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(54) TELECOMMUNICATIONS TERMINAL BLOCK

FERNMELDEANSCHLUSS-KLEMMENBLOCK

BLOC DE FONCTION POUR TELECOMMUNICATIONS

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Description

Field of the Invention

This invention relates primarily to telecommunications terminal blocks by means of which multi-core cables, often containing many tens or hundreds of conductor pairs, may be terminated for final connection to drop wires that lead to individual subscriber's telephones, and for convenience will be described in such terms. The invention may, however, be useful for making other similar electrical connections.

Background of the Invention

Various types of terminal blocks have been used in the telecommunications industry, which provide some means for anchoring an incoming multi-core cable and which have a number of pairs of conductors, known as binding posts, to a base of each of which a conductor of the cable is more or less permanently connected. A top part of each binding post protrudes above an upper surface of the block, and is screw-threaded. A stripped drop wire may be wrapped around the exposed binding post and secured with a washer and nut, thus making a breakable electrical connection between a core of the incoming cable and the drop wire. A terminal block may the incoming cable and the drop wire. A terminal block may typically provide for connections to up to 25 pairs of conductors, a pair of conductors of course being required for each telephone.

Several problems may arise with such terminal blocks, in particular corrosion. The binding posts, washer and nuts, and drop wires are liable to corrosion and other environmental damage which results in interference and cross-talk etc. on telephone lines. Provision of a permanent seal around the binding posts or around the whole block is generally not practical since access to the conductors for testing of the lines or for rearrangement of the lines may be required. An excellent re-enterable technique for encapsulation of binding posts is marketed by Raychem under the trademark Termseal, and is disclosed in U.S. 4,634,207, the disclosure of which is incorporated herein by reference. This tech-. nique generally requires however, that badly corroded binding posts be properly cleaned and that new washers and nuts be employed before the technique is carried out. That may not always be convenient or possible to ensure.

A further problem is inherent in the design of prior art terminal blocks, in that they require that the drop wires be pre-stripped at their ends before connection to the binding posts. Also, in the case of multi-core drop wires (generally two cores side-by-side, giving the drop wire an oval or almost rectangular cross-section), the drop wire has to be split, i.e. its cores separated for separate connection to spaced-apart binding posts. Thus the wire is split in two, and insulation removed from each of the resulting two wires, and connection then made to the binding posts, after cleaning in the case of repair to an installed block.

The present invention is able to overcome such problems as these by providing an article and a method whereby a non-stripped, non-split, multi-core drop wire can be connected to an existing, prior art terminal block (an exercise that may be referred to as rehabilitation) and preferably to terminal blocks of different binding post separation.

Summary of the Invention

The present invention therefore provides a terminal block having at least one pair of birding post projective, from a Surface of the terminal block characterize by an adapter by means of which cores of a multi-core drop wire can be connected to a pair of binding posts of a terminal block, which comprises:

(a) two caps that can be received on respective binding posts; and

(b) a housing having:

(i) two first apertures each extending from a first surface to a second surface of the housing, the housing being positionable with the first surface adjacent the terminal block and the binding posts within respective said first apertures such that the posts can receive respective caps at the second surface, the caps extending within respective said first apertures; and

(ii) a second aperture that passes between, and is in communication with each of, said first apertures, each first aperture intersecting the second aperture at different lateral sides thereof and the second aperture being capable of receiving said drop wire such that respective cores thereof pass through respective first apertures and are contacted by respective caps when received by respective binding posts within the first apertures.

The term "binding post" will be readily understood by those skilled in the art. The term means a terminal, generally small and screw threaded, used to make electrical connections to wires. Usually a binding post is part of a terminal block. Prior art binding posts have a male screw-thread, i.e. have the form of bolts, and nuts are screwed over them to secure wires for electrical connection. In the present invention caps, (having a female screw-thread, i.e. having the form of nuts but optionally also having for example insulation-displacement means or recesses for holding sealing material) may be used on such binding posts. As will be clear from the text, the term "binding post" (and the term "terminal") is used herein also to include a connection means that has a fe-

male screw-thread (i.e. has the form of a nut) and into which a cap, having the form of a bolt, may be screwed. This type of binding post (see figure 8) may be mounted in a hole in a terminal block, for use with a cap such as that shown in figure 9.

Detailed Description of the Invention

The housing of the adapter used in the invention preferably comprises a block of insulating, generally plastics, material whose first and second surfaces are substantially planar (but may have recesses in them for receiving sealing material etc.) and are mutually parallel. The first and second surfaces will generally have a major dimension of 2-10, especially 3-6 cm, and a minor dimension of 1-5, especially 1.5-3 cm. The separation between the first and second surfaces, i.e. the thickness of the block, is preferably 0.5-3, especially 0.75-1.5 cm. Where the adapter is used for rehabilitation of terminal blocks such as Western Electric 9AI or TII Model 325 the block is preferably about 2.5 X 4 cm by 1.0 cm thick. Several such blocks can be positioned side-by-side over several pairs of binding posts, the pairs being about 2.5 cm apart, and the ppsts of each pair about 2.2 cm apart.

The housing may be specially shaped such that two or more can be positioned side-by-side in substantially close packing arrangement: its first and second surfaces may be thought of being rectangular with one or more corners removed to allow this close-packing, bearing in mind that a stiff drop wire emerging from the second aperture may have to be accommodated. The housing may therefore have first and second sides that extend between the first and second surfaces, the drop wire emerging, say, from an opening in the second side. The first side will then preferably have a substantially similar shape (at least as seen in plan view of the housing) to the combined shape of the second side plus a substantially straight drop wire extending therefrom.

The second aperture is preferably straight since the drop wire may be stiff, and thus difficult to insert into a curved aperture, particularly if, as is preferred, the drop wire is a close fit in the aperture. The aperture is preferably elongate and closed in transverse cross-section (although it may, for example, comprise an open channel). This is because such an aperture may be better able to locate the drop wire with respect to the first apertures and therefore to the binding posts for proper contact with the caps. We prefer that the second aperture is of non-circular cross-section such that the cores of a multi-core drop wire therein of non-circular cross-section are maintained in fixed orientation with respect to the first apertures, and therefore to the binding posts.

The first apertures are preferably each of closed, more preferably circular, cross-section. Each first aperture may be of smaller diameter (preferably substantially equal to that of a binding post) at the first surface, and of larger diameter at the second surface. That larger diameter is preferably substantially equal to the diameter of a part of the cap that the aperture will receive when the cap is positioned on the binding post when received by the aperture. The aperture is thus stepped, and the transition from larger to smaller diameter limits the extent to which the cap is received on the binding post, and thus may prevent damage to the underlying drop wire. Other means may, however, be provided for limiting travel of the cap on the binding post, for example a closed end of the cap may ground on the top of the post.

The caps preferably include insulation displacement means, for example a cutting bottom edge. Thus, as they are brought down over the binding posts they cut into the insulation of the underlying drop wire. It is desirable that they cut through the insulation, and cannot be advanced sufficiently further that they excessively damage the cores of the drop wire. Hence, the preferred means for limiting travel mentioned above. Thus, the second aperture may break into the first aperture at the above-mentioned transition of diameters, such that a core ofa drop wire in the second aperture lies predominately in the part of smaller diameter whereas the insulation to be displaced lies in the part of larger diameter and is therefore accessible to the insulation displacement edge of the cap.

The binding posts and caps are preferably screw-threaded, so that caps are simply screw-threaded down onto the posts. The insulation means its then preferably an annular cutting edge, that overlaps one core, but not both cores, of the drop wire. The second aperture may therefore pass obliquely between two binding posts such that one edge of a drop wire therein lies adjacent one post and the opposite edge lies adjacent the other post. When the caps are screwed down over the posts, one cuts into one half of the drop wire, and the other into the other half, thus making contact to the cores. We prefer that slackening-off of the caps results in breaking of contact to the cores, particularly without complete removal of the caps. This allows independent testing of a circuit from the terminal block back to the central office, or on to the subscriber by selective slackening-off of one of the caps from a pair of binding posts.

A sealing material may be provided that encapsulates the binding posts, caps and/or drop wires to provide further environmental sealing, although the need for such sealing material may be reduced in the present invention since the vulnerable surfaces and the connections to be made may be buried within the housing.

A preferred sealing material comprises a gel, for example based on polyurethane or silicone. As an example a material may be mentioned- that is made by gelling curable polyurethane precursor materials in the presence of substantial quantities of minerals oil, vegetable oil or plasticizer or a mixture of two or more of them. Also, a suitable material may be made by curing reactive silicones with non-reactive extender silicones. The material may contain additives such as moisture scavengers (e.g. benzoyl chloride), antioxidants, pigments and fungicides. The material is-preferably electrically-insulating

and hydrolytically-stable.

Weprefer that the sealing material have a cone penetration value as measured by ASTM D217-68 at 21°C of 100-350 (10^{-1} mm), more preferably 150-350, especially 200-300 (10^{-1} mm). Cone penetration is measured on an undisturbed sample using a standard 1:1 scale cone (cone weight 102.5 g, shaft weight 47.5 g) the penetration being measured after 5 seconds. The material preferably has an ultimate elongation as measured by ASTM D638-80 at 21°C of at least 200%, preferably at least 500%, especially at least 750%. In the measurement of elongation, a Type 4 die is used to cut the sample, and elongation is measured at 50 cm per minute. We have found that with such materials it is possible to provide excellent encapsulation of the binding posts, caps and/or drop wires etc., particularly if the material is maintained under compression around them, but that it can be substantially cleanly removed from them for inspection or repair etc. Such sealing material may be provided within the caps, or within recesses in the housing.

The terminal block of the invention may incorporate any of the relevant features described above in connection with the adapter. In general, the terminal block will comprise a housing having at least 2 pairs, preferably 2-25, more preferably 2-10, especially 5 or 6 pairs of binding posts. Each pair of binding posts will have associated with it an adapter with an aperture that can receive a drop wire as described above. The terminal block may have means, such as a recess, for accommodation of an end of a multi-core cable, and may have means for providing strain relief to the cable. It may be housed in an enclosure.

