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(54) **Connector with spring contact member and shorting means**

Steckverbinder mit federndem Kontakt und Kurzschlussanordnung

Connecteur avec contact à ressort et des moyens de court-circuitage

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Description

The present invention relates to a connector block comprising a body and at least one contact member, each contact member being integrally made and provided with a first contact terminal for electrical contact to a contact member of a mating electric element, a second contact terminal and a spring part giving the contact member a resilient capacity in a predetermined axial direction, the connector block also comprising a shorting rod electrically contacting predetermined contact members when the connector block is in its disconnected state and being electrically separated from said predetermined contact members when the connector block is in its connected state. Such a connector block is known from US-A-4,954,087 which is intended for test purposes and to identify electric components which are able to push away predetermined first terminals from the shorting rod in the testing state. The shorting rod in this prior art connector block is not intended to short circuit vulnerable electronic equipment, such as MOS elements, when the connector block is in its disconnected state. Moreover, the known shorting rod extends in an open space in the connector block and the spring parts of the contact elements occupy a large space. Thus, the design of the known connector block is unsuitable for miniaturization.

US-A-3,903,385 shows a connector provided with opposite pairs of electrical contact members which are "shorted" by a shorting bar assembly when the connector is not connected to a printed circuit board. The shorting bar assembly comprises a shorting bar extending substantially perpendicular to the longitudinal direction of the contact members. The shorting bar is supported by a spring pushing the shorting bar against both contact members which are somewhat bent to one another for that purpose, whenever a printed circuit board is absent. Inserting a printed circuit board into the connector pushes the shorting bar away from the contact members. Since each contact member is made up of two opposite parts and each pair of contact members needs its own shorting bar with a spring the known shorting bar assembly is unsuitable for miniaturization.

US-A-4,070,557 discloses a shroud, e.g. used in back panel systems, in which resilient bridging contact members are provided. When no connector is inserted in the shroud the bridging contact members are forced in electrical contact with preselected terminals to form a closed loop condition in vacant module positions. When a connector is inserted into the shroud the connector block pushes the bridging contact members away from the terminals, thus breaking the closed loops. The bridging contact members are U-shaped and need a relatively large space within the shroud making the known arrangement unsuitable for miniaturization.

Therefore, it is an object of the present invention to provide a connector with shorting means able to protect vulnerable electronic equipment against static discharges, the connector having a design which allows further miniaturization of the connector and which connector can be easily and relatively cheaply manufactured.

This object is obtained with a connector block defined above which is characterized in that each spring part has a corrugated structure and is accommodated in a separate cavity within the connector block, the shorting rod extending within the body of the connector block and being partly exposed in predetermined cavities. By providing the shorting rod within the body of the connector block and only exposing it in preselected cavities only very little additional space is required by the shorting rod which serves the purpose of further miniaturization.

In an alternative the connector block according to the invention comprises a body and at least one contact member, each contact member being integrally made provided with a first contact terminal for electrical contact to a contact member of a mating electric element, a second contact terminal and a spring part giving the contact member a resilient capacity in a predetermined axial direction, the connector block also comprising shorting means electrically contacting predetermined contact members when the connector block is in its disconnected state and being electrically separated from said predetermined contact members when the connector block is in its connected state characterized in that each spring part has a corrugated structure and is accommodated in a separate cavity within the connector block, the shorting means comprising at least one shorting strip extending on the surface of the body of the connector block and being exposed in predetermined cavities. Accordingly to an embodiment, a very thin shorting strip exposed in preselected cavities is used which also occupies very little space, thus serving the purpose of further miniaturization.

The present invention will be further illustrated by reference to some drawings showing embodiments of the present invention. These embodiments are only meant to illustrate the present invention and not to limit its scope. In the drawings:

figure 1 shows, schematically, a hand-held telephone set according to the prior art;
figures 2a and 2b show connectors used in the prior art arrangement according to figure 1;
figure 3 shows a cross section through a connector block provided with a corrugated spring contact member largely known as such;
figure 4 shows a connector block according to figure 3 accommodated within a connector housing connected to a conventional cable;
figures 5a, 5b, 5c show different embodiments of the spring part of the spring contact member;
figure 6 shows a functional relationship between the force necessary to compress the spring contact member in its axial direction and the compression distance;

figure 7a shows a top view of one embodiment of the spring contact member;
figure 7b shows a side view of the spring contact member according to figure 7a;
figure 7c shows a side view of the spring contact member according to figure 7a but perpendicular to the side view of figure 7B;
figure 8a and figure 8b show, schematically, different possible orientations of the spring contact member 22 relative to the housing of the connector block;
figure 9 shows a connector with several spring contact members and one ground conductor to establish a static discharge possibility to ground;
figure 10a shows a cross section along line X-X in figure 9;
figure 10b shows an enlarged view of a detail of figure 10A;
figure 11a shows a cross section view along line XI-XI in figure 9;
figure 11b shows an enlarged view of a detail of figure 11A;
figure 12a shows a cross section of an alternative embodiment of the connector with a spring contact member according to the invention;
figure 12b shows a detail of the connector according to figure 12A;
figure 12c shows a detail of a cross section through another cavity of the connector according to the embodiment of figure 12A;
figures 13a, 13b, 13c illustrate a method to produce a C-shaped spring contact member for a connector according to the invention;
figure 14 shows a C-shaped spring contact member and U-shaped spring contact member within a connector block;
figure 15 shows an alternative arrangement of two C-shaped spring contact members for a connector according to the invention;
figure 16 shows a further embodiment of a spring contact member for a connector according to the invention;
figure 17a shows a spring contact member with V-shaped corrugations for a connector according to the invention and
figure 17b shows a side view of the spring contact member of figure 17a.

Figure 1 shows, schematically, a hand-held telephone set known per se and comprising a telephone cradle 1 and a separate housing 4. The separate housing 4 may have any convenient shape, e.g. a large U-shape able to entirely accommodate the telephone cradle 1. The housing 4 may be fixed to a wall, a dash board of a car, etc. The housing 4 is made of any suitable material, e.g. plastic.

