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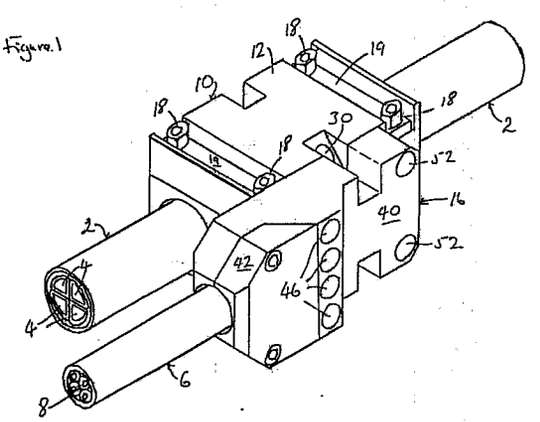
(54) Cable connector.

(57) A branch-off connector for an electric power cable has two half shells containing moisture resistant sealing gel that are clamped around the branch-off region to form a sealed housing. A pre-terminated branch cable may be mounted in one of a plurality of orientations on the housing. Electrical connection to the main cable, and thus energisation of the branch cable, can be made subsequently to sealing of the housing around the branch-off region by insulation - piercing screws retained within the housing. Further branch cables can be added to, or branch cables removed from the connector, without disturbing the sealing of the branch-off region of the main cable.

Figure 1



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Description

Cable Connector

This invention relates to a connector, and particularly, though not exclusively, to a branch-off connector, for an electric cable, especially a power cable. Although the invention finds application primarily with low voltage cables, that is to say cables operating at voltages less than about lkV, it is also applicable to higher voltage cables.

In a branch joint, a branch cable takes electricity from a main cable to supply equipment on a spur. In some instances, there is the requirement that the core conductors of the main cable are not cut at the branch connection. The main cable has its outer jacket and any other common outer components of the cable cut back so as to expose the individual, insulated cores of the cable, defining a branch-off region. Conventionally, a branch-off connector is mounted on the exposed cores in the branch-off region and has one set of contacts, which may be screw contacts, for connecting to respective ones of the core conductors of the main cable, and another set of contacts for receiving the core conductors of the branch cable. Electrical connection between the branch cable and the main cable is made. Subsequently, electrical insulation and environmental protection is applied to the branch-off region.

One known method of insulating and protecting the branch-off region involves the positioning of a two-part rigid plastic box around the region, being sealed at each end on to the cable jacket. Epoxy resin is poured in to fill the box and to exclude air from around the connector and between the cores. The resin is allowed to cool and cure. This method, however, has the disadvantages of using poten tially toxic materials, and of having to mix two components together, and then pour them into the box before any appreciable curing takes place. Consequently, adequate ventilation has to be ensured, thus precluding use of the method in confined areas, care has to be taken with the viscous resin, and the jointer has to wait until the resin has cooled and fully cured before power can be re-supplied to the main cable. The curing period can be as long as ten to fifteen hours, and if power is applied too soon, gas bubbles may be evolved from the resin, giving rise to voids in the insulation and thus the risk of poor electrical performance of the branch joint. Furthermore, the potting that is involved with this method in practice precludes re-entry of the joint without its destruction.

Another known method of insulating and protecting a branch-off region, and one that mainly overcomes the disadvtantages of cast resin joints, is to use a heat-recoverable polymeric insulating wraparound sleeve. Such a sleeve, available from Raychem with its rail and channel closure system, is wrapped around the branch-off region and extends at each end over the cable jacket. The longitudinal sleeve edges, each having a rail formed therealong, are brought into abutment and the channel member slid over them to secure them together. Heat, for example from a gas torch, is then applied to the sleeve to cause it to shrink into conformity with the underlying components. The sleeve is internally coated so as to provide a seal along its closure region and on to the cable. Power may be restored immediately to the main cable, and the shrinking technique is quick, relatively safe, and involves little skill. The joint may be re-entered by cutting away the sleeve, and the required action to the connector or cable carried out. Insulation and protection may be re-applied to the branch-off region using a fresh recoverable sleeve.

In the known methods, however, access to the branch connector, for replacing a branch cable, for adding a further branch cable, or for taking one away for example, involves disturbing the joint at least to the extent that the environmental sealing of the branch-off region is destroyed. Furthermore, the joint has subsequently to be re-built, to a greater or less degree depending on the particular method used.

It is one object of the present invention to provide an electrical connector and a method of forming an electrical connection that overcomes the above-mentioned disadvantages associated with branch-off connections, and that also allows connection to be made to a cable in an in-line manner. An in-ine joint involves the connection of two cables end-to-end.

In accordance with one aspect of the present invention, there is provided an electrical connector that is arranged to seal a region of a cable at which core conductors of the cable are exposed, and that allows electrical connection to be made to the or each core conductor of the cable subsequent to the sealing of said region, and without interrupting said sealing. The connector may also allow connection of one or more further cables to be made to the said cable subsequent to the sealing of said region.

In accordance with another aspect of the present invention, there is provided a method of forming an electrical connection to an electric cable, wherein first and second body members are arranged to form a sealed housing around a region of the cable at which core conductors thereof are exposed, and electrical connection of a further cable is subsequently made to the said cable without interrupting said sealing.

The invention is particularly, though not exclusively, concerned with the provision of a branch-off connector and branch-off connecting method, thus dealing with a branch-off region of a cable (the main cable) that is partway along its length and at which outer components of the cable (such as outer jacket and insulation) have been removed to expose the individually insulated cores so that they may be correctly identified for subsequent connection. The further cable is then the branch cable. Furthermore, the branch-off connector may be applied to a single core cable, in which case removal of the cable jacket is not usually required. However, the invention is also applicable to an in-line joint, whereby a sealed

connection can be provided at an end of a cable for subsequent connection to an end of another cable. Thus, a cable may have a region at its end at which the core or cores (usually individually insulated) are exposed, and the connector of the invention may be sealingly connected thereto. Electrical connection to a further cable can then be made either at the same time or subsequently, with the original cable having voltage supplied thereto. It will be appreciated that the further cable may itself have a connector in accordance with the invention mounted at one end, so that the interconnection of the two cables involves only the interconnecting of the two connectors.

It will further be appreciated that when the connector of the present invention is applied to the end of a cable, it can be used in place of a conventional end cap. An end cap is a sealing component mounted on an exposed end of the cable, for example being heat shrunk thereon, to provide temporary protection until the circuit of which the cable forms part is completed. The end cap however, has to be removed, and thereby destroyed, when electrical connection is required to be made to the cable. The connector of the invention when used in this way may also be utilised to provide a supply of power from the cable, for example while the cable is temporarily unconnected at a work site.

A branch-off region of a cable, for example, needs to be sealed against ingress of moisture, so that no electrically conductive path is thereby formed between a live conductor and earth, or, in the case of a multi-conductor cable only, between one live conductor (i.e. phase) of the cable and another. It is known that in operation of a cable in a damp environment, moisture may penetrate a damaged outer cable jacket and travel along the cable along a core or between the cores. Thus, where the core insulation is broken, e.g. pierced, at a branch-off region, it is necessary to ensure that insulation is re-applied. The sealed housing and of connector of the present invention ensures this.

The housing of the connector of the present invention is accordingly provided with a quantity of cross-linked insulating material for sealing against ingress of moisture.

The sealant material used in the present invention is cross-linked so as to enhance its performance at higher temperatures, for example at temperatures of 50° C, up to around 95° C and higher, at which power cables can operate under load. A non cross-linked material, such as a grease, would melt and flow away at high temperature, thus negating its sealing.