Brief Description of the Drawings

Figure 1 shows a prior art terminal block;

Figure 2 shows an adapter used for rehabilitation of a prior art terminal block in accordance with the invention;

Figure 3 shows a terminal block housing, what is however not the subject of the present claims;

Figure 4 is a plan view of a preferred adapter housing, together with a drop wire;

Figures 5A and 5B are views of terminal blocks, fitted with adapters and drop wires;

Figure 6 is a section through a partially assembled adapter as used in the invention;

Figure 7 shows a holding means that may be used with two single core drop wires, for insertion into the adapter;

Figure 8 shows a terminal block which is however not the subject of the present claims; and

Figure 9A and 9B show caps for the terminal block of figure 8.

Figure 10-13 show an adapter that can be adjusted to suit different binding post separations.

Figure 1 shows a prior art terminal block 1 comprising a housing 2 carrying five pairs of binding posts 3. A drop wire 4 is shown connected to a binding post by means of washers 5 and a nut 6.

An adapter 7 of the invention is shown in figure 2, in position ready to be placed over binding posts 3 of a prior art terminal block housing 2. The adapter 7 comprises a housing 8 and caps 9. The housing 8 has two first apertures 10 extending from a first surface 11, which will lie adjacent the terminal block, to a second surface 12. The first apertures have greater size 13 at the second surface 12, and smaller size 14 at the first surface 11. The greater size 13 is for accommodation of a part 15 of the caps 9, and the smaller size 14 is for accommodation of the binding posts 3. A second aperture 16 passes between, and is in communication with each of, the first apertures. A multi-core drop wire may be positioned in the second aperture, such that respective cores of the drop wire pass through respective first apertures. Thus, when the caps 9 are positioned over the binding posts, parts 15 thereof will contact the respective cores, if necessary after first passing through the drop wire insulations. The second aperture preferably breaks into the first aperture to such an extent that less than 67% (more preferably less than 50%) of a transverse domension of the second aperture lies within the first aperture. In this way only one core of a two core drop wire will lie within any given first aperture and be capable of being contacted by any given cap.

The adapter may have more than two first apertures, and may have more than one second aperture.

The adapter may be used in conjunction with means for providing electrical protection to the circuits to be connected, for example against lightning strikes. Such protection may comprise a block that is first positioned over the binding posts, and which has its own binding posts over which the adapter is in turn positioned. The protection may operate by switching high voltages to ground.

A terminal block 2 is shown in figure 3. It is not, however, the subject of the present claims. This block 2 may be regarded as similar to a series of adapters having binding posts 3 fixed thereto. A first terminal block aperture 17 can be seen to pass between the binding posts 3, and is capable of receiving a multi-core drop wire such that respective cores thereof are adjacent respective binding posts. Reference to the first aperture passing between the binding posts is to be taken to include a situation where the binding posts stop short of the level in the block of the aperture, or in other words where the aperture is above (as drawn) the tops of the binding

posts. In this case the caps may have threaded portion that extend down below a part that engage the drop wire in order to meet the binding posts. The situation illustrated (namely where the aperture lies between the top and the bottom of each post) will be preferred where the binding posts have the form of bolts, and the caps have the form of nuts. Where, however, the binding posts have the form of nuts and the caps have the form of bolts, the aperture will preferably be positioned above the tops of the binding posts. The terminal block preferably has from 2-25 pairs of binding posts, only one pair being shown. The conductors of a multi-core cable to be connected to drop wires may be connected to the binding posts in any suitable way, for example by soldering to their bases.

Figure 4 is a plan view of a preferred adapter housing 12 of the invention. The two parts 13, 14 of the first apertures can be seen, as can the path of the second aperture 16. A multi-core drop wire 18, having two conductor cores 19, is shown ready to be slid into the aperture 16. The adapter housing 12 is shaped in figure 4 to provide a better fit when several such housings are placed side-by-side on a terminal block. This is shown in figure 5.

In figure 5A, five adapter housings 7 are positioned over five pairs of binding posts 3 on a terminal block housing 2. The left hand adapter housing 7 is shown with caps 9 in place. Drop wires 18 are shown extending into the adapter housings, and the housings can be seen to be shaped to allow a substantially close packing arrangement, their lower left-hand corners cut-away to accommodate drop wires of adjacent housings. Thus, first side 20 of each terminal block has a substantially similar shape to the combined shape of a second side 21 plus a substantially straight drop wire 18 extending therefrom.

The design of figure 5B is similar to that of figure 5A, but the binding posts of each pair are staggered along the length of the block. This allows the drop wires to leave the adaptors on the block in a direction substantially perpendicular to the long sides of the block. A close-packing arrangement of the adaptors may still be achieved.

Figure 6 is a partial section through a part of an adapter having a drop wire 18 inserted therein, and positioned over a terminal block housing 2 and binding posts 3. The drop wire 18 can be seen within aperture 17 and passing behind the left-hand binding post 3 such that core 19A will be contacted by cap 9 when screwed down over that binding post. The drop wire 17 then passes out of the section in front of, and adjacent the right-hand binding post. Core 19B will be contacted by a cap on that binding post.

The cap 9 can be seen to have an internal screw thread, which engages screw threads of the binding post 3. The cap also has a part 15 that will extend into an upper part 13 of the first aperture, a base of the part 15 having an insulation displacement cutting edge 22 that cuts through insulation of the drop wire to contact a core thereof. The cutting edge 22 is prevented from severing a core by its grounding on the base 13A of the wide upper part 13 of the first aperture. The cap may be provided with a sealing material such as a gel, preferably in the form of a collar 23.

The adapter housing may have a recess 24 within which may be positioned a sealing material such as a gel, again preferably in the form of a collar 25. When the caps are tightened down onto the binding posts, the adapter housing is forced against the terminal block housing 2, thus causing the sealing material to be displaced around the surfaces of the binding posts, cap and drop wire. The sealing material may be retained under compression by some means for example by the extent to which the cap is tightened on the binding post. When the cap is in position it can be seen to make electrical connection from the core of the drop wire to the binding post, which in turn may be connected to a conductor of a multi-core telecommunications cable. The contact between the cap and the core may be maintained by some resilient bias, for example that provided by compression of the insulation of the drop wire under the core, or by other means.

The adapter and terminal block of the invention may be used with stripped multi-core drop wires or with pairs of single core drop wires. If desired, some means may be provided to hold two such single core drop wires in proper position relative to one another, for example by providing some holding means that may be folded around the pair or into which the pair may be slid. In this way, a multi-core drop wire may be said to be formed from single core wires. The insulation-displacing caps may then cut through this holding means in the same way that it cuts through the insulation of a two-core drop wire. We prefer that this holding means can be folded around the pair and that two parts of it can snap together, optionally causing the drop wires to be cut to length. A holding means 26 is illustrated, together with a pair of drop wires 27 in figure 7. It may have a live hinge 28, means 29 for locking it closed, cutting means 30 for cutting the wires 27 to length, and means 31 for locating the wires.

Figure 8 shows a novel terminal block 2 having female screw-threaded binding posts 31. It is not, however, the subject of the present claims. The caps 9 have male screw-threads 32, which can be screwed into the binding posts 31. The caps may also have an insulation-displacement cutting edge 22. Drop wires 18 are shown entering apertures 17. The conductors of a multi-core cable 33 may be connected to the posts 31 at the base of the block 2. The binding posts 31 may lie flush with bases of apertures 10 in which case the threads 32 will extend below edges 22 of the caps. Alternatively, the posts 31 may extend above the bases of the apertures 10 (as drawn), in which case the threads 32 need not extend below edges 22. Drop wire guide or support means 34 are also shown.

Figures 9A and 9B, show, in partial section, a preferred cap 9 having male screw-threads 32. The cap has an insulation cutting edge 22 and a sealing material 23.

The block (or adapter) with which such caps are used need be provided with no sealing material, since where desired it can be supplied in the caps. Thus, if sealing material becomes ineffective or partially lost, a new cap, pre-filled with sealing material, can be used. The cap may be provided with means 35, for example as a screw-threaded or other plug, that can make and break electrical connection between the external screw threads 32 and the insulation cutter 22. Thus, in the configuration of figures 9A the means 35 is partially removed thus breaking connection between threads 32 and cutter 22, thus breaking connection between the multi-core cable and the drop wire. In figure 9B the means 35 is screwed home, thus making the connection. This make and break capability may be useful for selective testing of different parts of a telephone circuit employing a terminal block of the invention. Alternatively, breaking of the contact may require slight unscrewing of the cap 9, the means 35 being provided merely to cover a hole in the cap, which hole may serve to provide a contact point for a testing probe.

Figures 10-13 illustrate adapters having a variable separation between first aperture thereof. Such an adapter preferably has two first apertures but may have more.

Figure 10 illustrates in disassembled form an adapter comprising a housing 8 having two parts, a first part 8A at the left-hand side of the figure and a second part 8B at the right hand side of the Figure. One first aperture 10 runs through the first part 8A and a second first aperture 10 runs through the second part 8B. Each of the first and second parts 8A, 8B comprises a base 36 and a wire-holder 37. A portion 16A of the second aperture lies in the wire holder 37 of the first part 8A and another portion 16B lies within the wire-holder 37 of the second part 8B. Generally, the second aperture will extend right through one of the wire holders, and be blind in the other wire holder. The second aperture is preferably of non-circular, generally substantially rectangular or oval, cross-section for close-fitting receipt of a multi-core drop-wire 18. The base of the first part may be unconnected to that of the second part, but we prefer that they be connected together, for example slidably connected together. One technique of slidable connection comprises telescoping of the first and second parts together, for example by telescoping of pins 38 mounted on one base into apertures in the other base. Sliding, or other movement of one base (or part in general) relative to the other results in a change in the separation between the two first apertures 10. Thus, a given adapter may be used on design of terminal block having different separations between its binding posts.