The telephone cradle 1 can be connected to and disconnected from the housing 4. To this end, the telephone cradle 1 is provided with a cradle connector 2 and the housing 4 with a connector block 3. Such a hand-held telephone set must meet very demanding requirements. First of all, the force necessary to connect the telephone cradle to the housing 4 must be as low as possible. Secondly, the electrical connection between the cradle connector 2 and the connector block 3 must be very reliable, even after very many connections and disconnections: the cradle connector 2 and the connector block 3 must be designed for as many connecting and disconnecting operations as at least ten thousand. Thirdly, the cradle connector 2 and the connector block 3 must be designed as small as possible. Sometimes, fifteen or more electrical connections have to be made. However, the overall dimensions of the telephone cradle 1 are largely dependent on the dimensions of the cradle connector 2 and the connector block 3. Especially, the pitch distance between neighbouring contact members in the cradle connector 2 and the connector block 3 must be as small as possible. Moreover, the thickness and the width of the cradle connector 2 and the connector block 3 have to be as small as possible. Fourthly, any operator of the telephone cradle 1 must be allowed to connect the telephone cradle 1 to the housing 4 from a bevelled position, i.e. from a position in which the length direction of the telephone cradle 1 does not coincide with the axial direction of the contact members of the connector block 3.

Because of the fourth requirement mentioned above the cradle connector 2 cannot simply be provided with female type terminals to receive male type contact terminals 10 (figure 2B) of the connector block 3. The contact terminals 6 of the cradle connector 2 have to be designed in such a way that in the connecting state between the cradle connector 2 and the connector block 3 a sliding contact is provided between the respective contact terminals 6 (figure 2A) and the contact terminals 10 (figure 2B). Therefore, the contact terminals 6 of the cradle connector 2 are usually provided with flat extremities, as shown in figure 2a.

The cradle connector 2 and the connector block 3 may be provided with at least one switch coax line for guiding signals which have to be shielded from the outside world.

However, when the option of a sliding contact between the contact terminals 6 and the contact terminals 10 is chosen, each of the contact members of the connector block 3 have to be provided with a spring action in the axial direction of each contact member.

Figure 3 shows a cross section through a connector block 3 along one of the contact members 22. Such a connector block is essentially known from US-A-4,773,877 albeit for purposes of testing electronic components. The contact member 22 is accommodated within a cavity 24 within the insulating housing 11. The contact member 22 is an integral member comprising a contact terminal 10 for electrical contact to a mating contact terminal 6 (figure 2A), a contact pin 9 to be fixed to a printed circuit board in a manner known to any person

skilled in the art and a corrugated spring part 13. The contact member shown in figure 3 is substantially flat and may, advantageously, be made by stamping from a sheet of thin metal, e.g. made of phosphor bronze.

The connector block 3 may be arranged in a housing as shown in figure 1. However, the connector block 3 shown in figure 3 may also be accommodated within the housing 14 of a connector connected to a cable 15, as shown in figure 4. There is no restriction as to the location where the connector block 3 of figure 3 may be arranged. Moreover, there is no restriction as to the number of spring contact members 22 within the housing 11 of the connector block 3, or their arrangement within the connector block 3. Like the prior art connector block 3, shown in figure 2b, the connector block 3 according to the invention may be provided with one or more switch coax lines 12 or any other kind of contact members.

Figure 5a shows a side view of several legs of a corrugated spring part 13 of a spring contact member 22. The corrugated spring part 13 comprises several adjacent U-shapes, adjacent U-shapes being oppositely arranged. In figure 5a R designates a radius of each U-shape base. Reference sign X designates the width of each of the legs, whereas reference sign Y designates the width of each of the bases. In the arrangement according to figure 5a the following relation holds: $Y = X$.

Figure 5b and 5c show alternative embodiments of the corrugated spring part 13 of a spring contact member 22. Reference signs X and Y designate the same dimensions as in figure 5a. In the embodiment shown in figure 5b the relation $Y > X$ holds, whereas in the embodiment shown in figure 5c the relation $Y < X$ holds.

By varying the radius R and the width X of the legs, and the width Y of the base the force necessary to compress the spring contact member 22 may be varied. Figure 6 shows a functional relationship between said force and the compression distance for some selected dimensions of X, Y, and R. The dimensions given are in millimetres. Of course, the relationship shown in figure 6 also depends on the material from which the spring contact member 22 is made. Preferably, the force necessary to compress the spring contact member 22 is constant, and independent of the compression distance. However, in practice this is not possible. The dimensions of X, Y, and R are preferably chosen in such a way that the force necessary to compress the spring contact member 22 is between 0.2 and 0.4 Newton.

Figure 7a shows a further embodiment of a connector block 3. Figure 7a shows a top view, whereas figure 7b shows a side view in the direction of arrow P1 in figure 7a and figure 7c shows another side view in the direction of arrow P2 in figure 7a. Arrows P1 and P2 are perpendicular to each other. In the embodiment of figures 7a, 7b, and 7c each of the contact terminals 10 is provided with a bent extremity 16 in order to establish a less sharp contact member 10 and to enhance the possible number of connecting and disconnecting operations between the connector block 3 and the mating cradle connector 2 (figure 2A). Preferably each of the bent extremities 16 is provided with a dimple 17 to further enhance the possible number of connecting and disconnecting operations.

Also shown in figures 7a, 7b, and 7c is a rill 18 arranged in the axial direction of each contact terminal 10 in order to enforce the rigidity of each of the contact terminals 10.

Figure 8a and 8b show two different possible orientations of the spring contact members 22. Both figures 8a and 8b show schematical top views of a connector block 3 having contact terminals arranged along one line L1. In the embodiment shown in figure 8a, the spring contact members 22 have an angle of inclination relative to line L1 smaller than $\pi/2$, whereas in the embodiment shown in figure 8b the angle of inclination between the spring contact members 22 and line L1 is substantially $\pi/2$. The advantage of the embodiment according to figure 8a is that the width W1 of the connector block 3 may be smaller than the width W2 of the connector block 3 in the embodiment according to figure 8b.

Figure 9 schematically shows a connector block 3 which is provided with a ground conductor 19. The ground conductor 19 is, during operation, connected to ground, e.g. through a contact pin connected to a ground layer on a printed circuit board to which the connector block 3 is connected. The purpose of the ground conductor 19 is to provide a static discharge capability for selected contact members 22, e.g. those contact members 22 which are connected to (C)MOS circuit parts on a printed circuit board.

Figure 10a shows a cross section through the connector block 3 according to figure 9 along line X-X, whereas figure 11a shows a cross section through the connector block 3 according to figure 9 along line XI-XI. Figure 10b shows an enlarged view of the ground conductor 19 from the cross section of figure 10a, whereas figure 11b shows an enlarged view of the ground conductor 19 from the cross section of figure 11a.