For convenience only, and not by way of limitation, the following description will refer mainly to a branch-off joint of a multi-core cable, with the cable (the main cable) extending continuously through the connector housing. It is understood that, with suitable modification where necessary, the invention is also applicable to an in-line joint or end cap, and to connection to a single core cable.

The connector may comprise first and second body members, one or both of which preferably contains or retains the cross-linked moisture resistant sealant material, that together form a housing that encloses the branch-off region. The housing may contain, for example by having moulded therein, a plurality of first conductive members to be associated with respective ones of the cores of a multi-core main cable. It is envisaged, however, that only one first conductive member would be required for a single core main cable. The first conductive members are each arranged to provide one, and preferably two, or more, electrical contacts that are accessible from an outer surface of the sealed housing for connection to respective cores of a branch cable. A plurality of electrical connection members, such as insulation piercing screws for example, are preferably mounted in the housing so as to be accessible from an outer surface thereof. The connection members are arranged to contact respective ones of the first conductive members, and to pierce the insulation of respective core conductors of the main cable so as to effect electrical contact therewith. The electrical connection members may either be permanently retained within the housing, or may be introduced therein at any time when it is required to energise the branch cable. It will be appreciated that the connection members should be sealingly engaged with the housing, and may, after insertion, be covered by insulating plugs, of the cross-linked, insulation, moisture sealant material for example.

A third body member may be arranged to be mounted at an end of a branch cable and to have exposed at an outer surface thereof a contact of a respective second electrically conductive member that is arranged to be connected with a respective one of the core conductors of the branch cable. The third body member is mountable on the housing such that the contacts of the second conductive members are electrically connectable, for example by bolts, with respective ones of the contacts of the first conductive members, thereby to connect the cores of the main cable with those of the branch cable in a one-to-one relationship (phase-to-phase, and earth-to-earth), as required. It will be appreciated that the connection and disconnection of the third body member does not disturb the sealing of the branch-off region, since the mounting of the first and second body members on the main cable is not disturbed. Furthermore, when each of the first conductive members is arranged to expose two or more contacts, the third body member may be mounted on the housing in a plurality of different orientations with respect to the main cable. Thus, the branch cable may be arranged to extend to one or the other side of the main cable, parallel therewith in one or the other direction, or perpendicularly thereto. Additionally, two or more branch cables may be connected to the main cable independently of each other.

Thus, the connector and method of the invention overcomes the destruction of the sealing that is associated with re-entry using known connectors and methods.

Other pieces of electrical equipment, such as a switch, a fuse, or a surge arrestor for example, may also be connected electrically in series with the branch cable, interposed between it and the main

cable, and may be so connected without disturbing the sealing of the branch-off region of the main cable.

It will be noted that using the present invention, there is no need to interrupt the power supply to the main cable, since electrical connection thereto by means of the electrical connecting members may be made whilst the cable is live. Furthermore, this connection need not be made at the time the sealing of the branch-off region is effected. Indeed, the attachment of the branch cable to the housing need not be made at the time of sealing the branch-off region. Thus, the main cable could be put into position, possibly with a plurality of (sealed) branch-off housings mounted at desired positions thereallong, and branch-off connections conveniently made at any subsequent time. Also, the branch cables could be mechnically connected to the main cable at one time, left without power supplied thereto (even though the main cable is live), and electrically connected to the main cable at a later time. All of this can be done using the connector and method of the present invention without disturbing the sealing of the branch-off region.

At a branch-off region, sealing is required primarily to prevent ingress of water and water vapour into the housing. Such moisture may have entered the cable away from the branch-off region, through a breach inthe cable jacket for example, and may pass along the inside thereof between the cores. It is essential then to ensure that at the branch-off region, where the core conductor insulation has been interrupted, no moisture can form a conductive path between any of the cores (whether at phase voltage or at earth potential). The sealing may also conveniently be required to replace the electrical insulation of the removed cable jacket, in the case of a multi-core cable. The sealing may conveniently be achieved by having a quantity of the electrically insulating and water resistant cross-linked sealant material, such as gel for example, in one or both of the first and second body members before they are secured together around the branch-off region to form the housing. The quantity of gel, or other sealant material, is chosen such that all of the air spaces around the conductor cores and within the body members are filled when the housing is formed. In general, the following materials when cross-linked are suitable for providing an electrically insulating and water resistant seal of the branch-off region:gels, greases, mastic, unvulcanised soft rubbers, or a water curable material such as silicone. When the material is a gel, this is preferably a suitable material as described in Patent Application Publication No. WO 86/0l634, the contents of which are herein incorporated by this reference.

The or each of the body members may be made, for example by moulding, from rigid plastics insulating material. In general, the body members of the branch-off connector of the invention may be formed from rigid thermoplastics or thermosetting materials, epoxy resins, or polyester materials, that are capable of mechanically withstanding the temperatures to which they are subjected during normal and test operation of the cable. One or more mechanical reinforcing members may be embedded in or applied to the body members if required so as to withstand the mechanical stresses, particularly under thermal cyling that occurs with operation of power cable. Such member or members may be of metal, electrically insulated from the other conductive components of the connector.

In one embodiment, the connector, which may be a branch-off connector, comprises: first and second body members arranged to be secured together to form a housing enclosing and sealing a cable at a region at which the or each core conductor of the cable is exposed, for example a branch-off region, the housing comprising a first electrically conductive member, for connection to a further, for example branch cable, that provides at least one electrical contact exposed to an outer surface of the housing, and a first electrical connection member mountable within the housing and operable from outside thereof to effect connection between the first conductive member and a core conductor of said main cable, and electrically insulating, cross-linked sealant material contained within the housing for sealing said region against ingress of moisture.

In one embodiment, the cable connection method, which may be a method of forming a branch-off connection, comprises the steps of connecting together first and second body members so as to form a housing sealed around a region of the cable at which the or each core of the cable is exposed, for example a branch-off region, in which the housing contains electrically insulating cross-linked sealant material that seals said region against ingress of moisture, and wherein a first electrically conductive member is mounted in the housing so as to expose at least one electrical contact thereof to an outer surface of the housing for connection to a core conductor of a further, for example branch cable, the method further comprising the step of operating from outside the sealed housing an electrical connection member that is mounted in the housing so as to contact a core conductor of the cable, thereby to effect electrical connection, sealed by said sealant material, between said electrical contact and said core conductor.

Embodiments of a connector and method, for forming a branch-off with a four-core cable, in accordance with the present invention, will now be described, by way of example with reference to the accompanying drawings, in which:

Figure l is a perspective view showing one embodiment of the connector connecting a branch cable to a main cable;

Figure 2 is a plan view of the connector of Figure l;

Figure 3 is a side elevation of a housing part of the connector of Figure l;

Figure 4 is a section along the line l-J of Figure 3;

Figure 5 is a section along the line G-H of Figure 3;

Figure 6 is an elevation along the line C-D of Figure 3;

Figure 7 is an elevation along the line E-F of Figure 3;

Figure 8 is a side elevation of a termination part of the connector of Figure I, with a cover removed; and

Figure 9 is side elevation of another embodiment of the connector.

