), between the sheath (17) around the central conductor and the coaxial reticular mesh (18), in this way the mesh is distanced concentrically from the central conductor (9) and subjected to pressure (21) from a female truncated cone pressing on a typical insulating sheath (19) around the coaxial reticular mesh (18), due to the pressure applied by a screw (22) on a sliding block (20) containing the above-mentioned female truncated cone.
2. Screened connection structure according to the previous revendication, where the route of the usable signal conductor (9, 6, 12) is completely surrounded by metallic structures (2, 20) which are earthed (7C).
3. Screened connection structure according to the previous revendications, characterized by an insulating structure (5) holding an electro-conducting strip (6) equipped with elasticated aperture (8), as well as a metal base (7) containing a tubular cylinder (7C) for the earth.
4. Screened connection structure according to revendication 1, characterized by its being inside a metal plug consisting of two prismatic bodies (31, 32), cables and relevant couplings, one of these bodies (31) having the form of a small tray with a tubular hole and a central insulated metal pivot-pin, to be inserted in a socket for screened coaxial cable and incorporating a panel or plate (37) in insulating material, which holds an electronic printed circuit (38) for decoding the signal coming in via the said central pivot-pin. The other body (32) of the plug incorporates a screened connection structure for at least two cables with coaxial reticular screening, consisting of parallel bushes (39) in insulating material, directed perpendicularly to the said printed circuit and connected to it. The said insulator bushes will each receive a metal conductor (40) furnished with prismatic head (43) which will remain in contact with the stripped end of the central conductor of a coaxial

cable, inserted perpendicularly to said conductor with the prismatic head, and blocked against said head by a screw that is coaxial to the same conductor, by means of a clamping element (44, 145). The said body (32) of the plug that incorporates said bushes, has a quadrangular cavity (49) with a flat bottom wherein there are at least two holes (60) through each of which can be passed that part of the cable deprived of screening mesh and relative internal and external sheaths, so as to expose the final section of the conductor to be clamped between said heads; from the said flat bottom and coaxial to each of the said pass holes, there emerges essentially a truncated-cone section (53) with its larger base on the said flat bottom and the smaller with its sharp edge and cylindrical axial cavity; the sharp edge of said truncated-cone cavity permitting - during the insertion of the cable towards the clamping heads - the screening mesh and relative external sheath to open out from the external sheath of the central conductor in the cable, to the point where they are concentrically distant from the central conductor itself; the clamping of the screened cables within the said cavity being achieved by a carriage (33) with parallel holes (60), guided perpendicularly to the said flat bottom and designed with truncated-cone countersinks (61) at the ends of said parallel holes, so as to clamp the reticular mesh of each cable against the respective truncated-cone cavity and thereby establishing the contact with the metal plug; the said carriage will be blocked against said flat bottom by means of a screw (62) which passes through the metal part of the plug body between the said truncated-cone cavities.

5. Connection structure as in revendication 4, characterized by the fact that said insulating panel or plate carrying the printed circuit is attached to the insulating bush of the central pivot-pin by means of soft soldering of the ends of aforementioned pin to said panel.

6. Connection structure as in revendication 4 characterized by the fact that said panel carrying the printed circuit is connected to the end of said parallel insulator bushes by means of soft soldering of the ends of the metal conductors passing through said bushes.

7. Connection structure according to revendications 5 and 6, in which said panel carrying the printed circuit is placed between the aforementioned cable bodies (31, 32) and has earth contact points with one of these bodies; the two bodies are fastened together by pins (47), integral with one body (32) and clinched in holes of the other body.

8. Connection structure as in revendications 4 to 6, characterized by the fact that the clamping elements in insulating material (44) are in the form of truncated pyramids, and activated by the aforementioned coaxial screws (45) on the conductors inserted in the bushes.

9. Connection structure as in revendications 4 to 6, characterized by the fact that said clamping elements in insulating material (145) are in the form of catches operated by springs.

10. Connection structure as in the previous revendications, characterized by the fact that aforementioned central pivot-pin is connected, on the side with the small chute, to the printed circuit by means of soft soldering, thereby binding strongly together the insulating bushes, the printed circuit and the central pivot-pin, and so creating an electric contact between the various elements which will suffer only slight losses in the high-frequency signal during the transfer.