Figures 10a and 10b show that each of the contact members 22 may be provided with an extension 21 at the extremity part of the corrugated spring part 13 adjacent to the ground conductor 19. In the disconnected state of the connector block 3 the extension 21 is forced to the extremity of the cavity within the insulating housing 11 of the connector block by the spring action of the corrugated spring part 13. The extension 21 shown in figures 10a and 10b is insulated from the ground conductor 19 by a wall part of the insulating housing 11. Consequently, there is no electrical contact between the extension 21 and the ground conductor 19 and no static discharge capability is provided for.

However, the extension 21 of the contact member 22 shown in figures 11a and 11b electrically contacts the ground conductor 19 when the connector block 3 is not connected to a cradle connector 2 and the extension 21 is forced to the extremity of the cavity within the housing

11. No insulating wall is present between the ground conductor 19 and the extension 21 in figures 11a and 11b. Therefore, any static charge on the contact member 22 in figures 11a and 11b will be conducted to ground through the ground conductor 19 when the connector block 3 is disconnected. Static charges on the contact member 22 of figures 11a and 11b are not able to damage (C)MOS circuit parts on a printed circuit board connected to contact pin 9.

The ground conductor 19 in the embodiment shown in figures 9, 10a, 10b, 11a, and 11b is made of a small rod from any suitable metal, e.g. phosphor bronze. However, it is also possible to provide a ground conductor strip 19' instead of a rod 19: figures 12a, 12b and 12c. The ground conductor strip 19' may be applied to the inside wall of the insulating housing 11 of the connector block 3 by means of a method for selectively metallization of plastic connectors as described and claimed in European patent application 94202140.3 (EP-A- 0 694 990). The ground conductor strip 19' is connected to ground, e.g. on a printed circuit board to which the connector block 3 is fixed, by suitable conductor means (not shown).

Figure 12b shows a cross section through a cavity 24 in which the ground conductor strip 19' is exposed to electrically contact part 21 of spring part 13 when the connector block 3 is in its disconnected state. Figure 12c shows a cross section through a cavity 24 in which the ground conductor strip 19' is covered by an insulating layer 25 to prevent electrical contact between the strip 19' and the part 21 of the spring part 13 in this cavity 24.

Figures 12a and 12b, the latter showing an enlarged view of a construction detail of figure 12a, also show by-pass strips 20 provided on the inside wall of the cavity in which the contact member 22 is accommodated. As is clearly shown in figure 12b the ground conductor strip 19' and the by-pass strip 20 are separate from each other and do not contact each other directly. The purpose of the by-pass strip 20 is to electrically contact as many U-shaped bases of the spring contact member 22 as possible and therefore to provide a short circuit for any electrical current through the contact member 22. The application of by-pass strip 20 reduces the electrical resistance between the contact terminal 10 and the contact pin 9 from each of the spring contact members 22. A by-pass strip 20 may be provided at both sides of each of the contact members 22, as shown in figure 12a. However, one by-pass strip 20 may be provided instead. The by-pass strips 20 may be applied on the inside walls of the cavity by the method for selective metallization of plastic connectors described in European patent application 94202140.3, referred to above. However, any other method for selective metallization may be used. Alternatively, a metal sleeve may be used, surrounding the spring contact member 22.

In order to ensure the best operation of the by-pass strip 20 the corrugated structure of the spring part 13 is, preferably, designed in such a way that the extension 21 is resiliently forced against the by-pass strip 20. Then, as little current as possible is flowing through the spring part 13 itself. The surface part of extension 21 contacting the by-pass strip 20 is preferably rounded and free of any burr. Alternatively, the first part of the corrugated structure opposite to extension 21 may be resiliently forced against by-pass strip 20.

The provision of a ground conductor 19 or a ground conductor strip 19' according to any of the figures 9 through 12b is also applicable to any other kind of spring contact member, e.g. the ballpen-type of spring members from the prior art described in the introduction. Of course, when the conductor block 3 provided with either a ground conductor 19 or a ground conductor strip 19' is connected to a mating cradle connector 2 those spring contact members 22 which electrically contact either the ground conductor 19 or the ground conductor strip 19' in the disconnected state will have to be at least slightly compressed in the connected state in order to avoid an electrical connection between the ground conductor 19 or the ground conductor strip 19' and the extension 21 during operation. In order to have such a guaranteed compression during operation those spring contact members 22 which have such a static discharge capability may extend slightly more from the body of the connector block 3 with their contact terminals 10 than do the other spring contact members 22 which do not have such a static discharge capability.

Figure 13a shows an enlarged view of a spring contact member 22, preferably stamped from a thin metal sheet. Figure 13a further shows two folding lines f1, f2. In order to reduce the width of a connector block 3 each of the U-shaped base parts of the corrugated spring part 13 is folded π radians about folding lines f1 or f2, respectively. Figure 13b shows the contact member 22' after such a folding operation which clearly shows that the width of the spring contact member is reduced relative to the width of the spring contact member 22 according to figure 13a. Figure 13c shows a side view of the spring contact member 22' according to figure 13b. Figure 13c shows that the gain in width is at the cost of the space needed in a direction perpendicular to the width direction of figure 13b.

Like the original spring contact member 22 the spring contact members 22' according to figures 13b and 13c may be provided with a bent extremity 16 provided with a dimple 17. Moreover the contact terminal 10 of the spring contact member 22' may be provided with a rill 18 like the original spring contact member 22.

Figure 14 shows several spring contact members 22' which are made in accordance with the method described above. The spring contact members 22' are shown in a top view in figure 14 in which they show a C-shape. The distance between the legs of the C-shaped spring contact member 22' may be varied, as required. Different distances are shown in figure 14. Moreover, the angle of inclination between the C-shaped spring contact members 22' and the line L1 may be varied, as

required.

Figure 14 also shows an alternative way of bending (or folding) a spring contact member 22 in order to produce an U-shaped spring contact member 22'' (when seen from a top view as in figure 14). The distance between the legs of such U-shaped spring contact members 22'' may be varied, as required. This is also shown in figure 14. Moreover, the angle of inclination between these U-shaped contact members 22'' and the line L1 may vary in accordance with the requirements. As explained above, the larger this angle of inclination the smaller the width w1 of the connector block 3 may be.

Figure 15 shows two C-shaped spring contact members 22' produced in accordance with the method described above referring to figures 13a, 13b, and 13c. In order to further reduce the required space for a connector block 3 the legs of two adjacent spring contact members 22' may be interlaced as shown in figure 15. Of course, insulating walls (not shown) between the two adjacent spring contact members 22' may be provided in order to prevent undesired electrical contact between both spring contact members 22'.