Referring to Figures I to 3, a IkV main power cable 2 has four cores 4, one for each of the three phases of the supply and an earth core. Each core 4 comprises a sectored conductor enclosed within an individual, colour-coded layer of insulation. The four cores 4 are all enclosed within a further layer of insulation and an outer insulating and abrasive-resistant cable jacket. A branch cable 6 that has four cores 8 is to be connected to the main cable 2. To this end, two electrically insulating, half-shells I2,I4 of plastics material are clamped together around the cable 2 at a branch-off region to form a housing I0 that is sealed on to the cable 2. The branch-off region is formed by removing the outer jacket and common insulating layer of the cable 2 for a length that is less than that of the housing I0, so as to expose the cores 4, whose individual insulation is left in position. Such preparation of the cable 2 can be carried out with power still being carried by the cable 2. The branch cable 6 is cut back at one end thereof to expose the conductors of the cores 8, and a two-part electrically insulating termination block I6 of plastics material is mounted on that end of the cable 6. The block I6 is then mounted on the housing I0 for effecting electrical connection beween the conductors of the cores 8 of the branch cable 6 and respective ones of the conductors of the cores 4 of the main cable 2.

The construction of the housing I0 and its connection on to the main cable 2 will now be described in further detail with reference additionally to Figures 3 to 7.

The half shells I2 and I4 mechanically interlock with each other along their length, are secured together by four bolts I8, and are sealed at each end on to the outer jacket of the continuous cable 2 by foam members I9 (Figure 5) contained therewithin. The housing I0 is thus mechanically retained on the main cable 2 at its branch-off region. In order to distribute the mechanical load, arising from the clamping action of the bolts I8, over a larger area of the housing I0, rigid strips I9 extend between pairs of the bolts I8 over the faces of the half-shells I2,I4. The half-shells I2 and I4 are substantially identical, and each is arranged to provide for electrical connection with two of the four cores of the cables 2 and 6.

Referring to Figures 6 and 7, prior to mounting the half-shells on the branch-off region of the cable 2, the cores 4 are manually separated and a pair of rigid planar dividers 20 introduced there between in opposing fashion. Each half shell I2,I4 has a further inwardly-projecting rigid divider 22 integrally formed therewith that, on bringing the half shells together, separates the remaining adjacent cable cores. Thus, as can be seen from Figure 6, the cable cores 4 are located in individual compartments, insulated from each other, and restrained against inward movement, which could otherwise compress and thus reduce in thickness their insulation.

Referring to Figures 4,6 and 7, each half-shell I2,I4 has two connecting members 24 moulded thereinto. Each member 24 extends from one side to the other of the housing I0 and exposes an internally threaded contact portion 26 at each of two outer faces thereof. The four exposed contacts at each outer face are located at the corners of a square. Within the housing, each connection member 24 extends towards a longitudinally central area of the branch-off region, and has an internally threaded portion 28 directed radially towards a respective one of the compartments containing the cores 4. Insulation-piercing electrically conductive screws 30 engage the portions 28, and are accessible from outside the housing I0 (Figures I,2 and 3) so as to be screwed in through the insulation of the cores 4 to contact respective ones of the core conductors. In this way, electrical connection is established between each core conductor and the two contact portions 26 at the outer surfaces of the housing I0. In order to ensure low contact-resistance engagement between the screws 30 and the conductors of the cores 4 over the lifetime of the connector, it may be found necessary to enhance the rigidity of at least this part of the housing I0 and to maintain the inwards pressure on the screws 30 by a reinforcing arrangement (not shown), which may extend peripherally around the housing and mechanically engage each of the screws 30.

The mounting of the termination block I6 on to the branch cable 6 will now be described in more detail with reference to Figures I,2 and 8. The block I6 has a base 40 and a screw fitted, interlocking cover 42, that provide a water-resistant foam seal 44 around the outer jacket of the entering branch cable 6. The common outer jacket of the cable 6 is removed, and the conductors exposed at the ends of the individual insulated cores 8. The core conductors are retained within respective moulded-in screw terminals 46 in the base 40 of the block I6. Connection members 48 are moulded into the base 40, and extend from respective ones of the terminals 46 to threaded apertures 50 that extend right through the base 40. The apertures 50 are located at the corners of a square that is of the same dimension at that of each set of contact portions 26 of the conductive members 24 at opposing outer surfaces of the housing I0.

The termination block I6 is mounted on the housing I0 (Figure I and 2) by four conductive bolts 52 that engage the threaded apertures 50 from one side of the block I6, extend therethrough and engage respective ones of the threaded contact portions 26 at an outer surface of the housing I0. In this way, electrical paths are established between respective ones of the conductors of the cores 4 of the main cable 2 and of the cores 8 of the branch cable 6. Each path extends through an insulation piercing screw 30, housing conductive member 24 and contact 26, retaining bolt 52, termination connecting member 48 and screw terminal 46. The exposed heads of the bolts 52 and screw terminals 46 may be covered by insulating plugs.

An electrically-insulating and water-resistant gel, which is cross-linked, is arranged to fill any voids within the housing I0 and within the termination

block 16, and this is achieved by locating the gel in spaces in each of the four components 12,14,40,42 such that on bringing the respective components together, the gel is forced into any voids that would otherwise occur, such as for example in the interstices between the cores of the cables 2 and 6, and around the insulation-piercing screws 30.

It will be appreciated that the housing 10 may be formed around the branch-off region of the main cable 2 without necessitating cutting the conductors of the main cable and without interrupting the supply of power along the main cable. The branch-off connection may thus be left sealed and insulated at this stage of its construction, if required, and completed at a later time. The termination block 16 may be fitted to the branch cable 6 without any power being supplied to the branch cable. The termination block 16 may be mechanically mounted on the housing 10, by means of the bolts 52, and may still not have power supplied thereto, the branch cable thus being non-activated but sealed and insulated, if required, awaiting energisation at a later time.

The supply of power to the branch cable does not take place until the screws 30 are screwed in to pierce the insulation of the cores 4 of the main cable 2, and this is arranged so that it may be carried out after the branch-off region has been sealed, and can be carried out after the branch cable has been mechanically secured to the main cable. This energising operation can thus be carried out almost as the last stage of forming the branch-off connection, since the screws 30 are accessible from outside the sealed housing 10, even after the branch cable termination block 16 has been mounted thereon. All that remains is to fit insulating plugs over the exposed heads of the screws 30.

Since the termination block mounting bolts 52 are located at corners of a square that is of the same dimension as that of the location of the contacts 26 of the housing connecting members 24, it will be appreciated that the lock 16 may be mounted on the housing 10 not only in the orientation shown in Figure 1, whereby the branch cable 6 extends to the left of the housing 10 and parallel to the main cable 2, but may also be mounted with the branch cable 2 extending in the opposite direction, or extending at right angles, in one direction or the other, to the main cable 2. In addition, each of these orientations is possible with the termination block 16 mounted on the opposing face of the housing, with the branch cable on the other side of the main cable, electrical connection then being made with the other set of contacts 26 of the connecting members 24 (Figure 4). It will also be appreciated that coding, for example colour coding, may be employed to ensure that whatever the chosen orientation of the branch cable, the cores of the branch and main cables will always be correctly matched to each other.

Figure 9 shows a side elevation, corresponding to the side elevation of Figure 3, of another embodiment of a branch-off connector 60 for use with a four-core cable. The connector 60 comprises two identical half-shells that interengage with each other and that are mounted around a main cable 64. The shells 62 are made from rigid insulating plastics material and are secured together by two bolts 66 (only on of which is shown) that interengage metal semi-cylindrical inlays 68 in the shells 62. The inlays 68 form a metal band around the closed connector 60 that provides mechanical support.