11. Connection structure as in the previous revendications, characterized by a direct link between the central pivot-pin and the conductors inserted in the bushes, and the absence of a panel carrying the electronic circuit.

12. Connection structure as in any of the revendications from 5 to 11, where each truncated-cone appendage with sharp edge (53) has elasticated sections like a pincer, where the clamping carriage (33) has a conical cavity which fits the external surface of said appendage so as to clamp towards the middle said elasticated pincer sections; where the coaxial cable is inserted axially into said carriage and said truncated-cone appendage in such a way that its braided wire or net mesh - once stripped - can be tightly accommodated in said truncated-cone pincer appendage when the carriage is held by the clamping.

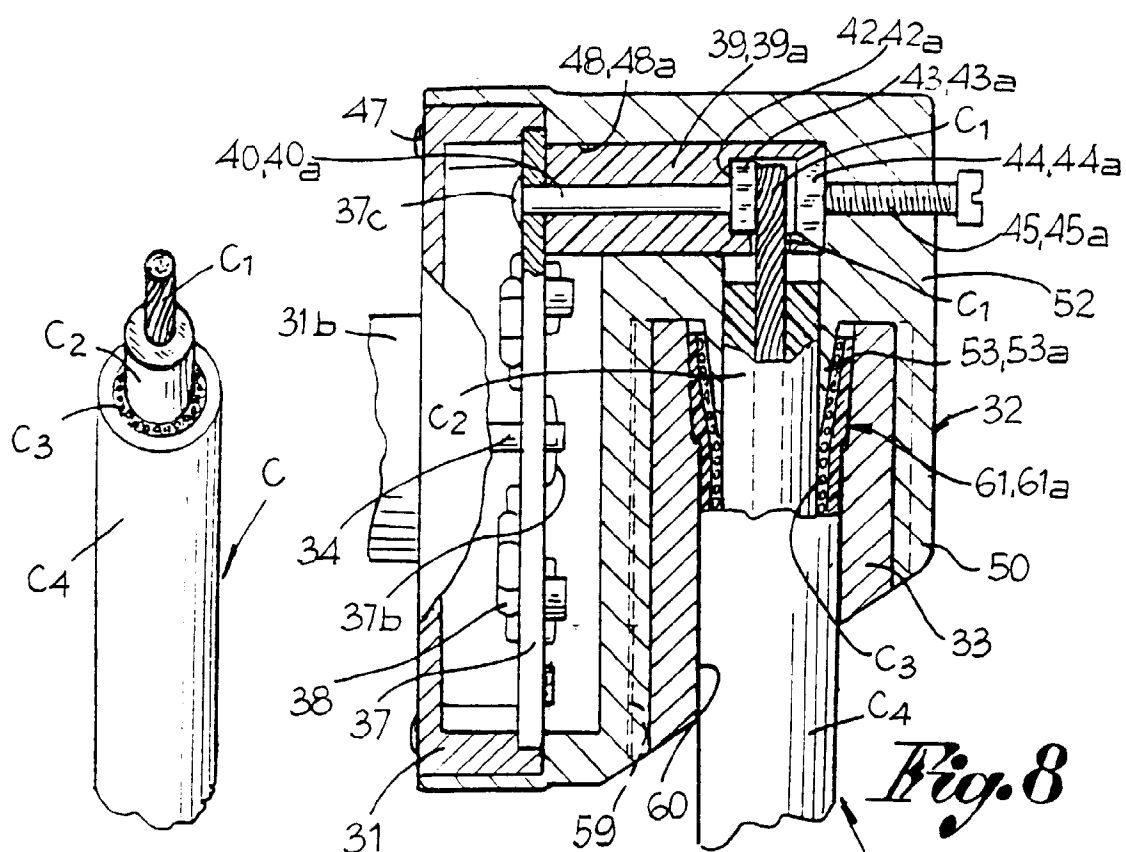


Fig. 1

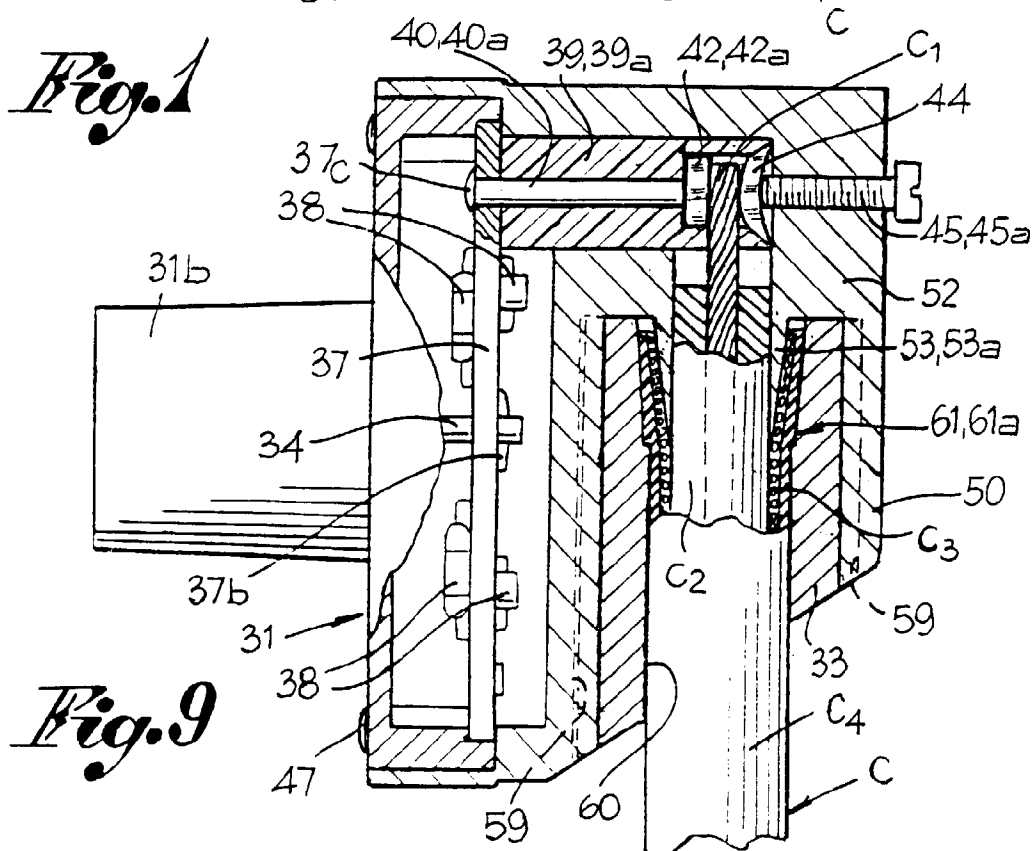
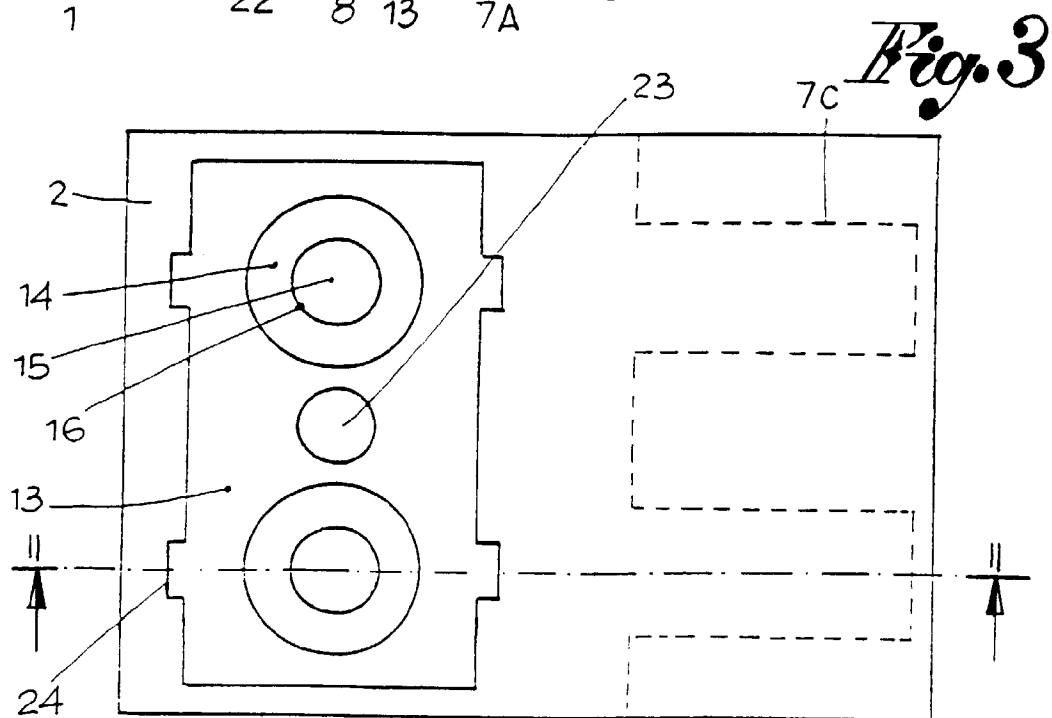
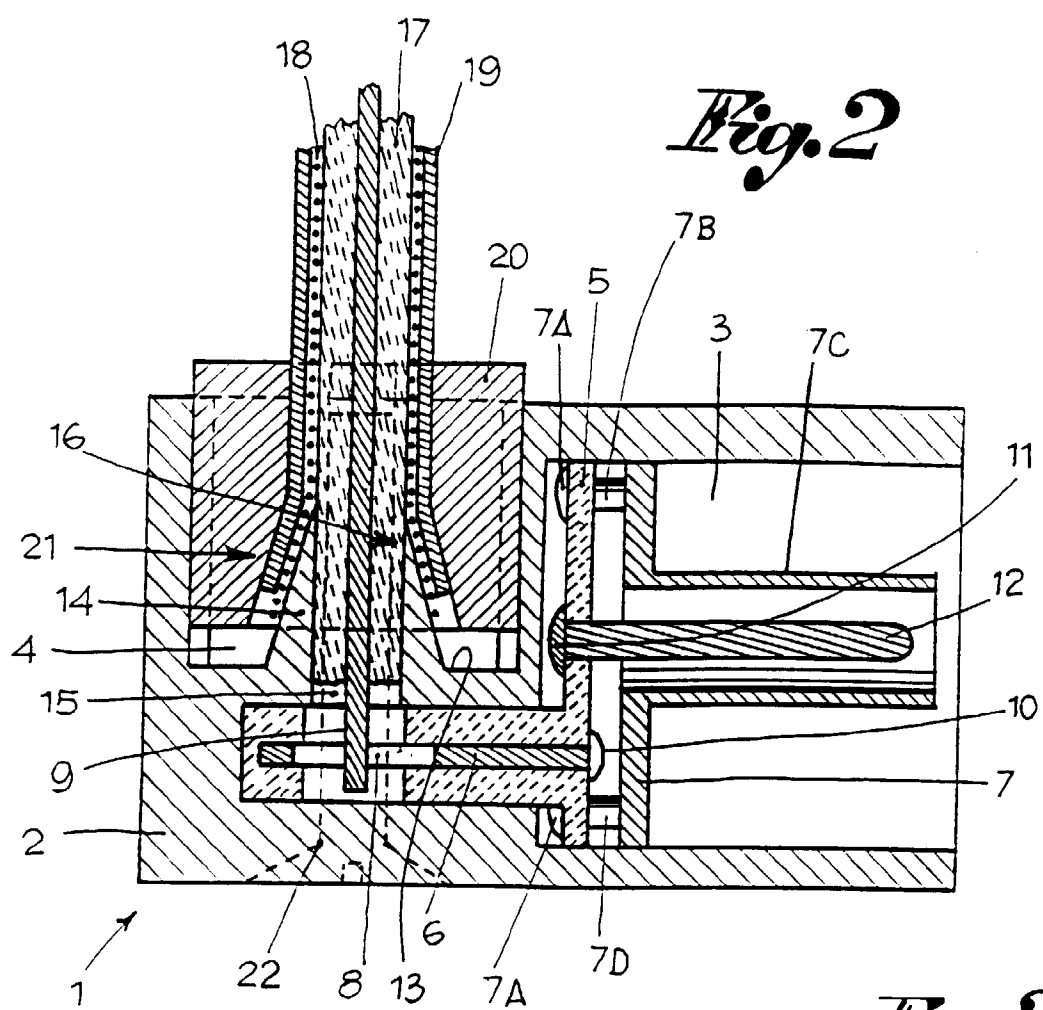