Figure 16 shows a further embodiment of a spring contact member 122. The spring contact member 122 differs from the spring contact member 22 (e.g. figure 13A) in the ratio of the distance between adjacent legs of the corrugated spring part 13' to the width of the corrugated spring part 13' as compared to the ratio of the distance between adjacent legs of the corrugated spring part 13 to the width of the corrugated spring part 13.

Figure 17a shows that the invention is not restricted to corrugated spring contact members 22 with U-shapes. Figure 17a shows a spring contact member 222 comprising a corrugated spring part 13'' of which adjacent legs are arranged in a V-shape. Optionally, the base parts of these V-shapes may be bent about a predetermined angle in order to reduce the width of the spring contact members 222. The bent base part is denoted by the reference sign 23. Moreover, each of the contact terminals 10 of the spring contact member 222 may be provided with a rill 18 and with a bent extremity 16, the latter in turn being provided with a dimple 17. Adjacent bent base parts 23 may be bent in opposite directions, as shown in figure 17b which shows a side view of the spring contact member 222 according to figure 17a.

The present invention is not restricted to the embodiments shown in the figures and described above. The connector blocks provided with spring contact members according to the invention are not only applicable in hand-held telephone sets. They can be applied wherever a connector block is needed having contact members with a spring action in their axial direction. Since the spring contact members themselves are made from a single piece of metal they can be easily produced. Moreover, assembling a connector block with several spring contact members according to the invention is relatively easy since the total number of pieces is reduced.

The contact pin 9 of the contact members can be substituted by contact lips or the like suitable for hold down applications. Actually, the contact pins 9 may be substituted by any type of contact terminal known to a person skilled in the art. Moreover, they may extend from a side face of block 3 instead of from the face opposite to contact terminals 10.

It is to be understood that wherever the expression "axial direction" of the contact members 22, 122, 222 is used a direction substantially coinciding with the axial direction of the contact terminals 10 is meant.

Claims

1. Connector block (3) comprising a body (11) and at least one contact member (22), each contact member being integrally made and provided with a first contact terminal (10) for electrical contact to a contact member (6) of a mating electric element (2), a second contact terminal (9) and a spring part (13) giving the contact member a resilient capacity in a predetermined axial direction, the connector block (3) also comprising a shorting rod (19) electrically contacting predetermined contact members (22) when the connector block (3) is in its disconnected state and being electrically separated from said predetermined contact members (22) when the connector block is in its connected state, characterized in that each spring part (13) has a corrugated structure and is accommodated in a separate cavity (24) within the connector block (3), the shorting rod (19) extending within the body (11) of the connector block and being partly exposed in predetermined cavities (24).

2. Connector block (3) comprising a body (11) and at least one contact member (22), each contact member being integrally made provided with a first contact terminal (10) for electrical contact to a contact member (6) of a mating electric element (2), a second contact terminal (9) and a spring part (13) giving the contact member a resilient capacity in a predetermined axial direction, the connector block (3) also comprising shorting means (19') electrically contacting predetermined contact members (22) when the connector block (3) is in its disconnected state and being electrically separated from said predetermined contact members (22) when the connector block is in its connected state, characterized in that each spring part (13) has a corrugated structure and is accommodated in a separate cavity (24) within the connector block (3), the shorting means comprising at least one shorting strip (19') extending on the surface of the body (11) of the connector block (3) and being exposed in predetermined cavities (24).

3. Connector block according to claim 1 or 2, characterized in that each of the first contact terminals (10) is provided with a bent extremity (16).

4. Connector block according to claim 3, characterized in that each of the extremities (16) is provided with a dimple (17).

5. Connector block according to claim 3 or 4, characterized in that each of the first contact terminals (10) is provided with a rill (18) arranged in the axial direction of the first contact terminals.

6. Connector block according to any of the preceding claims, characterized in that each of the spring parts (13) extend in a substantially flat surface and are provided with U-shaped or V-shaped interconnected parts.

7. Connector block according to claim 6, characterized in that the interconnected parts are provided with legs and base parts interconnecting the legs, the width (x) of the legs differing from the width (y) from the base parts.

8. Connector block according to claim 6 or 7, characterized in that the contact block comprises a plurality of said contact members (22) arranged along a line (L1) and said flat surfaces are inclined relative to said line (L1).

9. Connector block according to any of the claims 1 through 5, characterized in that each of the spring parts (13) are provided with U-shaped or V-shaped interconnected parts provided with legs and base parts interconnecting the legs, at least some of the spring parts (13) being folded in such a way that they show a substantially C-shaped or U-shaped cross section seen in the axial direction of the contact members.

10. Connector block according to any of the claims 1 through 5, characterized in that each of the spring parts (13) are provided with U-shaped or V-shaped interconnected parts provided with legs and base parts interconnecting the legs, at least one pair of adjacent spring parts (13) being folded in such a way that they show substantially C-shaped cross sections seen in the axial direction of the contact members, the C-shaped cross sections being interlaced.

11. Connector block according to any of the claims 1 or 3 through 10, characterized in that those contact members (22) which are accommodated in cavities (24) in which said exposed shorting rod (19) extends extend slightly more from the body of the connector block (3) than do the other contact members (22).

12. Connector block according to any of the claims 2 through 10, characterized in that those contact members (22) which are accommodated in cavities (24) in which said exposed shorting strip (19') extends extend slightly more from the body of the connector block (3) than do the other contact members (22).

13. Connector block according to any of the preceding claims, characterized in that each of the cavities (24) are provided with a by-pass strip (20) for reducing the electrical resistance between the first terminal (10) and the second terminal (9) of each of the contact members (22).

14. Connector block according to claim 13, characterized in that the spring part (13) is provided with a part (21) close to the first terminal (10) and is designed in such a way that said part (21) is resiliently forced against the by-pass strip (20).

Patentansprüche

1. Steckerblock (3), umfassend einen Körper (11) und mindestens ein Kontaktelement (22), wobei jedes Kontaktelement als Einheit hergestellt und mit einem ersten Kontaktanschluß (10) für einen elektrischen Kontakt mit einem Kontaktelement (6) eines passenden elektrischen Elementes (2), einem zweiten Kontaktanschluß (9) und einem Federteil (13) versehen ist, der dem Kontaktelement ein Federvermögen in einer vorbestimmten axialen Richtung verleiht, wobei der Steckerblock (3) auch einen Kurzschlußstab (19) umfaßt, der sich mit vorbestimmten Kontaktelementen (22) in elektrischem Kontakt befindet, wenn sich der Steckerblock (3) in seinem ausgekuppelten Zustand befindet, und der von den vorbestimmten Kontaktelementen (22) elektrisch getrennt ist, wenn sich der Steckerblock in seinem eingekuppelten Zustand befindet, dadurch gekennzeichnet, daß jeder Federteil (13) eine gewellte Struktur aufweist und in einem gesonderten Hohlraum (24) innerhalb des Steckerblocks (3) untergebracht ist, wobei sich der Kurzschlußstab (19) innerhalb des Körpers (11) des Steckerblocks erstreckt und teilweise in vorbestimmten Hohlräumen (24) freiliegt.