Four insulating plugs 70 in each pair of opposing faces of the connector 60 seal the ends of four connecting members (not shown) embedded within the connector, which correspond to the connecting members 24 of the embodiment of the connector described with respect to the earlier Figures. Four screws 72 (only two of which are shown) corresponding to the screws 30 of the previous embodiment, are operable from outside the connector and are arranged to pierce the insulation of respective cores of the cable 64. The screws 72 are insulated from the metal band 68 through which they pass.

The internal construction of the connector 60, and in particular the arrangement of conducting components and the gel filling, the operation of the connector, including the interconnection with a branch cable, and other features, correspond to the construction and operation of the connector already described with respect to Figures 1 to 8.

If required, the core separators of the connector of the invention, for example the separators 20 of the first described embodiment, may be spring-loaded to enhance their separation of the cores. The springs may be put under compression be biassing screws (not shown) operable from outside the connector 60.

The present invention allows for more than one branch cable to be attached to the main cable at one branch-off region. As can be seen from Figures 1 and 2, for example, with one branch cable attached, not only is an opposing set of contacts 26 still available on the other side of the main cable 2, but also, with suitable modification of the retaining bolts 52, one or more, further termination blocks may be mounted on top of the existing one. Furthermore, additional branch cable may be added, or existing ones removed, at any time without disturbing the sealing and insulation of the main cable or any existing branch cables, and without interrupting the supply of power to the main cable or to an existing branch cable.

Other pieces of electrical equipment, such as a switch, a fuse, or a surge arrestor may be connected in series with the branch cable, and may be arranged to be interposed between the housing and the termination block. Furthermore, the connector may be used as a means of supply of power from the cable to operate other equipment.

It will be appreciated that when the connector of the invention is mounted at the end of a cable, either to act as an end cap, which may be a permanent attachment to the cable, or as part of an in-line joint, it will be desirable to modify the housing, for example to seal one end thereof. It is envisaged that this may most simply be achieved by fitting a disc into the housing formed by the two body members so as to close the opening that in a branch connection would otherwise allow exit of the continuing main cable from the housing. As an alternative, the body

members may themselves be specifically formed in a different shape for use in such application so as to allow (a) entrance of a single cable, or (b) entrance of two cables with means for electrical interconnection therebetween.

Claims

I. An electrical connector for an electric cable, comprising: first and second body members arranged to be secured together to form a housing enclosing the cable at a region of the cable at which the or each core of the cable is exposed, the housing comprising a first electrically conductive member that provides at least one electrical contact exposed to an outer surface of the housing for connection to a further cable, and a first electrical connection member mountable within the housing and operable from outside thereof to effect connection between the first conductive member and a core conductor of said cable within the housing, the housing containing cross-linked, insulating material for sealing against ingress of moisture.

2. A connector according to claim I for a multi-core electric cable, comprising a plurality of said first conductive members and a like plurality of said first connection members, one of each of said members being arranged to provide electrical connection with a respective core conductor of said cable.

3. A connector according to claim I, comprising a third body member arranged to receive and terminate a further cable, the third body member comprising a second electrically conductive member that is arranged to extend from a core conductor of the further cable so as to provide an electrical contact exposed to an outer surface of the third member, and the third body member being arranged to be mounted on the housing such that the first and second conductive members are interconnected, thereby to interconnect the core conductors of the said cable and the core conductors of said further cable.

4. A connector acording to claim 3 for a multi-core electric cable and a multi-core further cable, comprising a plura lity of said first conductive members, a like plurality of said first connection members,and a like plurality of said second conductive members, one of each of said members being arranged, on mounting of said third body member on the housing, to provide electrical interconnection between respective ones of the core conductors of the said cable and of said further cable.

5. A connector according to claim 4, wherein the housing and the third body member are arranged such that said first electrical connection members are operable from outside the housing after the third body member has been mounted on the housing, to effect said electrical interconnection between said cable cores.

6. A connector according to any of claims 3 to 5, wherein each of said first conductive members provides at least two of said electrical contacts, and wherein the housing and the third body member are arranged such that electrical interconnection between the or each core of the said cable and the or a respective core of the further cable can be arranged by mounting the third body member on the housing in a selected one of at least two orientations with respect thereto.

7. A connector according to any preceding claim wherein the sealant material is retained within at least one of said first and second body members prior to its mounting on the said cable.

8. A connector according to any preceding claim wherein the sealant material comprises a gel.

9. A method of forming a connection to an electric cable, using a connector in accordance with any preceding claim.

I0. A method of forming an electrical connection to an electric cable, comprising the steps of connecting together first and second body members so as to form a housing around a region of the cable at which the or each core of the cable is exposed, the housing containing cross-linked, insulating sealant material for preventing the ingress of moisture, wherein a first electrically conductive member is mounted in the housing so as to expose at least one electrical contact thereof to an outer surface of the housing for connection to a core conductor of a further cable, the method further comprising the step of operating from outside the sealed housing an electrical connection member that is mounted in the housing so as to contact a core conductor of said cable, thereby to effect electrical connection between said electrical contact and said core conductor.

II. A method according to claim I0, wherein a third body member is mounted at an end of a further cable such that a second electrically-conductive member mounted within the third body extends from a core conductor of the further cable so as to provide an electrical contact exposed to an outer surface of the third body member, wherein the third body member is mounted on the housing, and wherein the contact of the second conductive member is electrically connected to said at least one contact of the first conductive member.

I2. A method according to claim II, wherein the electrical connection member is operated to connect the first conductive member to the core conductor of the said cable after the second conductive member has been connected to the first conductive member.

I3. A method according to claim II or I2, wherein the said cable and the further cable each have the same number of conductor cores, wherein the housing comprises a like number of said first conductive members and a like number of said connection members,

wherein the third body member comprises a like number of said second conductive members, and wherein the or each of said first conductive members is arranged to expose at least two of said electrical contacts thereof to an outer surface of the housing, and wherein the third body member is mounted on the housing such that the further cable extends in a selected one of a plurality of orientations with respect to the said cable with the electrical contact of the or each second conductive member being engaged with a selected one or other of the electrical contacts of the or each first conductive member.