When the bases 3B are moved towards or away from each other it will in general be necessary that the wire-holders 37 be able to rotate, and preferably each is each of a pair is able to be angularly rotated about an axis of a respective first aperture therein without orbital rotation of one part about the other. Preferably the rotation allows the portion 16A and the other portion 16B of the second aperture to be and to remain mutually parallel since this will facititate insertion of the drop wire 18. The wire holders 36 may have a circular protrusion 39 at their undersides which allows rotational mounting in a surface of the base.

Such sliding of the bases 26 and rotation of the wire holders 3B will however result in the portions 16A and 16B becoming laterally separated. Since the amount of variation in spacing of the binding posts is unlikely to be very large, tolerance in the fit of the drop wire in the second aperture may be sufficient to allow insertion of the drop wire.

The effect of separtion of the bases 3B and rotation of the wire holders 37 is shown in figures 11A and 11B.

Figure 12 shows a variation on the design of figures 10 and 11, in which the first and second parts 8A, 8B are slidably fixed to each other, the direction of sliding being substantially parallel to a substantially straight line along which lie the portion 16A and other portion 16B of the second aperture. The pins 38 or other means can be seen to be set at the desired orientation, generally parallel to the portions 16A and 16B.

The adapter of figure 13 comprises a first part 8A and a second part 8B, each of which may be of unitary construction or made of two or more pieces that are fixed, preferably, immovably, together.

Each part has a first aperture 10 having an upper part 13 (as drawn) of larger diameter for receipt of a cap, and a lower part 14 of smaller diameter through which a binding post protrude. The first and second parts 8A, 8B may be interconnected by a flexible connector 40. The connector may comprise a wire, or cord or yarn, or a web of a material.

Such a connector 40 may be bonded to a surface of the parts 8A, 8B, may be inserted into a slot in the parts or may be integral with each part. If desired, the connector may be adjustable in the sense that the separation between the parts 8A and 8B can be altered and then at least temporarily fixed at tne new value.

The first surfaces of the parts 8A, 8B (ie. the undersides as drawn) may have a recess preferably substantially concentric with the first apertures, which recess may contain a sealing material such as a gel. Such a sealing material may provide an environmental seal around binding posts that enter the first apertures.

A part (8A or 8B) of the two part adapter of the general type shown in figure 13, but without the web 40 may be supplied and used alone, ie. without the other of its pair, or they may be used in pairs but supplied without the web.

For the avoidance of doubt it is here stated that the invention provides a terminal block with, an adapter for making electrical connections, particularly in the telecommunications network, and particularly to multi-core cables. Any of the housing, cap, binding posts, cutters, sealing means, etc. may be chosen.

Claims

1. A terminal block (1) having at least one pair of binding post (3) projecting from a surface of the terminal block characterized by a adapter (1) by means of which cores of a multi-core drop wire (18) can be connected to a pair of binding posts (3) of the terminal block (2), which adapter comprises:

   (a) two caps (9) that can be received on respective binding posts (3), and

   (b) a housing (8) having:

   (i) two first apertures (10) each extending from a first surface (11) to a second surface (12) of the housing (8), the housing being positionable with the first surface adjacent the terminal block (2) and the binding posts (3) within respective said first apertures such that the posts can receive respective caps at the second surface, the caps extending within respective said first apertures; and

   (ii) a second aperture (16) that passes between, and is in communication with each of said first apertures (10), each first aperture intersecting the second aperture at different lateral sides thereof and the second aperture (16) being capable of receiving said drop wire such that respective cores there pass through respective first apertures (10) and are contacted by respective caps (9) when received by respective binding posts (3) within the first apertures (10).

2. At a terminal block according to claim 1, in which the caps (9) are threaded such that they can be screwed onto threaded binding posts (3).

3. A terminal block according to claim 1, in which each cap has insulation displacement means (22) which can displace insulation of a drop wire.

4. A terminal block according to claim 1, in which the housing has means (13A) that limits the extent to which the caps can be received within respective said first apertures.

5. A terminal block according to claim 4, in which said means that limits comprises a shoulder (13A) within each of said first apertures (10), said apertures each being of greater size at the second surface than at said first surface.

6. A terminal block according to claim 1, in which each of said first apertures (10) is of substantially circular cross-section.

7. A terminal block according to claim 1, in which said second aperture (16) is of non-circular cross-section such that the cores (19) of a said drop wire therein of non-circular cross-section are maintained in fixed orientation with respect to said first apertures.

8. A terminal block according to claim 1, which additionally comprises:
   (a) a sealing material (23,25) at each of said first apertures and/or within each of said caps.

9. A terminal block according to claim 8, in which said sealing material has a cone penetration value as measured by ASTM D217-68 at 21°C of 100-350 (10-1 mm), and an ultimate elongation as measured by ASTM D638-80 at 21°C of at least 200%.

10. A terminal block according to claim 1, in which said second aperture (16) is substantially straight.

11. A terminal block according to claim 10, in which the housing has first and second sides (20,21), that extend between the first and the second surfaces; the second aperture terminating in an opening in said second side; and
    the first side (20) having a substantially similar shape to the combined shape of the second side (21) plus a substantially straight drop wire (18) extending therefrom, such that two or more said adapters can be positioned side-by-side in substantially close packing configuration.

12. A terminal block according to claim 1, in which said second aperture (16) is elongate and closed in transverse cross-section.

13. A terminal block according to claim 1, in which the housing comprises first and second parts (8A, 8B);

    the first part (8A) having therein one of said first apertures (10) and a portion of said second aperture (16);

    the second part (8B) having therein another of said first apertures (10) and another portion of said second aperture (16);

    the first part being movable relative to the second part.

14. A terminal block according to claim 13, in which the first and second parts (8A,8B) may be arranged such that axes or the two first apertures are substantially parallel, and the first part can be moved relative to the second part such that after the movement said

axes remain substantially parallel and the distance between them has varied.

15. A terminal block according to claim 13, in which the first and second parts (8A,8B) may be arranged such that axes of said portion of the second aperture and of the other portion of the second aperture lie along a common substantially straight line.

16. A terminal block according to claim 15, in which the first and second parts (8A,8B) are slidably fixed to each other, the direction of sliding being parallel to said substantially straight line.

17. A terminal block according to claim 14, in which the first and second parts (8A,8B) can each be angularly rotated about an axis of a respective first aperture therein without orbital rotation of one part about the other.

18. A terminal block according to claim 13, in which orientation of the first part is fixed relative to that of the second part such that axes of the two first apertures are substantially mutually parallel and remain substantially mutually parallel on said movement of the first part relative to the second part.

19. A terminal block according to claim 13, in which each of the first an second parts comprises:

a base (36); and

a wire holder (37);

the wire holder being rotatably mounted in the base;

a part of the second aperture (16) extending through at least part of the wire holder; the first aperture (10) extending through the wire holder (37) and the base (36); and

the base (36) of the first part (8A) being slidably fixed to the base (36) of the second part (8B) such that the distance between axes of the two first apertures can be varied.

20. A terminal block according to claim 19 in which each base has a recess therein at a surface opposite to that in which the wire holder is rotatably mounted, said recess being substantially concentric with said first aperture.

21. A terminal block according to claim 20, in which said recess contains a sealing material.

22. A terminal block according to claim 13, in which each of the first and second parts (8A,8B) has a recess therein at said first surface, said recess being substantially concentric with the first aperture.

23. A terminal block according to claim 22, in which said recess contains a sealing material.

24. A terminal block according to claim 13, in which the first and second parts are unconnected to one another.

25. A terminal block according to claim 13, in which said portion and said other portion of the second aperture are of non-circular cross-section and in which the second aperture breaks into each of the first apertures to such an extent that less than 67% of a transverse dimension of the second aperture lies within each first aperture.

26. A terminal block according to claim 13, in which the first and second parts are connected together by a flexible web (40).

Patentansprüche

1. Klemmenblock (1), der wenigstens ein Paar von Klemmenbolzen (3) hat, die von einer Oberfläche des Klemmenblocks vorstehen, gekennzeichnet durch einen Adapter (7), mit dessen Hilfe Seelen einer Mehrseelen-Hausanschlußleitung (18) mit einem Paar von Klemmenbolzen (3) des Klemmenblocks (2) verbunden werden können, wobei der Adapter folgendes aufweist:

(a) zwei Kappen (9), die auf jeweiligen Klemmenbolzen (3) aufgenommen werden können, und

(b) ein Gehäuse (8), das folgendes hat:

(i) zwei erste Öffnungen (10), die jeweils von einer ersten Oberfläche (11) zu einer zweiten Oberfläche (12) des Gehäuses (8) verlaufen, wobei das Gehäuse mit der ersten Oberfläche benachbart dem Klemmenblock (2) und den Klemmenbolzen (3) innerhalb der jeweiligen ersten Öffnungen positionierbar ist, so daß die Klemmenbolzen entsprechende Kappen an der zweiten Oberfläche aufnehmen können, wobei sich die Kappen in die jeweiligen ersten Öffnungen erstrecken;

(ii) eine zweite Öffnung (16), die zwischen den ersten Öffnungen (10) verläuft und mit jeder der ersten Öffnungen (10) in Kommunikation ist, wobei jede erste Öffnung die zweite Öffnung an verschiedenen Quersei-

ten davon schneidet und wobei die zweite Öffnung (16) fähig ist, die Hausanschlußleitung aufzunehmen, so daß jeweilige Seelen derselben durch entsprechende erste Öffnungen (10) verlaufen und mit entsprechenden Kappen (9) in Kontakt gelangen, wenn sie von entsprechenden Klemmenbolzen (3) innerhalb der ersten Öffnungen (10) aufgenommen sind.

2. Klemmenblock nach Anspruch 1, wobei die Kappen (9) Gewinde haben, so daß sie auf Gewinde aufweisende Klemmenbolzen (3) schraubbar sind.

3. Klemmenblock nach Anspruch 1, wobei jede Kappe eine Isolierungsverdrängungseinrichtung (22) hat, die Isolierung einer Hausanschlußleitung verdrängen kann.