2. Steckerblock (3), umfassend einen Körper (11) und mindestens ein Kontaktelement (22), wobei jedes Kontaktelement als Einheit hergestellt und mit einem ersten Kontaktanschluß (10) für einen elektrischen Kontakt mit einem Kontaktelement (6) eines passenden elektrischen Elementes (2), einem zweiten Kontaktanschluß (9) und einem Federteil (13) versehen

ist, der dem Kontaktelement ein Federvermögen in einer vorbestimmten axialen Richtung verleiht, wobei der Steckerblock (3) auch eine Kurzschlußeinrichtung (19') umfaßt, die sich mit vorbestimmten Kontaktelementen (22) in elektrischem Kontakt befindet, wenn sich der Steckerblock (3) in seinem ausgekuppelten Zustand befindet, und die von den vorbestimmten Kontaktelementen (22) elektrisch getrennt ist, wenn sich der Steckerblock in seinem eingekuppelten Zustand befindet, dadurch gekennzeichnet, daß jeder Federteil (13) eine gewellte Struktur aufweist und in einem gesonderten Hohlraum (24) innerhalb des Steckerblocks (3) untergebracht ist, wobei die Kurzschlußeinrichtung mindestens einen Kurzschlußstreifen (19') umfaßt, der sich auf der Oberfläche des Körpers (11) des Steckerblocks (3) erstreckt und in vorbestimmten Hohlräumen (24) freiliegt.

3. Steckerblock nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß jeder der ersten Kontaktanschlüsse (10) mit einem umgebogenen Ende (16) versehen ist.

4. Steckerblock nach Anspruch 3, dadurch gekennzeichnet, daß jedes der Enden (16) mit einer Warze (17) versehen ist.

5. Steckerblock nach Anspruch 3 oder 4, dadurch gekennzeichnet, daß jeder der ersten Kontaktanschlüsse (10) mit einer Rille (18) versehen ist, die in axialer Richtung der ersten Kontaktanschlüsse angeordnet ist.

6. Steckerblock nach irgendeinem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß sich jeder der Federteile (13) in einer im wesentlichen ebenen Fläche erstreckt und mit U-förmigen oder V-förmigen miteinander verbundenen Teilen versehen ist.

7. Steckerblock nach Anspruch 6, dadurch gekennzeichnet, daß die miteinander verbundenen Teile mit Schenkeln und Basisteilen versehen sind, welche die Schenkel miteinander verbinden, wobei die Breite (x) der Schenkel von der Breite (y) der Basisteile verschieden ist.

8. Steckerblock nach Anspruch 6 oder 7, dadurch gekennzeichnet, daß der Kontaktblock eine Mehrzahl der Kontaktelemente (22) umfaßt, die längs einer Linie (L1) angeordnet sind, und daß die ebenen Flächen bezüglich der Linie (L1) geneigt sind.

9. Steckerblock nach irgendeinem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß jeder der Federteile (13) mit U-förmigen oder V-förmigen miteinander verbundenen Teilen versehen ist, die mit Schenkeln und Basisteilen versehen sind, welche die Schenkel miteinander verbinden, wobei mindestens einige der Federteile (13) in einer derartigen Weise gefaltet sind, daß sie in axialer Richtung der Kontaktelemente gesehen einen im wesentlichen C-förmigen oder U-förmigen Querschnitt zeigen.

10. Steckerblock nach irgendeinem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß jeder der Federteile (13) mit U-förmigen oder V-förmigen miteinander verbundenen Teilen versehen ist, die mit Schenkeln und Basisteilen versehen sind, welche die Schenkel miteinander verbinden, wobei mindestens ein Paar benachbarte Federteile (13) auf eine derartige Weise gefaltet ist, daß sie in axialer Richtung der Kontaktelemente gesehen im wesentlichen C-förmige Querschnitte zeigen, wobei die C-förmigen Querschnitte miteinander verzahnt sind.

11. Steckerblock nach irgendeinem der Ansprüche 1 oder 3 bis 10, dadurch gekennzeichnet, daß sich diejenigen Kontaktelemente (22), die in Hohlräumen (24) untergebracht sind, in denen sich der freiliegende Kurzschlußstab (19) erstreckt, geringfügig weiter aus dem Körper des Steckerblocks (3) erstrecken als die anderen Kontaktelemente (22).

12. Steckerblock nach irgendeinem der Ansprüche 2 bis 10, dadurch gekennzeichnet, daß sich diejenigen Kontaktelemente (22), die in Hohlräumen (24) untergebracht sind, in denen sich der freiliegende Kurzschlußstreifen (19') erstreckt, geringfügig weiter aus dem Körper des Steckerblocks (3) erstrekken als die anderen Kontaktelemente (22).

13. Steckerblock nach irgendeinem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß jeder der Hohlräume (24) mit einem Überbrückungsstreifen (20) versehen ist, um den elektrischen Widerstand zwischen dem ersten Anschluß (10) und dem zweiten Anschluß (9) von jedem der Kontaktelemente (22) zu verringern.

14. Steckerblock nach Anspruch 13, dadurch gekennzeichnet, daß der Federteil (13) in der Nähe des ersten Anschlusses (10) mit einem Teil (21) versehen ist und derart gestaltet ist, daß der Teil (21) federnd gegen den Überbrückungsstreifen (20) gedrückt wird.

Revendications

1. Bloc connecteur (3) comprenant un corps (11) et au moins un élément de contact (22), chaque élément de contact étant formé intégralement avec et comprenant une première borne de contact (10) pour venir en contact électrique avec un élément de con-

tact (6) d'un élément électrique complémentaire (2), une seconde borne de contact (9) et une partie de ressort (13) donnant à l'élément de contact une propriété élastique dans une direction axiale prédéterminée, le bloc connecteur (3) comprenant aussi une tige de mise en court-circuit (19) venant en contact électrique avec des éléments de contact prédéterminés (22) quand le bloc connecteur (3) est dans son état déconnecté et étant électriquement séparée desdits éléments de contact prédéterminés (22) quand le bloc connecteur est dans son état connecté, caractérisé en ce que chaque partie de ressort (13) a une structure ondulée et se trouve logée dans une cavité distincte (24) à l'intérieur du bloc connecteur (3), la tige de mise en court-circuit (19) s'étendant à l'intérieur du corps (11) du bloc connecteur et étant partiellement exposée dans les cavités prédéterminées (24).