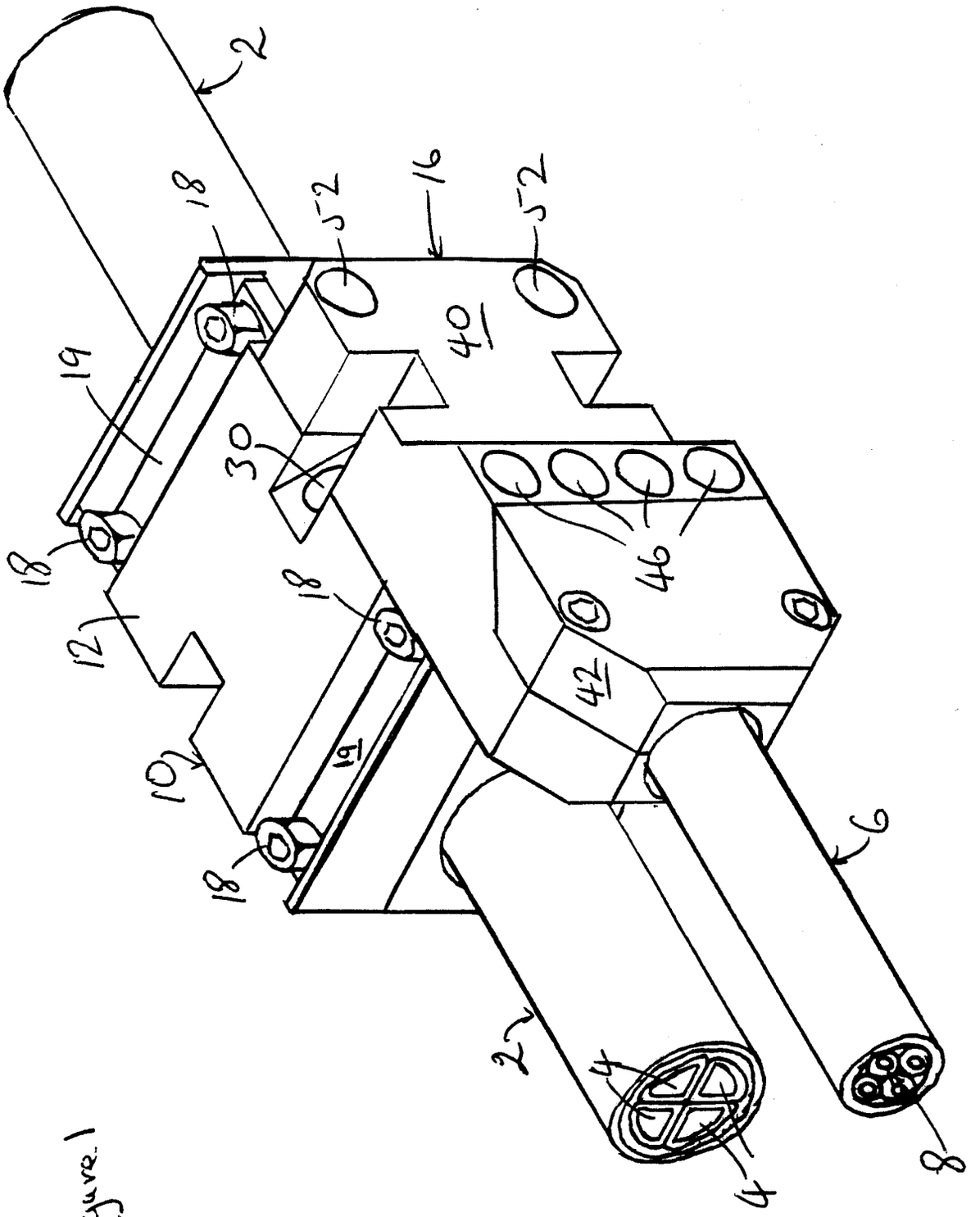

Figure 1

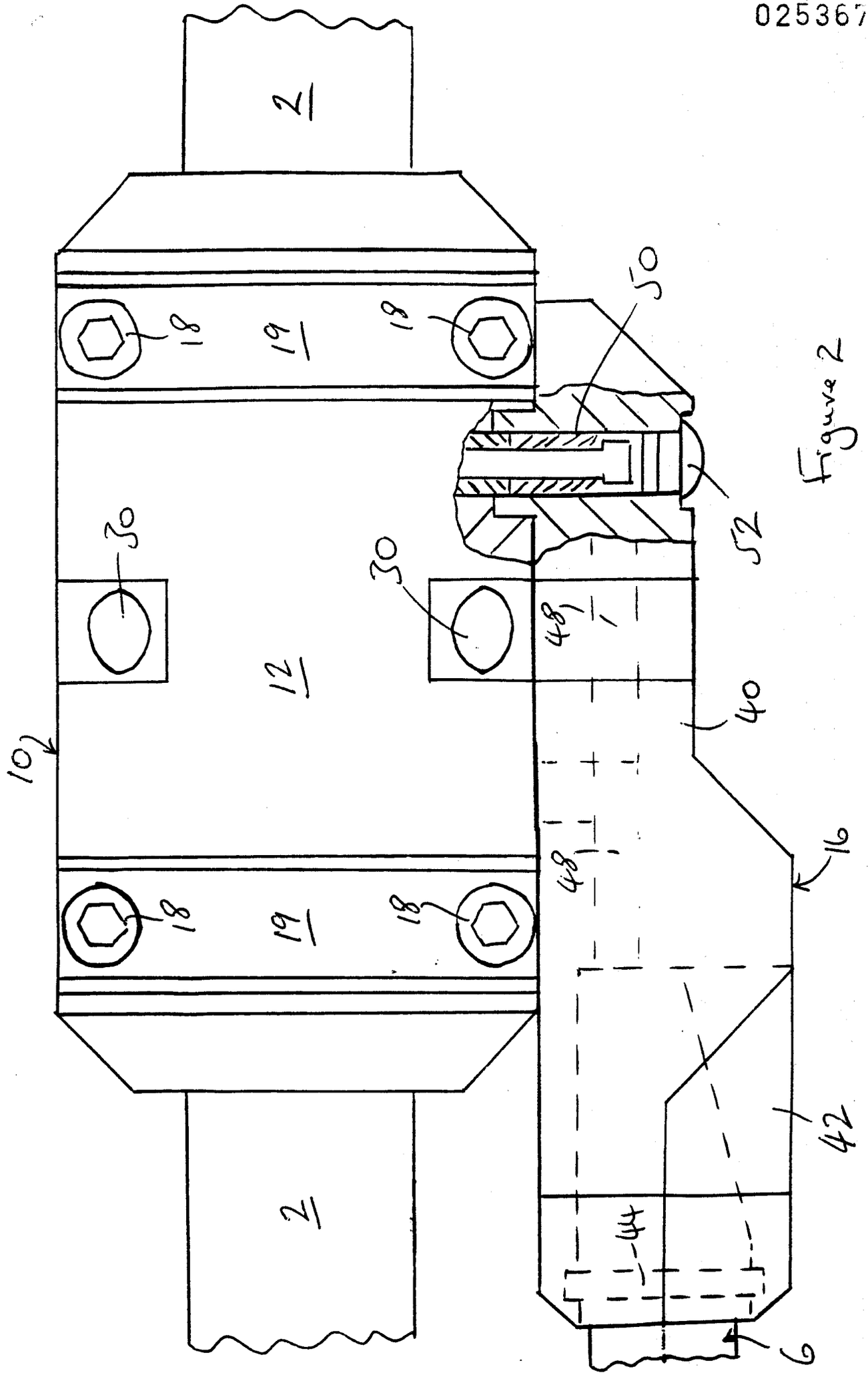

Figure 2