4. Klemmenblock nach Anspruch 1, wobei das Gehäuse eine Einrichtung (13A) hat, die das Ausmaß begrenzt, bis zu dem die Kappen jeweils in den ersten Öffnungen aufgenommen werden können.

5. Klemmenblock nach Anspruch 4, wobei die begrenzende Einrichtung eine Schulter (13A) in jeder der ersten Öffnungen (10) aufweist und die Öffnungen an der zweiten Oberfläche jeweils größer als an der ersten Oberfläche sind.

6. Klemmenblock nach Anspruch 1, wobei jede der ersten Öffnungen (10) im wesentlichen Kreisquerschnitt hat.

7. Klemmenblock nach Anspruch 1, wobei die zweite Öffnung (16) nichtkreisförmigen Querschnitt hat, so daß die Seelen (19) einer darin befindlichen Hausanschlußleitung mit nichtkreisförmigem Querschnitt in unveränderlicher Orientierung in bezug auf die ersten Öffnungen gehalten werden.

8. Klemmenblock nach Anspruch 1, der zusätzlich aufweist:

(a) ein Dichtmaterial (23, 25) an jeder der ersten Öffnungen und/oder im Inneren jeder der Kappen.

9. Klemmenblock nach Anspruch 8, wobei das Dichtmaterial einen Konuspenetrationswert, gemessen nach ASTM D217-68 bei 21 °C, von 100 bis 350 (10^{-1} mm) und eine Bruchdehnung, gemessen nach ASTM D638-80 bei 21 °C, von wenigstens 200 % hat.

10. Klemmenblock nach Anspruch 1, wobei die zweite Öffnung (16) im wesentlichen gerade ist.

11. Klemmenblock nach Anspruch 10, wobei das Gehäuse eine erste und eine zweite Seite (20, 21) hat, die zwischen der ersten und der zweiten Oberfläche verlaufen;

wobei die zweite Öffnung in einer Öffnung in der zweiten Seite endet; und

die erste Seite (20) eine Gestalt hat, die der kombinierten Gestalt der zweiten Seite (21) plus einer davon verlaufenden, im wesentlichen geraden Hausanschlußleitung (18) gleicht, so daß zwei oder mehr der Adapter nebeneinander in einer im wesentlichen dicht gepackten Konfiguration positioniert werden können.

12. Klemmenblock nach Anspruch 1, wobei die zweite Öffnung (16) langgestreckt und im Querschnitt geschlossen ist.

13. Klemmenblock nach Anspruch 1, wobei das Gehäuse einen ersten und einen zweiten Teil (8A, 8B) aufweist;

wobei der erste Teil (8A) darin eine der ersten Öffnungen (10) und einen Bereich der zweiten Öffnung (16) hat;

der zweite Teil (8B) darin eine andere der ersten Öffnungen (10) und einen anderen Bereich der zweiten Öffnung (16) hat;

der erste Teil relativ zu dem zweiten Teil bewegbar ist.

14. Klemmenblock nach Anspruch 13, wobei der erste und der zweite Teil (8A, 8B) so angeordnet sein können, daß Achsen der zwei ersten Öffnungen im wesentlichen parallel sind, und der erste Teil relativ zu dem zweiten Teil so bewegbar ist, daß nach dem Bewegen die genannten Achsen im wesentlichen parallel bleiben und die Entfernung zwischen ihnen geändert worden ist.

15. Klemmenblock nach Anspruch 13, wobei der erste und der zweite Teil (8A, 8B) so angeordnet sein können, daß Achsen des genannten Bereichs der zweiten Öffnung und des anderen Bereichs der zweiten Öffnung entlang einer gemeinsamen, im wesentlichen geraden Linie liegen.

16. Klemmenblock nach Anspruch 15, wobei der erste und der zweite Teil (8A, 8B) gleitbar aneinander befestigt sind und die Gleitrichtung parallel zu der im wesentlichen geraden Linie ist.

17. Klemmenblock nach Anspruch 14, wobei der erste und der zweite Teil (8A, 8B) jeweils um eine Achse einer jeweiligen ersten Öffnung darin winkelmäßig

drehbar sind ohne eine Orbitaldrehung eines Teils um den anderen.

18. Klemmenblock nach Anspruch 13, wobei die Orientierung des ersten Teils relativ zu derjenigen des zweiten Teils unveränderlich ist, so daß Achsen der beiden ersten Öffnungen im wesentlichen parallel zueinander sind und bei der Bewegung des ersten Teils relativ zu dem zweiten Teil im wesentlichen parallel zueinander bleiben.

19. Klemmenblock nach Anspruch 13, wobei jeder von dem ersten und dem zweiten Teil folgendes aufweist:

eine Basis (36); und

einen Leiterhalter (37);

wobei der Leiterhalter in der Basis drehbar angebracht ist;

wobei ein Teil der zweiten Öffnung (16) durch wenigstens einen Teil des Leiterhalters verläuft; die erste Öffnung (10) durch den Leiterhalter (37) und die Basis (36) verläuft; und

die Basis (36) des ersten Teils (8A) an der Basis (36) des zweiten Teils (8B) gleitbar festgelegt ist, so daß der Abstand zwischen Achsen der beiden ersten Öffnungen geändert werden kann.

20. Klemmenblock nach Anspruch 19, wobei jede Basis darin eine Ausnehmung an einer Oberfläche hat, die zu derjenigen entgegengesetzt ist, in der der Leiterhalter drehbar angebracht ist, wobei die Ausnehmung mit der ersten Öffnung im wesentlichen konzentrisch ist.

21. Klemmenblock nach Anspruch 20, wobei die Ausnehmung ein Dichtmaterial enthält.

22. Klemmenblock nach Anspruch 13, wobei jeder von dem ersten und dem zweiten Teil (8A, 8B) darin eine Ausnehmung an der ersten Oberfläche hat, wobei die Ausnehmung mit der ersten Öffnung im wesentlichen konzentrisch ist.

23. Klemmenblock nach Anspruch 22, wobei die Ausnehmung ein Dichtmaterial enthält.

24. Klemmenblock nach Anspruch 13, wobei der erste und der zweite Teil nicht miteinander verbunden sind.

25. Klemmenblock nach Anspruch 13, wobei der genannte Bereich und der genannte andere Bereich der zweiten Öffnung nichtkreisförmigen Querschnitt haben und wobei die zweite Öffnung in jede der ersten Öffnungen in einem solchen Ausmaß eindringt, daß weniger als 67 % einer Querdimension der zweiten Öffnung innerhalb jeder ersten Öffnung liegt.

26. Klemmenblock nach Anspruch 13, wobei der erste und der zweite Teil durch einen flexiblen Steg (40) miteinander verbunden sind.

Revendications

1. Bornier (1) comportant au moins une paire de bornes à écrous (3) faisant saillie d'une surface du bornier, caractérisé par un adaptateur (7) au moyen duquel des conducteurs d'un fil multiconducteur (18) de branchement d'abonné peuvent être connectés à une paire de bornes à écrous (3) du bornier (1), lequel adaptateur comporte :

(a) deux chapeaux (9) qui peuvent être reçus sur des bornes à écrous respectives (3) ; et
(b) un corps (8) ayant :

(i) deux premières ouvertures (10) s'étendant chacune d'une première surface (11) à une seconde surface (12) du corps (8), le corps pouvant être positionné de façon que la première surface soit adjacente au bornier (2) et que les bornes à écrous (3) soient logées dans des premières ouvertures respectives afin que les bornes puissent recevoir des chapeaux respectifs à la seconde surface, les chapeaux s'étendant à l'intérieur des premières ouvertures respectives ; et
(ii) une seconde ouverture (16) qui passe entre lesdites premières ouvertures (10) et qui est en communication avec chacune d'elles, chaque première ouverture intersectant la seconde ouverture à des côtés latéraux différents de celle-ci, la seconde ouverture (16) pouvant recevoir ledit fil de branchement d'abonné de façon que des conducteurs respectifs de celui-ci passent dans des premières ouvertures respectives (10) et que des chapeaux respectifs (9) entrent en contact avec eux lorsqu'ils sont reçus par des bornes à écrous respectives (3) à l'intérieur des premières ouvertures (10).

2. Bornier selon la revendication 1, dans lequel les chapeaux (9) sont filetés de façon à pouvoir être vissés sur des bornes à écrous filetées (3).

3. Bornier selon la revendication 1, dans lequel chaque chapeau comporte un moyen (22) de déplacement d'isolant qui peut déplacer l'isolant d'un fil de branchement d'abonné.

4. Bornier selon la revendication 1, dans lequel le corps comporte un moyen (13A) qui limite la distance sur laquelle les chapeaux peuvent être reçus dans les premières ouvertures respectives.

5. Bornier selon la revendication 4, dans lequel ledit moyen de limitation comporte un épaulement (13A) à l'intérieur de chacune desdites premières ouvertures (10), lesdites ouvertures étant chacune d'une dimension plus grande à la seconde surface qu'à ladite première surface.

6. Bornier selon la revendication 1, dans lequel chacune desdites premières ouvertures (10) est d'une section transversale sensiblement circulaire.

7. Bornier selon la revendication 1, dans lequel ladite seconde ouverture (16) est d'une section transversale non circulaire, de façon que les conducteurs (19) d'un fil de branchement d'abonné qu'elle contient, d'une section transversale non circulaire, soient maintenus dans une orientation fixe par rapport aux dites premières ouvertures.

8. Bornier selon la revendication 1, qui comporte en outre :

(a) une matière d'étanchéité (23, 25) à chacune desdites premières ouvertures et/ou à l'intérieur de chacun desdits chapeaux.

9. Bornier selon la revendication 8, dans lequel ladite matière d'étanchéité présente une valeur de pénétration de cône, telle que mesurée suivant la normale ASTM D217-68 à 21°C, de 100-350 (10^{-1} mm), et un allongement à la rupture, tel que mesuré suivant la norme ASTM D638-80, à 21°C, d'au moins 200 %.