2. Bloc connecteur (3) comprenant un corps (11) et au moins un élément de contact (22), chaque élément de contact étant intégralement formé avec une première borne de contact (10) pour venir en contact électrique avec un élément de contact (6) d'un élément électrique complémentaire (2), une seconde borne de contact (9) et une partie de ressort (13) donnant à l'élément de contact une propriété élastique dans une direction axiale prédéterminée, le bloc connecteur (3) comprenant aussi des moyens de mise en court-circuit (19') venant en contact électrique avec des éléments de contact prédéterminés (22) quand le bloc connecteur (3) est dans son état déconnecté et étant électriquement séparés desdits éléments de contact prédéterminés (22) quand le bloc connecteur est dans son état connecté, caractérisé en ce que chaque partie de ressort (13) a une structure ondulée et se trouve logée dans une cavité séparée (24) à l'intérieur du bloc connecteur (3), les moyens de court-circuit étant formés d'au moins une bande de mise en court-circuit (19') s'étendant sur la surface du corps (11) du bloc connecteur et étant exposés dans les cavités prédéterminées (24).

3. Bloc connecteur selon la revendication 1 ou 2, caractérisé en ce que chacune des premières bornes de contact (10) est formée avec une extrémité coudée (16).

4. Bloc connecteur selon la revendication 3, caractérisé en ce que chacune des extrémités (16) est formée avec un bossage (17).

5. Bloc connecteur selon la revendication 3 ou 4, caractérisé en ce que chacune des premières bornes de contact (10) est formée avec une nervure (18) agencée dans la direction axiale des premières bornes de contact.

6. Bloc connecteur selon l'une quelconque des revendications précédentes, caractérisé en ce que chacune des parties de ressort (13) s'étend en une surface sensiblement plane et est formée avec des parties interconnectées à profil en U ou à profil en V.

7. Bloc connecteur selon la revendication 6, caractérisé en ce que les parties interconnectées sont formées avec des branches et des parties de base interconnectant les branches, la largeur (x) des branches étant différente de la largeur (y) des parties de base.

8. Bloc connecteur selon la revendication 6 ou 7, caractérisé en ce que le bloc connecteur comprend une pluralité desdits éléments de contact (22) agencés le long d'une ligne (L1) et lesdites surfaces planes sont inclinées par rapport à ladite ligne (L1).

9. Bloc connecteur selon l'une quelconque des revendications 1 à 5, caractérisé en ce que chacune des parties de ressort (13) est formée avec des parties interconnectées à profil en U ou à profil en V formées avec des branches et des parties de base interconnant les branches, certaines au moins des parties de ressort (13) étant repliées de manière à présenter une section transversale essentiellement profilée en C ou profilée en U vue dans la direction axiale des éléments de contact.

10. Bloc connecteur selon l'une quelconque des revendications 1 à 5, caractérisé en ce que chacune des parties de ressort (13) est formée avec des parties profilées en U ou profilées en V interconnectées, formées avec des branches et des parties de base interconnectant les branches, une paire au moins de parties de ressort adjacentes (13) étant pliée de manière à présenter une section transversale sensiblement profilée en C vue dans la direction axiale des éléments de contact, les sections transversales profilées en C étant entrelacées.

11. Bloc connecteur selon l'une quelconque des revendications 1 et 3 à 10, caractérisé en ce que ces éléments de contact (22) qui sont logés dans des cavités (24) à l'intérieur desquelles s'étend ladite tige de mise en court-circuit (19) exposée, s'étendent légèrement plus loin du boîtier du bloc connecteur (3) que les autres éléments de contact (22).

12. Bloc connecteur selon l'une quelconque des revendications 2 à 10, caractérisé en ce que ces éléments de contact (22) qui sont logés dans des cavités (24) à l'intérieur desquelles s'étend ladite bande de mise en court-circuit (19') exposée s'étendent légèrement plus loin du boîtier du bloc connecteur (3) que les autres éléments de contact (22).

13. Bloc connecteur selon l'une quelconque des revendications précédentes, caractérisé en ce que chacune des cavités (24) est formée avec une bande de dérivation (20) pour réduire la résistance électrique entre la première borne (10) et la seconde borne (9) de chacun des éléments de contact (22).

14. Bloc connecteur selon la revendication 13, caractérisé en ce que la partie de ressort (13) est formée avec une partie (21) proche de la première borne (10) et étudiée de façon que cette partie (21) soit sollicitée de manière élastique contre la bande de dérivation (20).