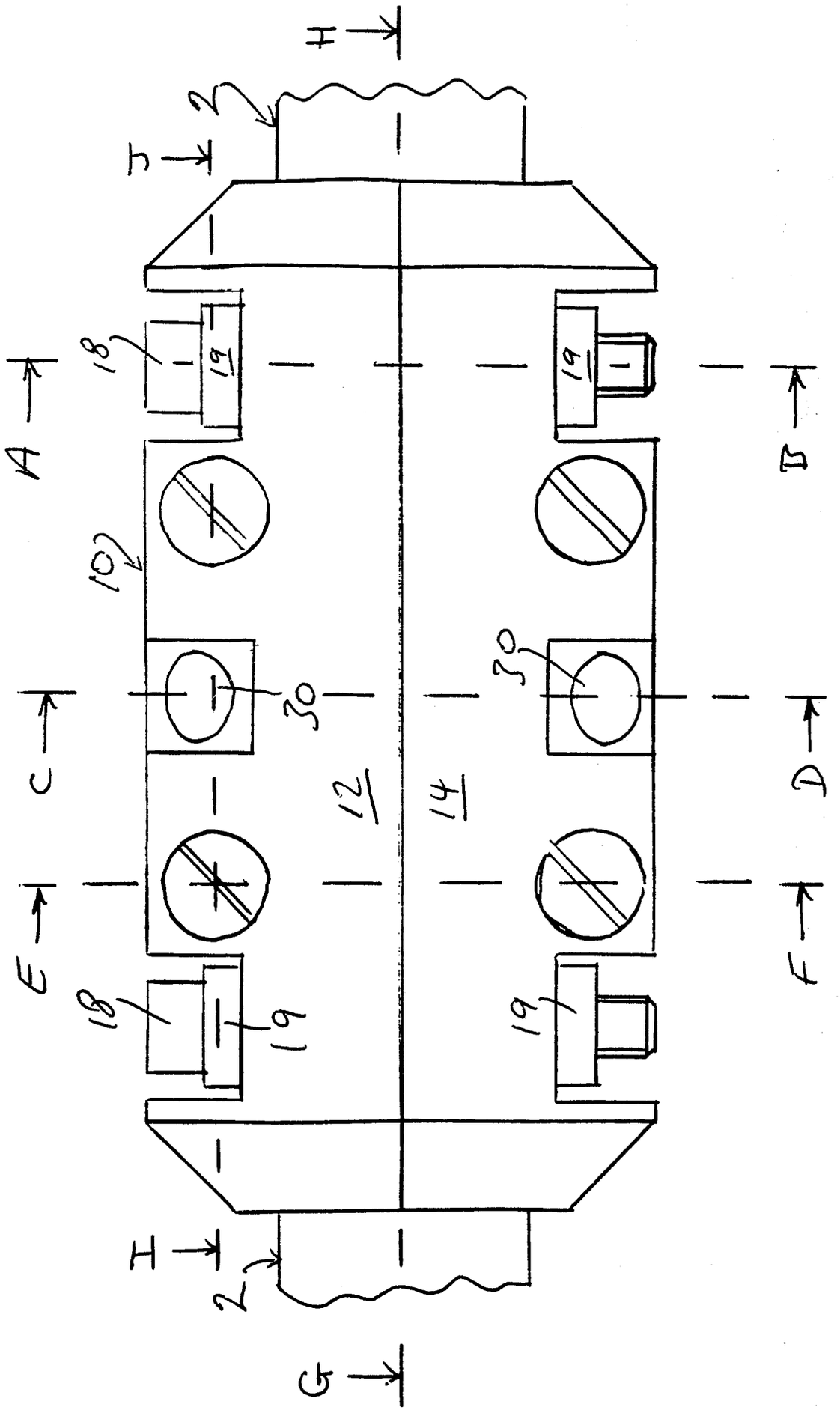

Figure 3

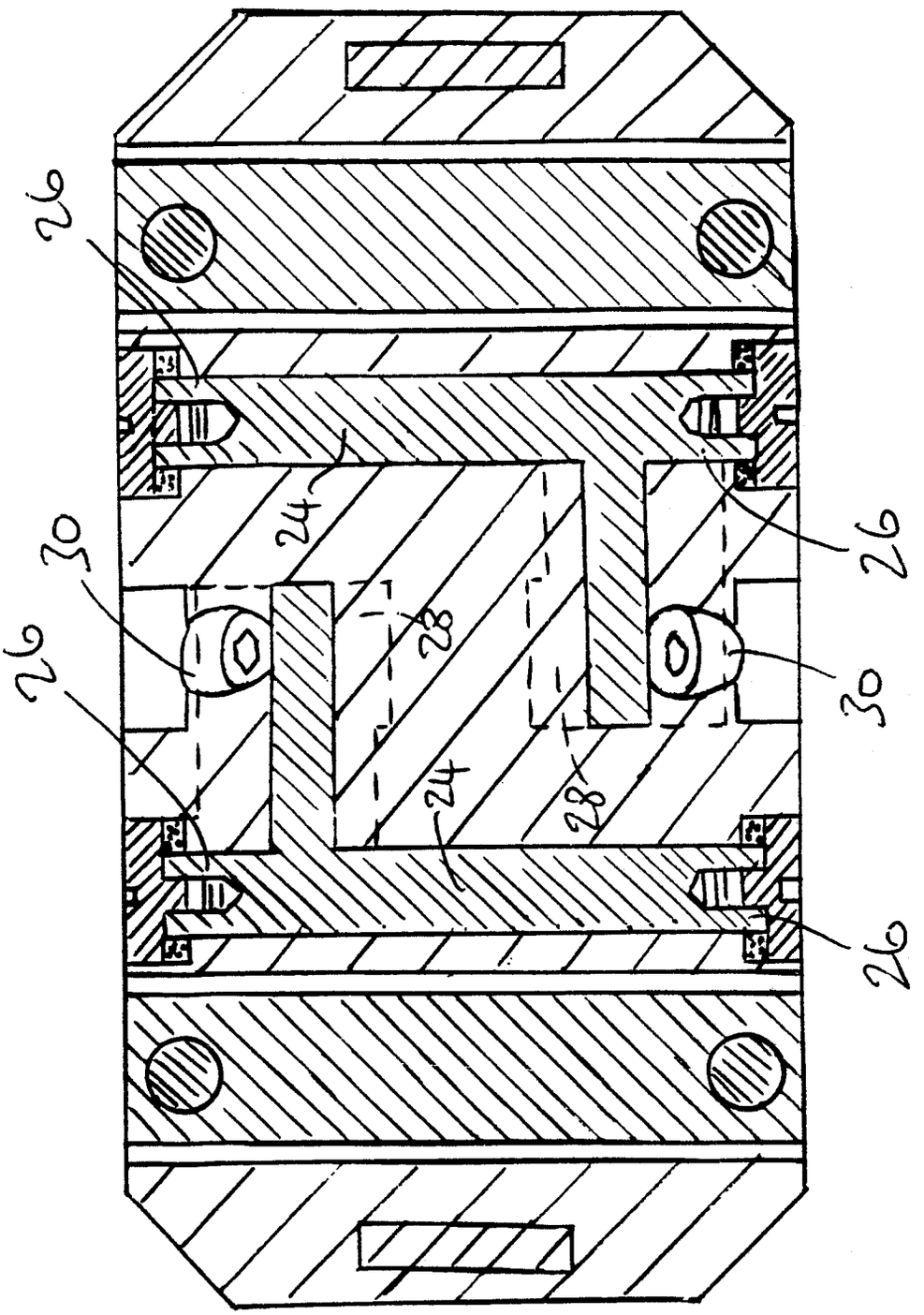

Figure 4

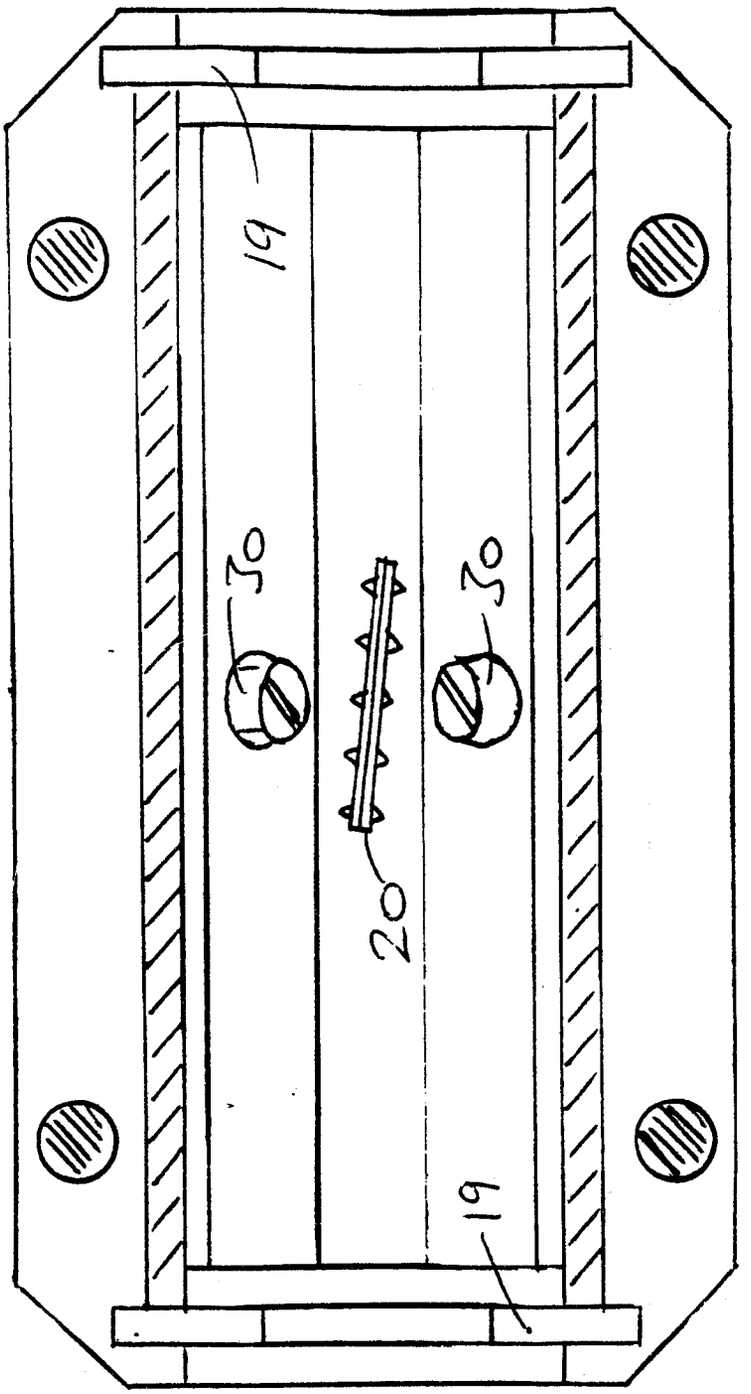