10. Bornier selon la revendication 1, dans lequel ladite seconde ouverture (16) est sensiblement droite.

11. Bornier selon la revendication 10, dans lequel le corps comporte des premier et second côtés (20, 21) qui s'étendent entre les première et seconde surfaces ; la seconde ouverture aboutissant dans un orifice dans ledit second côté ; et
la premier côté (20) ayant une forme sensiblement similaire à la forme combinée du second côté (21) et d'un fil sensiblement droit (18) de branchement d'abonné qui en sort, afin que deux ou plus de deux desdits adaptateurs puissent être placés côte à côte en une configuration sensiblement très serrée.

12. Bornier selon la revendication 1, dans lequel ladite seconde ouverture (16) est allongée et fermée en section transversale.

13. Bornier selon la revendication 1, dans lequel le corps comporte des première et seconde parties (8A, 8B) ; la première partie (8A) contenant l'une desdites premières ouvertures (10) et une portion de ladite seconde ouverture (16) ; la seconde partie (8B) contenant une autre desdites premières ouvertures (10) et une autre portion de ladite seconde ouverture (16) ; la première partie étant mobile par rapport à la seconde partie.

14. Bornier selon la revendication 13, dans lequel les première et seconde parties (8A, 8B) peuvent être disposées de façon que des axes des deux premières ouvertures soient sensiblement parallèles, et la première partie peut être déplacée par rapport à la seconde partie de manière que, après le mouvement, lesdits axes restent sensiblement parallèles et la distance entre eux soit modifiée.

15. Bornier selon la revendication 13, dans lequel les première et seconde parties (8A, 8B) peuvent être disposées de façon que des axes de ladite portion de la seconde ouverture et de l'autre portion de la seconde ouverture s'étendent suivant une ligne commune sensiblement droite.

16. Bornier selon la revendication 15, dans lequel les première et seconde parties (8A, 8B) sont fixées l'une à l'autre de façon coulissante, la direction du coulissement étant parallèle à ladite ligne sensiblement droite.

17. Bornier selon la revendication 14, dans lequel les première et seconde parties (8A, 8B) peuvent chacune être tournées angulairement autour d'un axe d'une première ouverture respective de cette partie, sans rotation orbitale d'une partie autour de l'autre.

18. Bornier selon la revendication 13, dans lequel l'orientation de la première partie est fixe par rapport à celle de la seconde partie de façon que des axes des deux premières ouvertures soient sensiblement mutuellement parallèles et restent sensiblement mutuellement parallèles lors dudit mouvement de la première partie par rapport à la seconde partie.

19. Bornier selon la revendication 13, dans lequel chacune des première et seconde parties comporte :

une embase (36) ; et
un élément (37) de maintien de fil ;
l'élément de maintien de fil étant monté de façon à pouvoir tourner dans l'embase ;
une partie de la seconde ouverture (16) s'éten-

dant à travers au moins une partie de l'élément de maintien de fil ; la première ouverture (10) s'étendant à travers l'élément (37) de maintien de fil et l'embase (36) ; et
l'embase (36) de la première partie (8A) étant fixée de façon coulissante à l'embase (36) de la seconde partie (8B) de manière que la distance entre les axes des deux premières ouvertures puisse être modifiée.

20. Bornier selon la revendication 19, dans lequel chaque embase présente un évidement dans une surface opposée à celle dans laquelle l'élément de maintien de fil est monté de façon à pouvoir tourner, ledit évidement étant sensiblement concentrique à ladite première ouverture.

21. Bornier selon la revendication 20, dans lequel ledit évidement contient une matière d'étanchéité.

22. Bornier selon la revendication 13, dans lequel chacune des première et seconde parties (8A, 8B) présente un évidement dans ladite première surface, ledit évidement étant sensiblement concentrique à la première ouverture.

23. Bornier selon la revendication 22, dans lequel ledit évidement contient une matière d'étanchéité.

24. Bornier selon la revendication 13, dans lequel les première et seconde parties ne sont pas reliées l'une à l'autre.

25. Bornier selon la revendication 13, dans lequel ladite portion et ladite autre portion de la seconde ouverture sont d'une section transversale non circulaire, et dans lequel la seconde ouverture débouche dans chacune des premières ouvertures sur une étendue telle que moins de 67 % d'une dimension transversale de la seconde ouverture s'étend à l'intérieur de chaque première ouverture.

26. Bornier selon la revendication 13, dans lequel les première et seconde parties sont reliées entre elles par un ruban flexible (40).

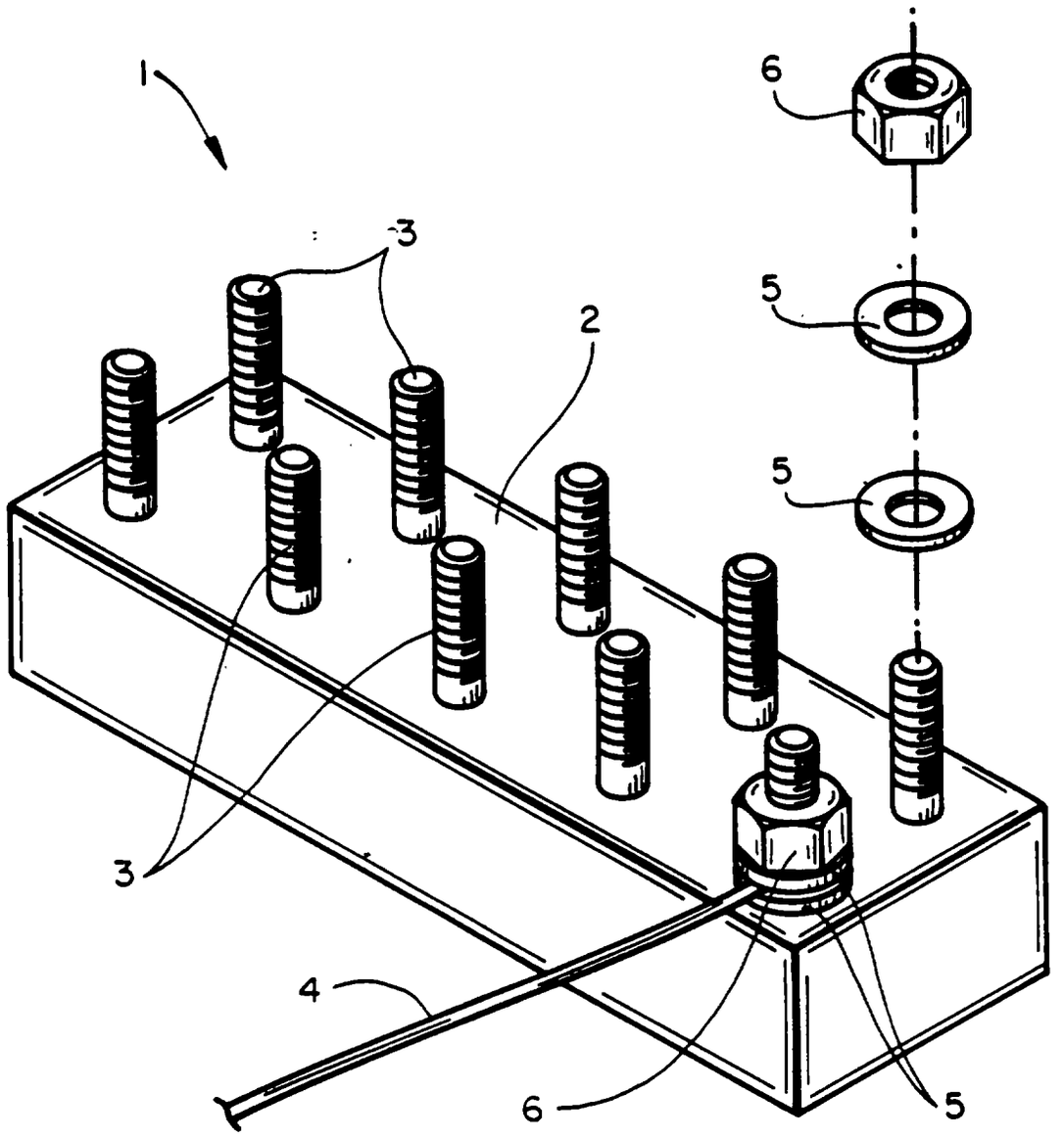


FIG_1
(PRIOR ART)