fig-1

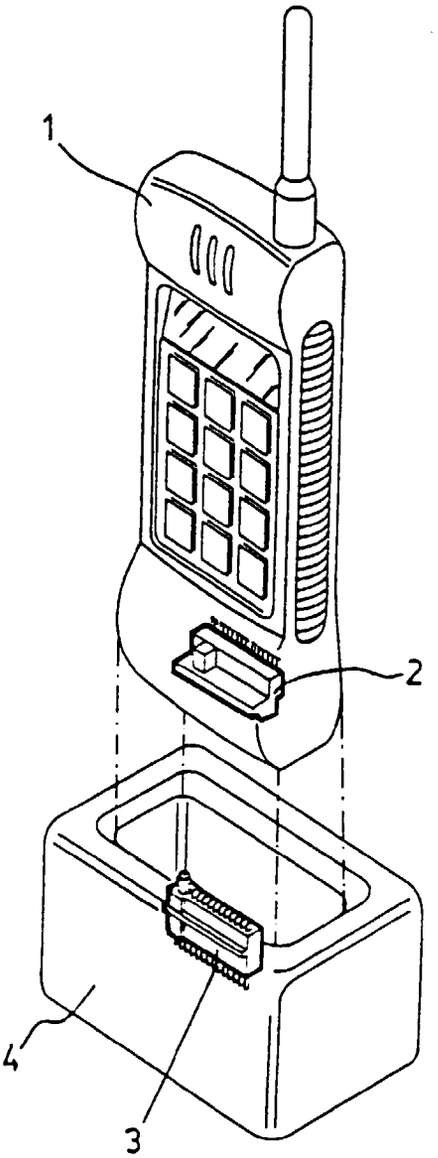


fig-2a

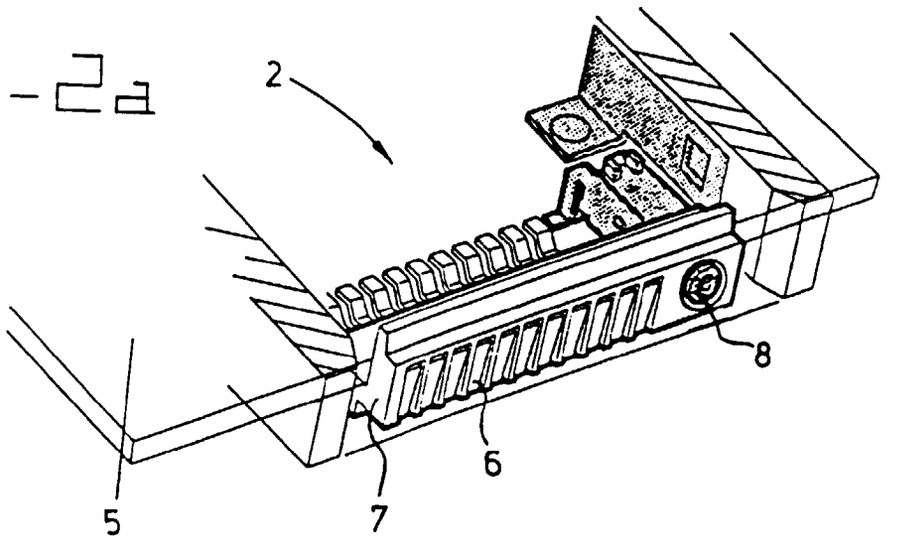


Fig-2b

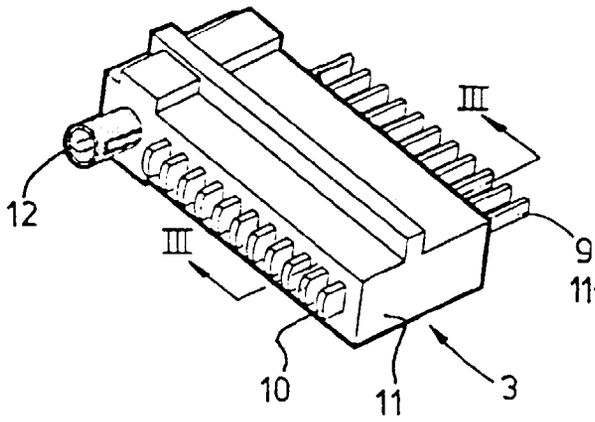


Fig-3

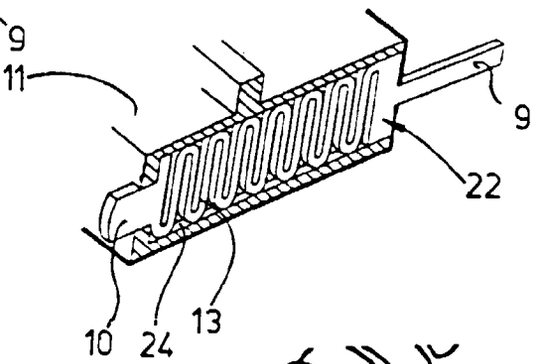


Fig-4

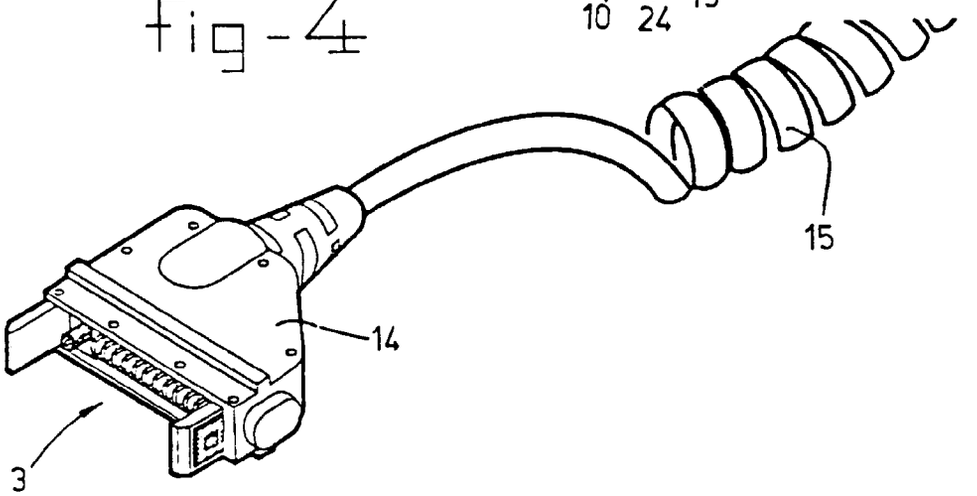
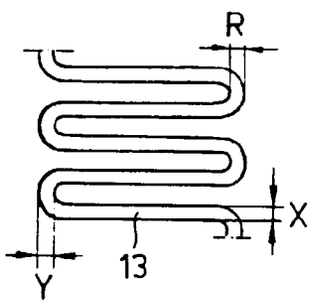
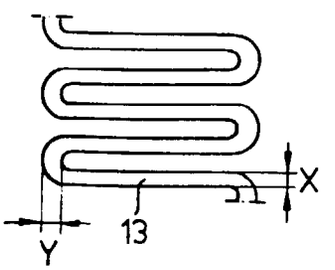