Figure 5

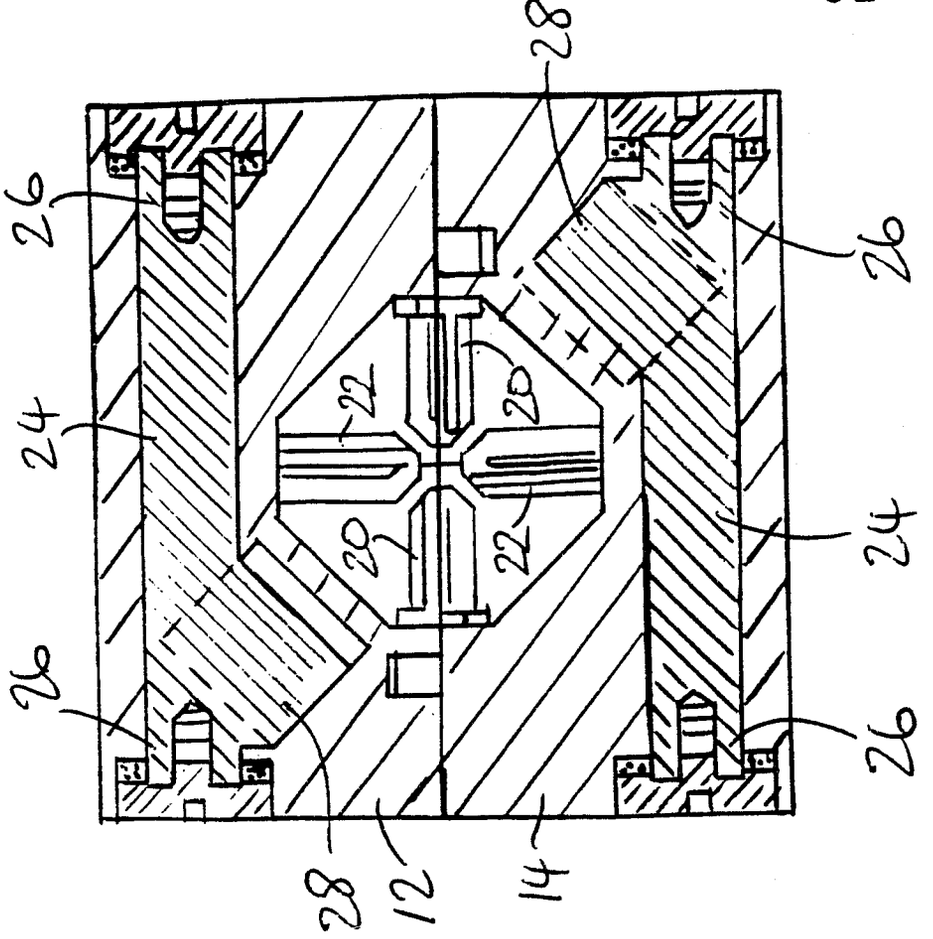

Figure 7

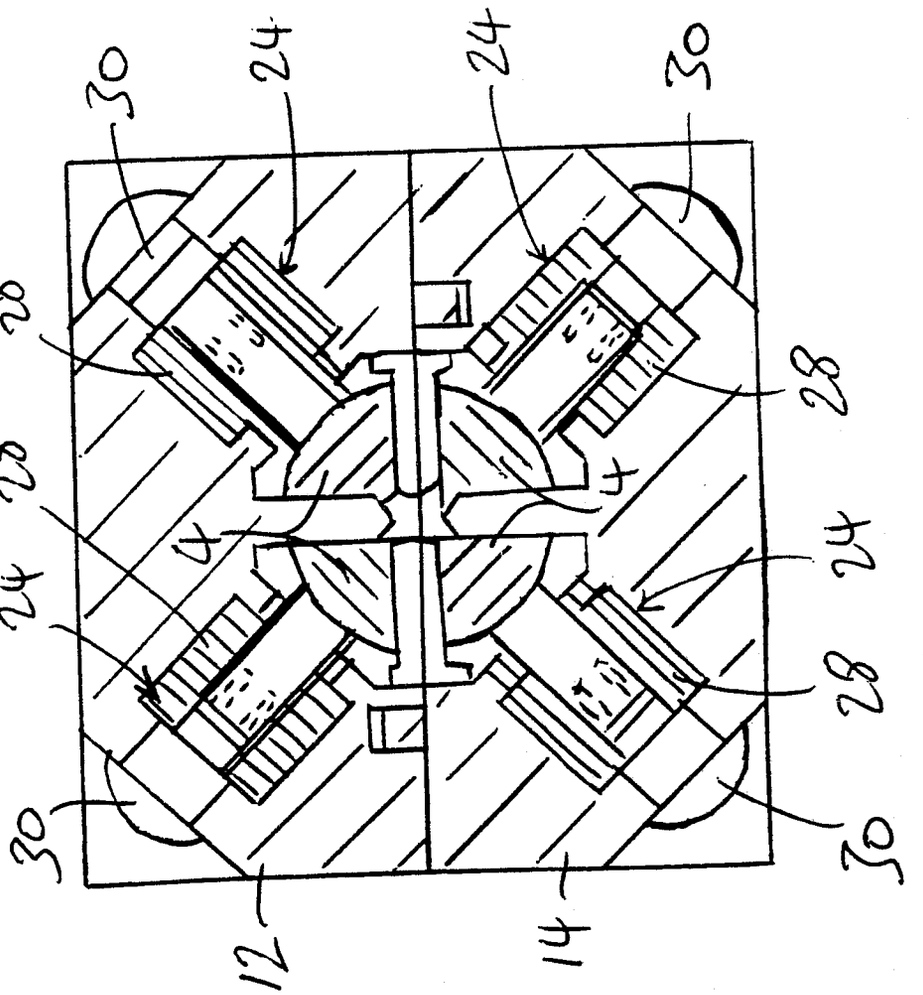