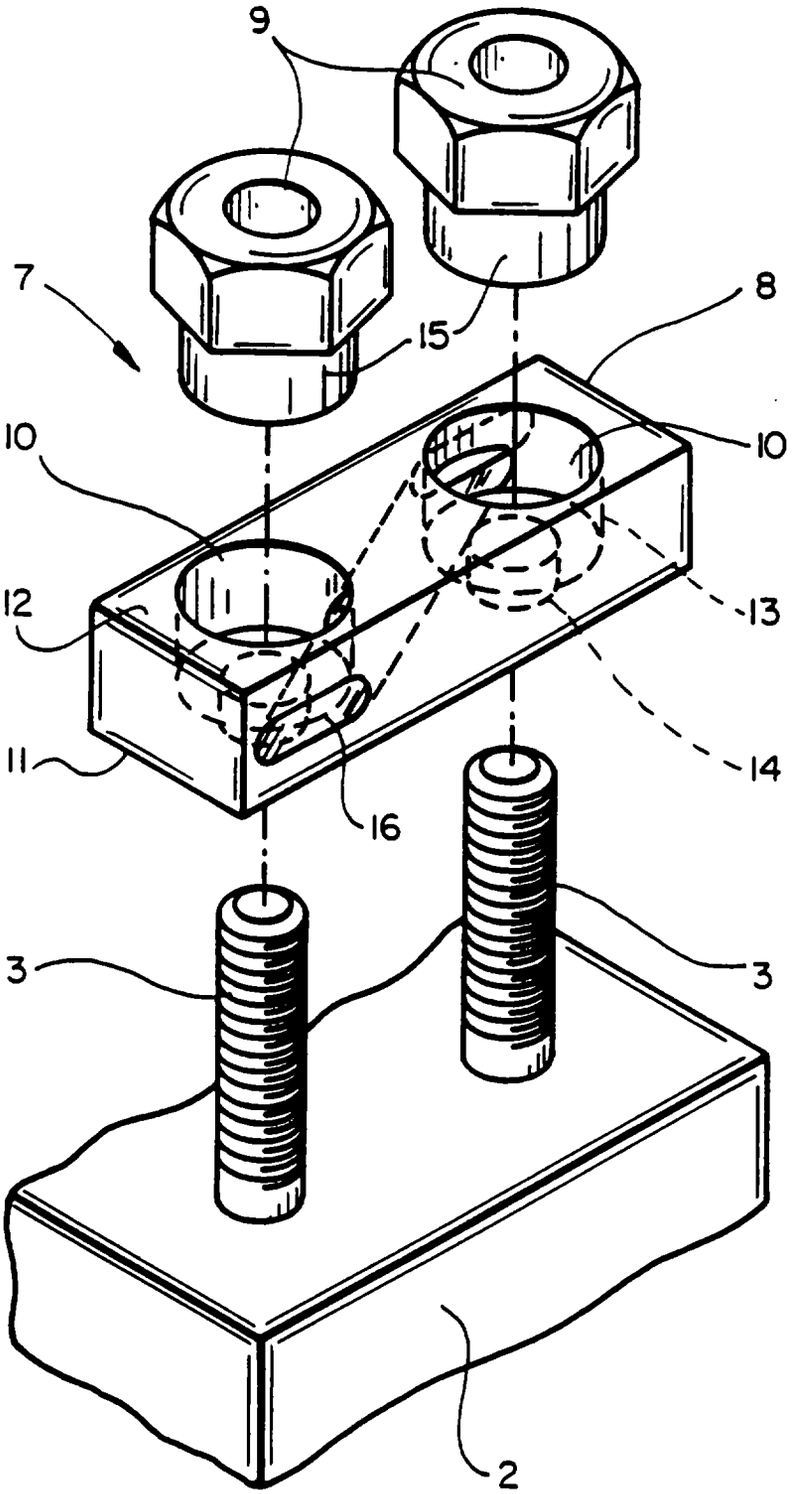


FIG_2

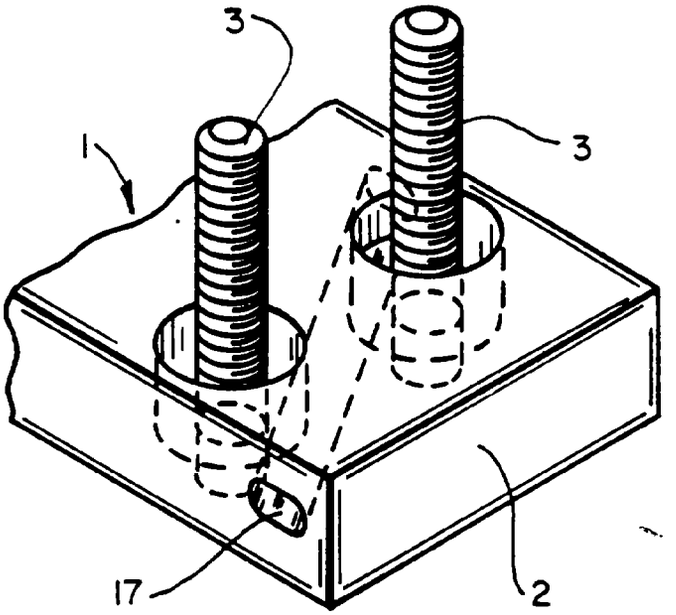


FIG_3

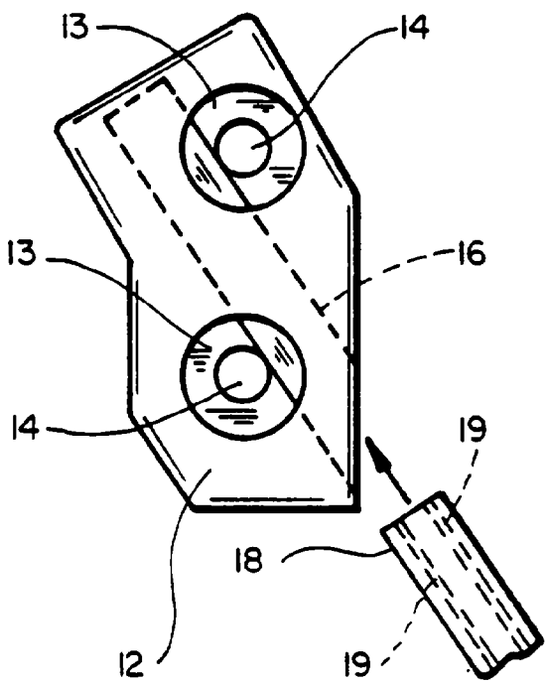


FIG_4

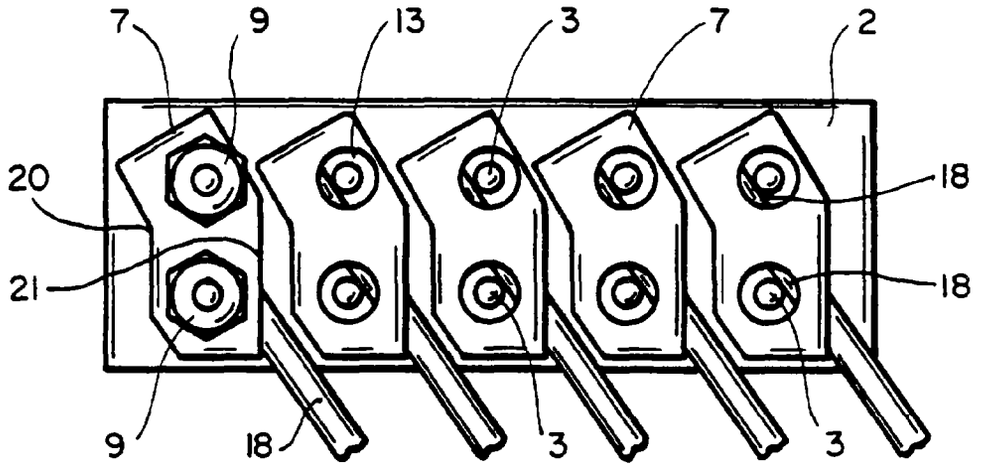


FIG_5A

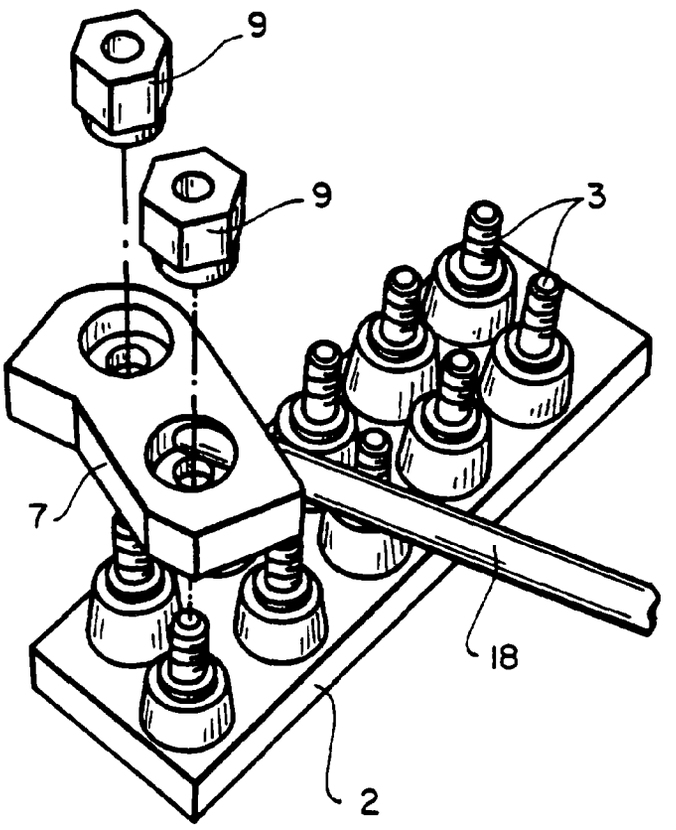
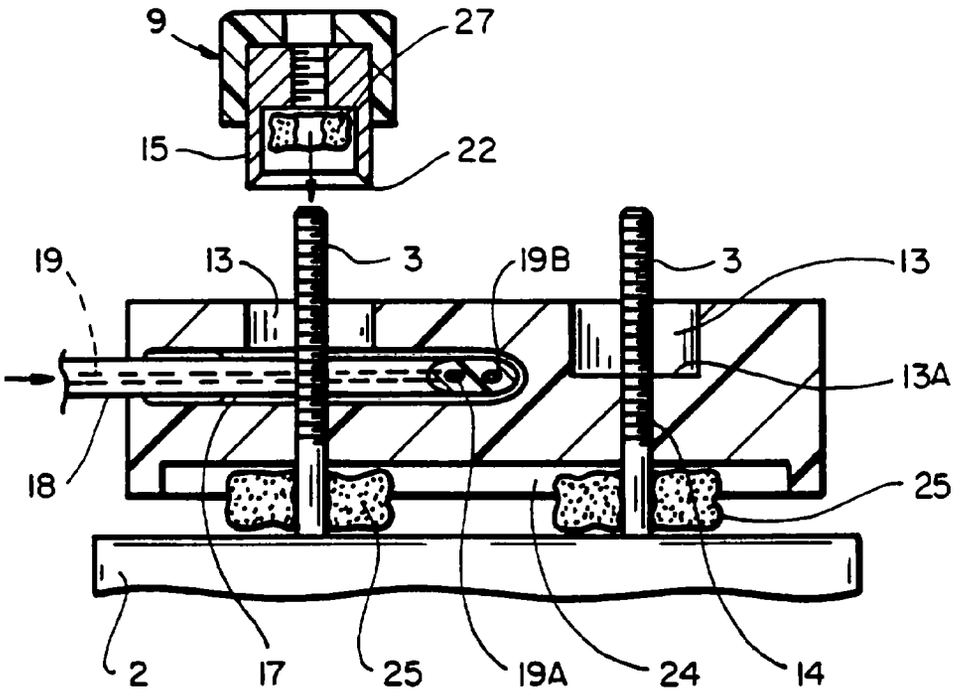