Fig. 9



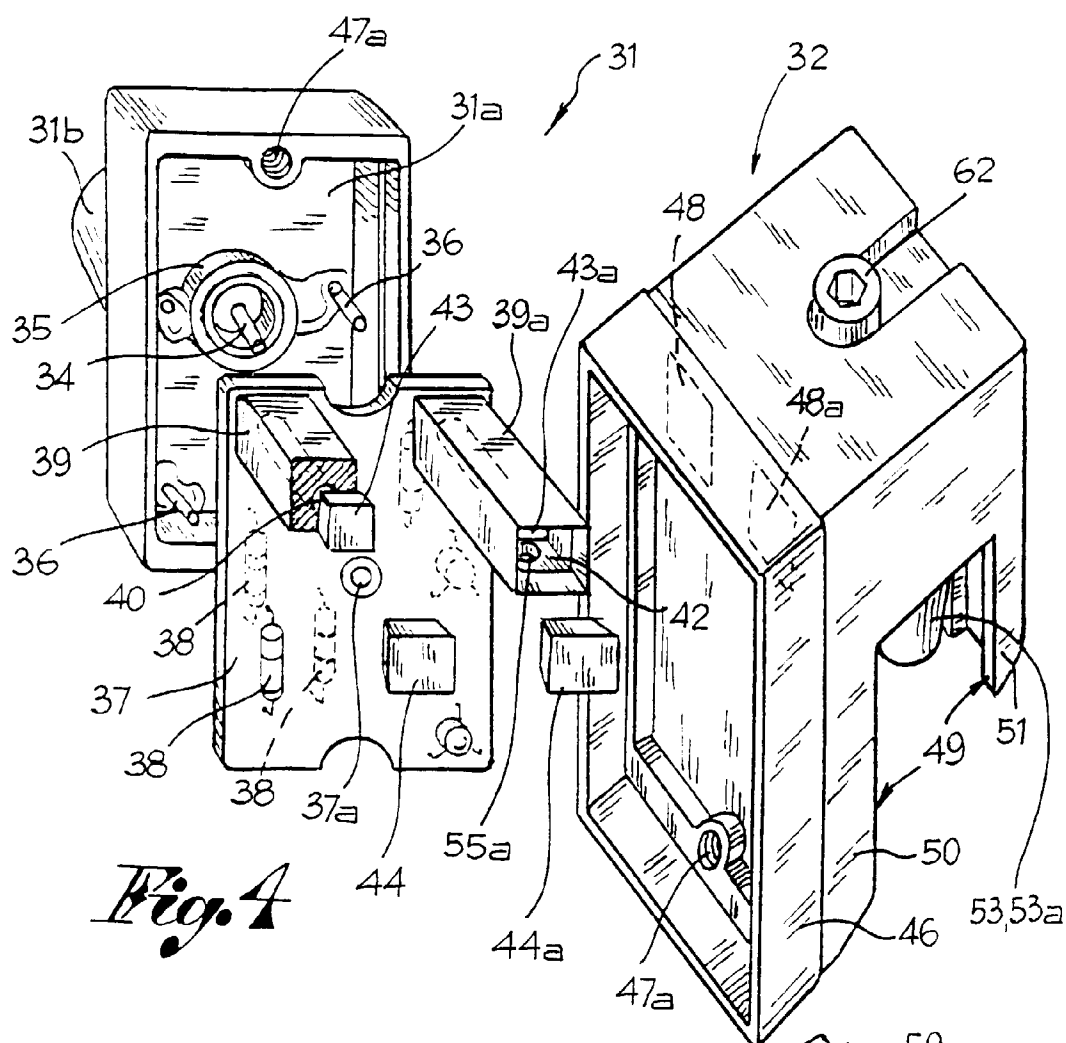


Fig. 5