Figure 6

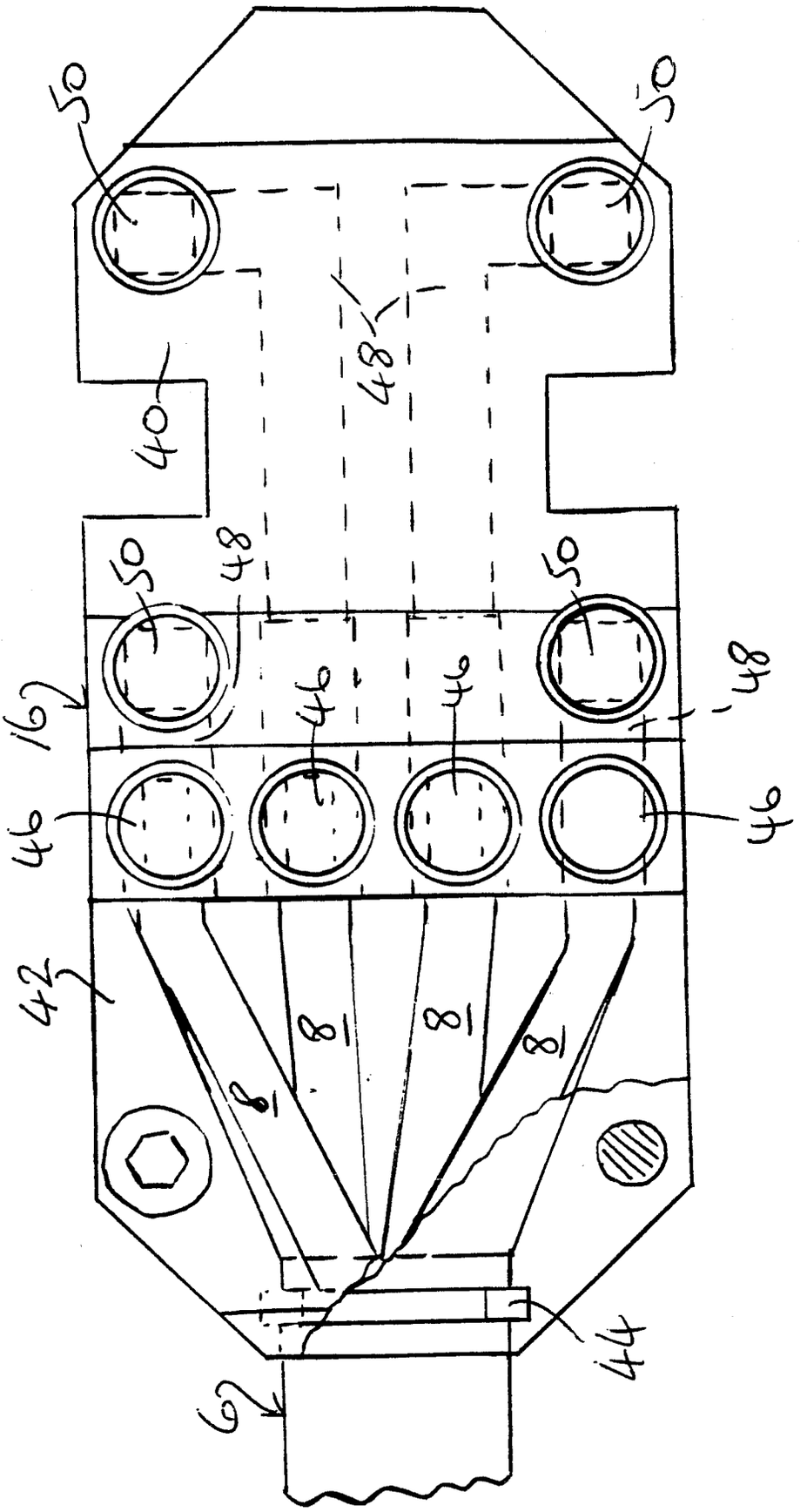

Figure 8

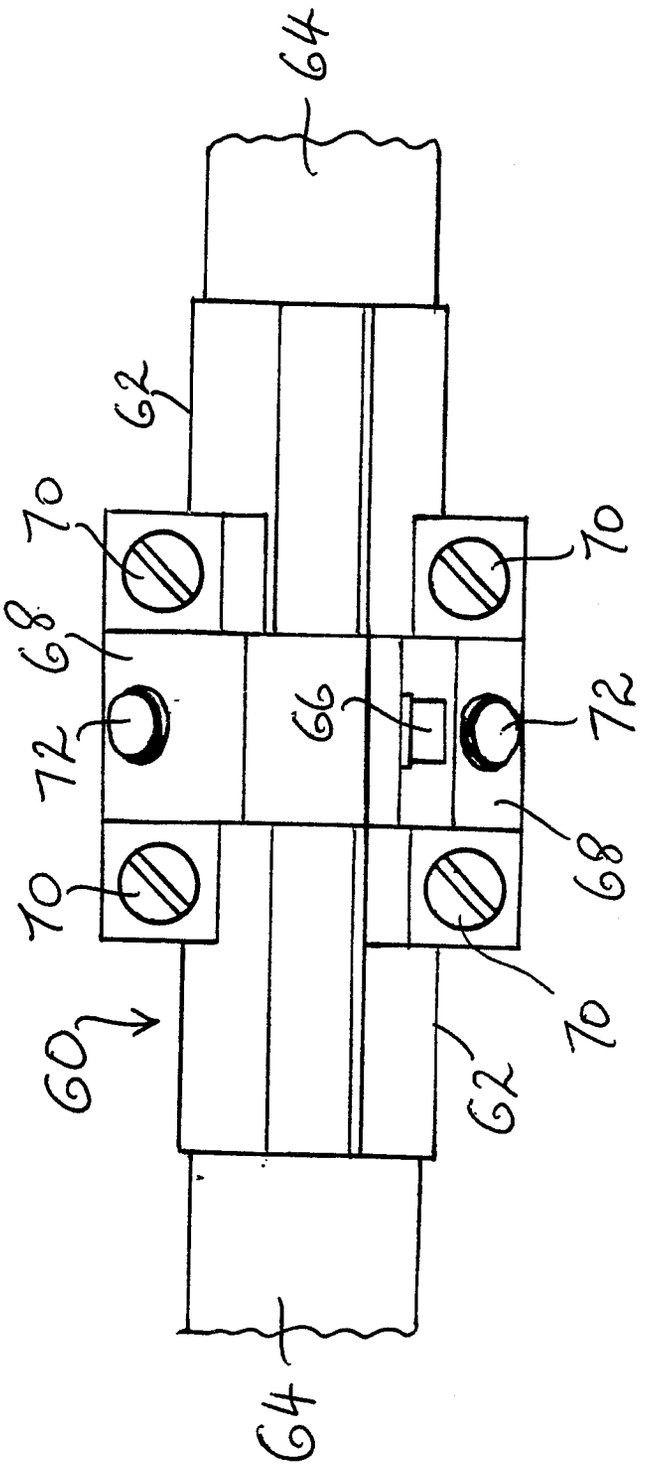

Figure 9