FIG_5B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27
15
22
19
13
3
19B
3
13
13A
18
25
2
17
25
19A
24
14

FIG_6

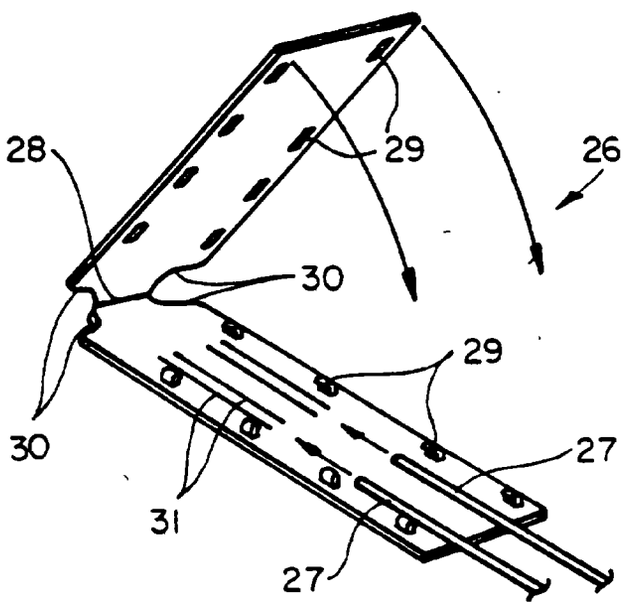
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FIG_7

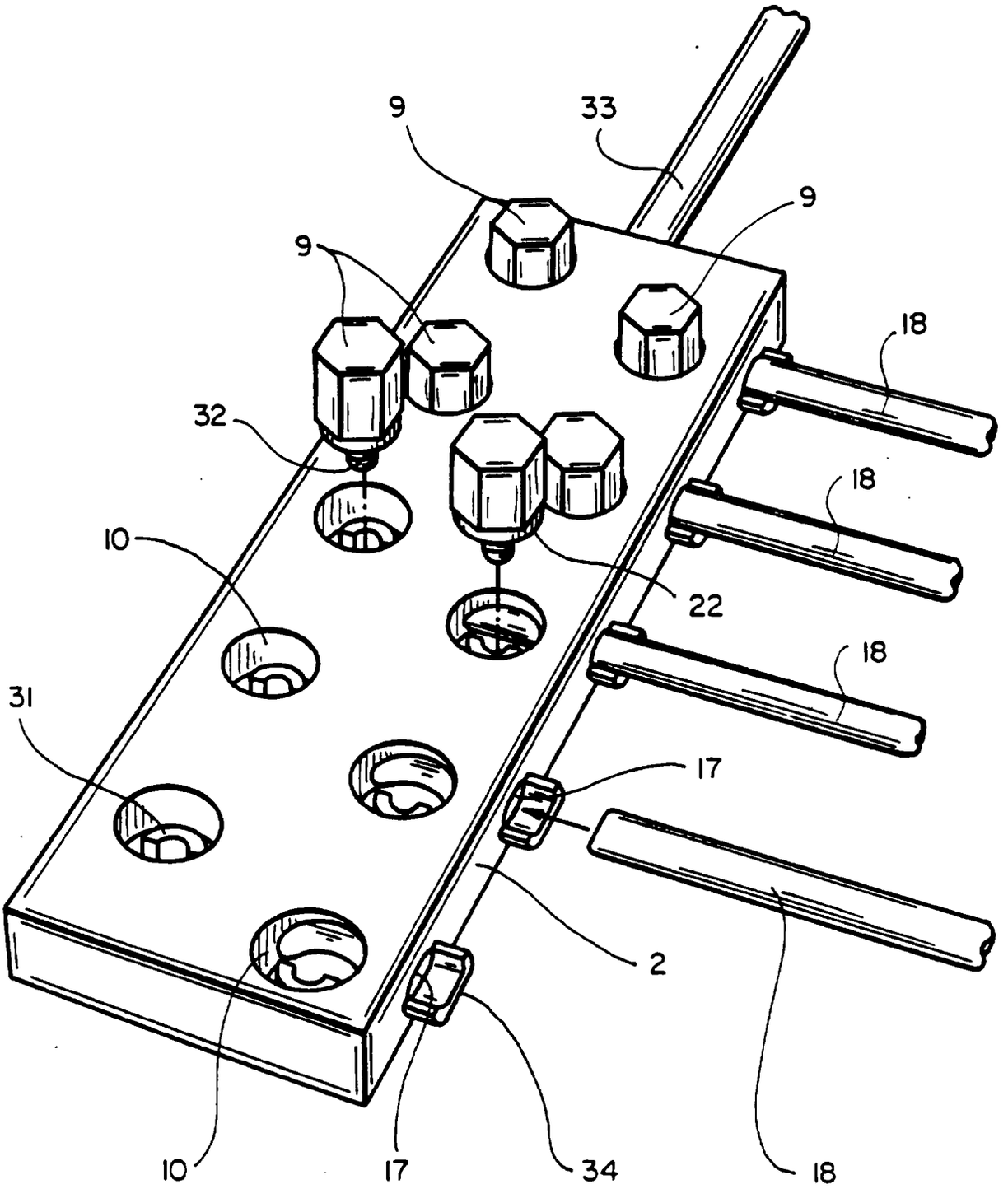


FIG_8

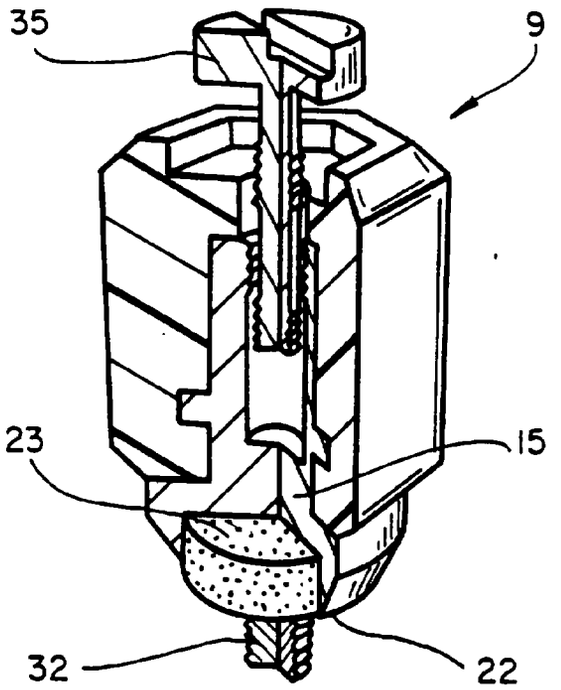


FIG_9A

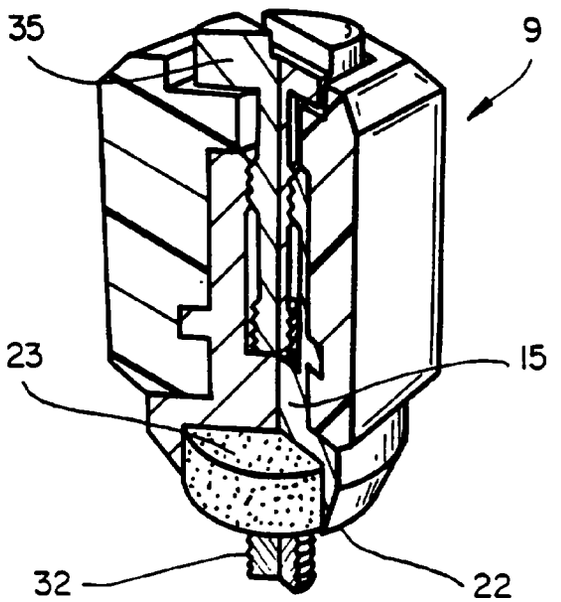


FIG_9B

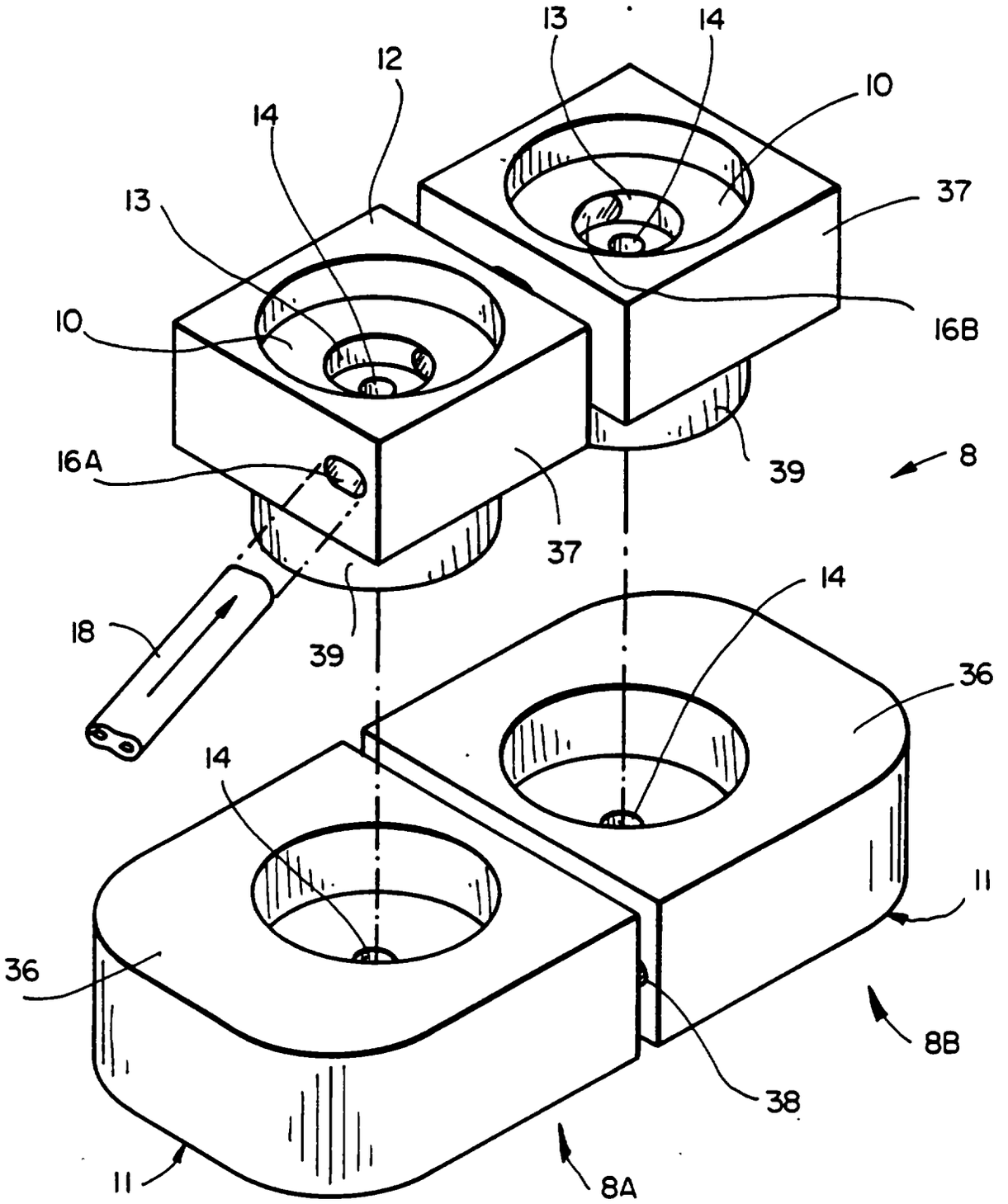
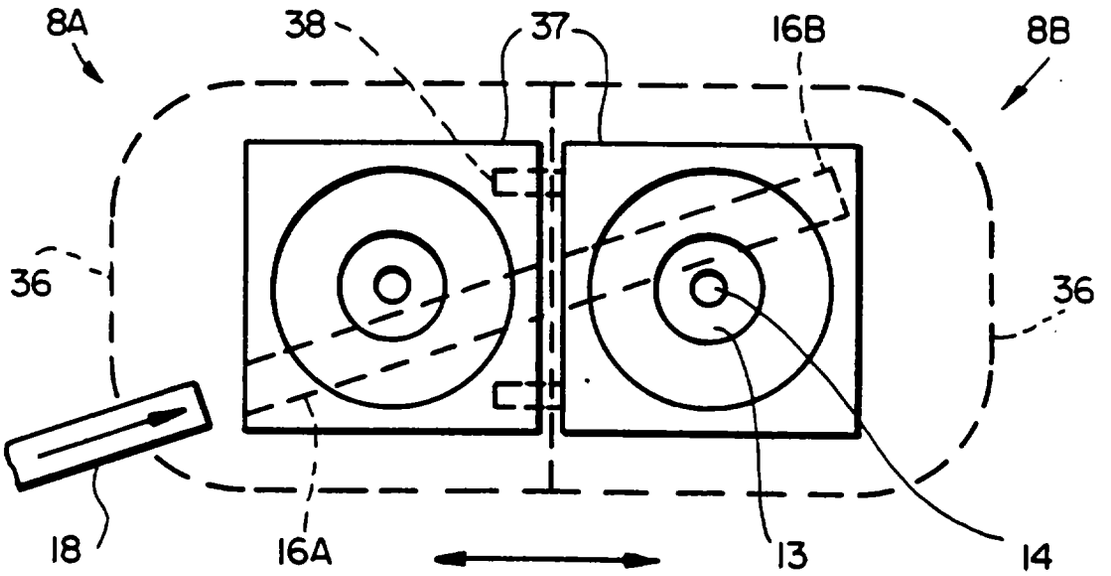
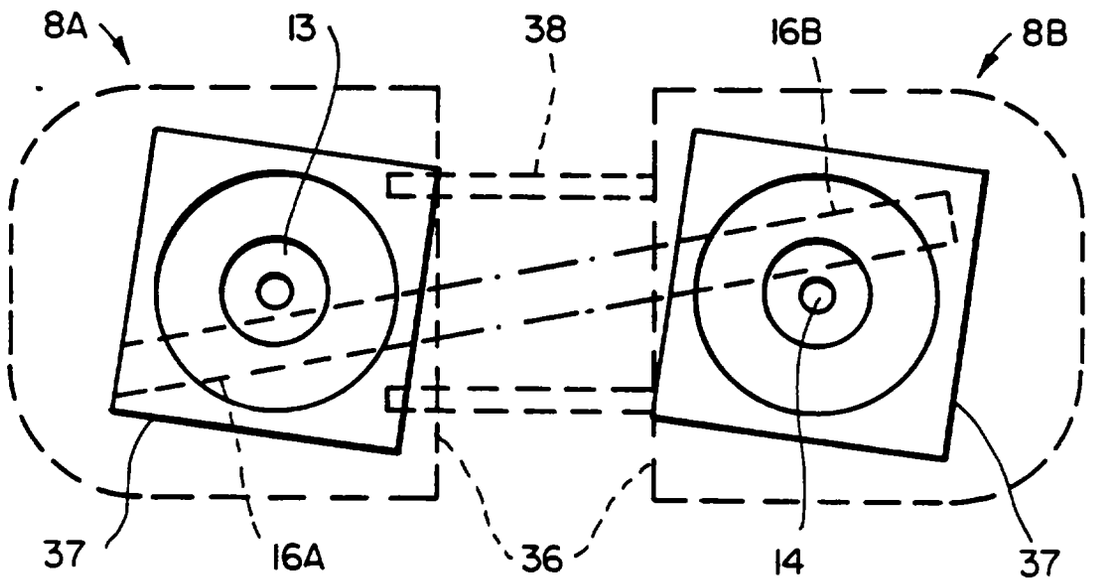


FIG_10



FIG_IIA



FIG_IIB

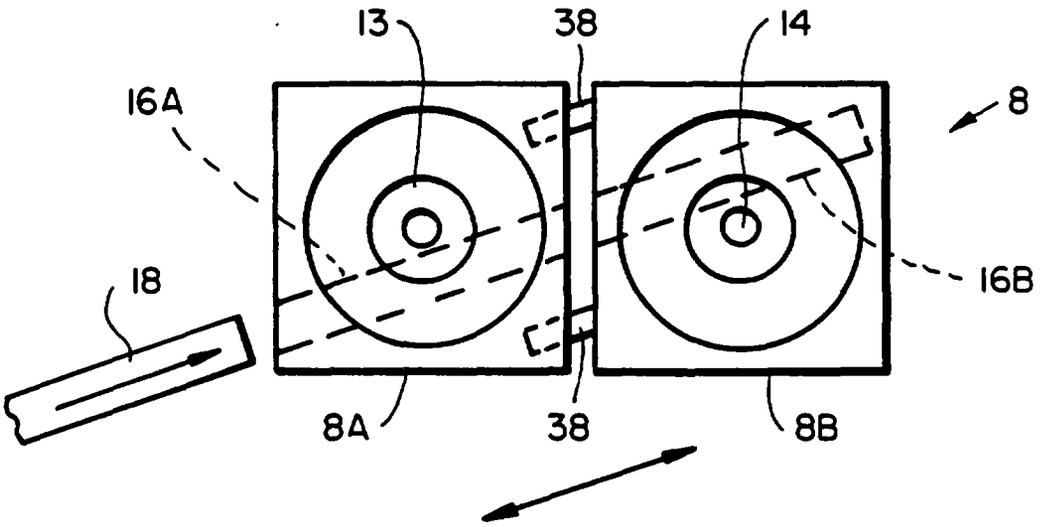


FIG_12

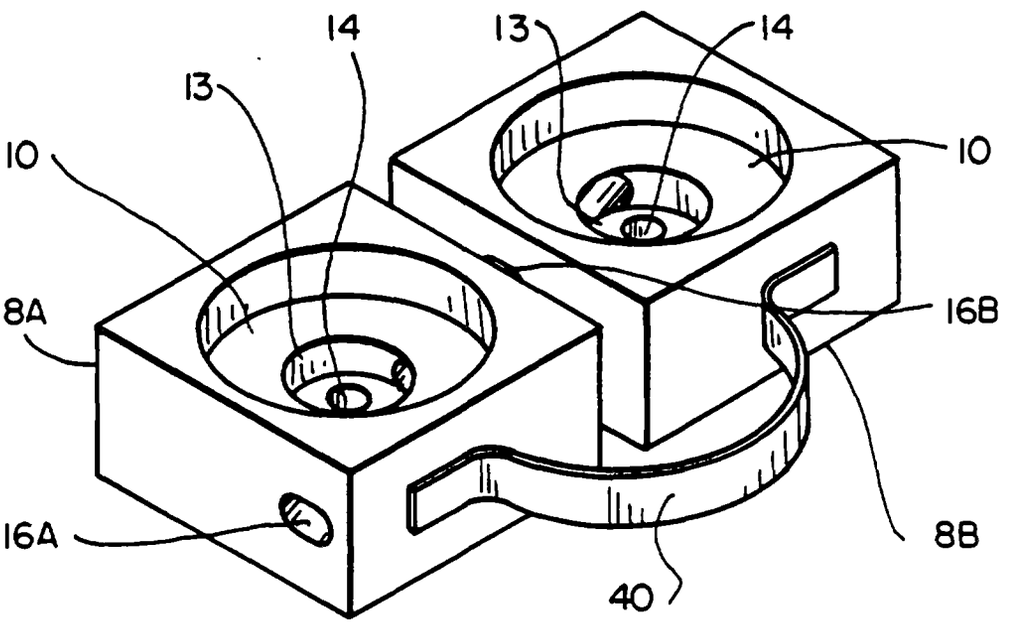


FIG_13