Fig-5a



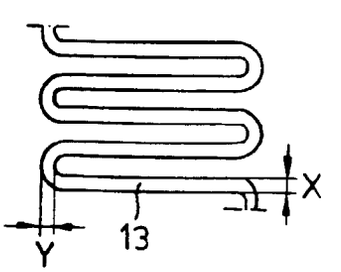
X = Y

Fig-5b



Y > X

Fig-5c



Y < X

fig-6

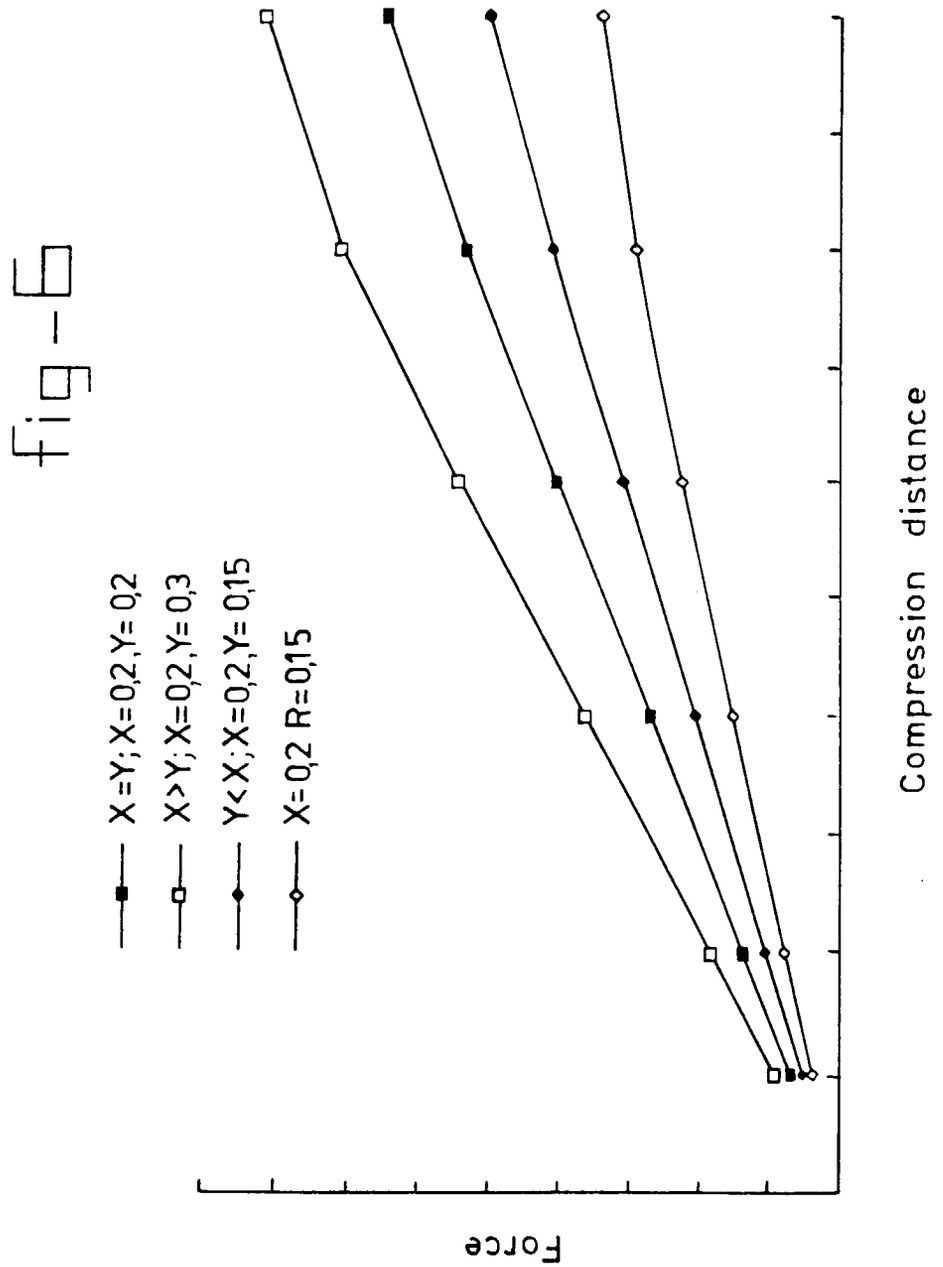

X=Y; X=0,2, Y= 0,2
X>Y; X=0,2, Y= 0,3
Y<X; X=0,2, Y= 0,15
X=0,2 R=0,15
Force
Compression distance

Fig-7a

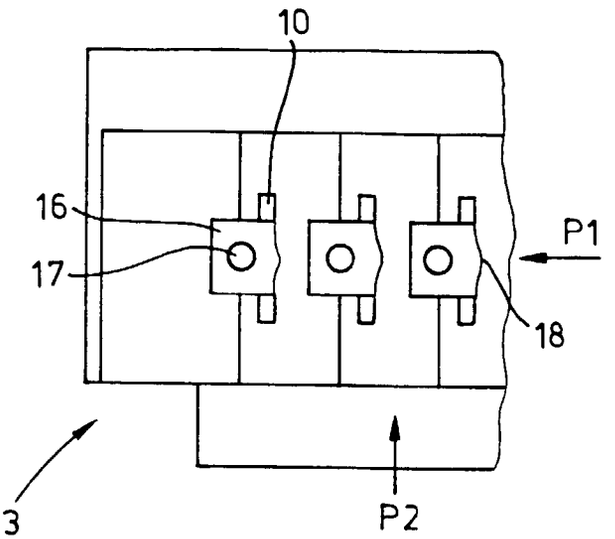


Fig-7b

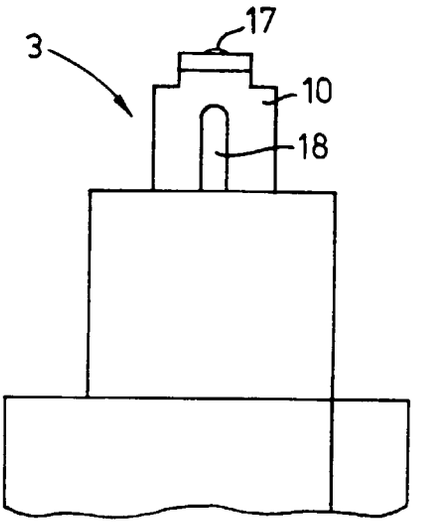


Fig-7c

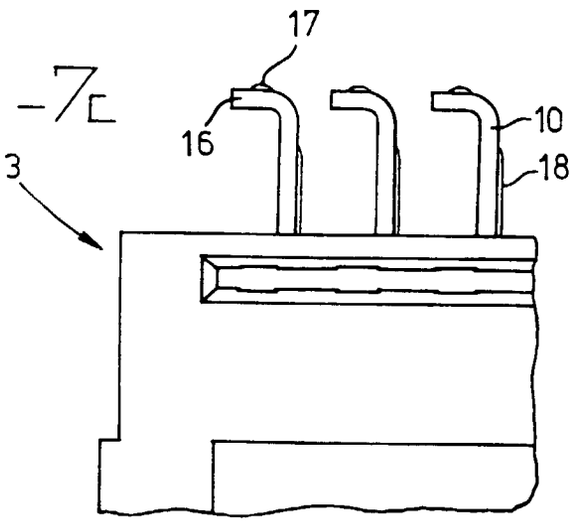


Fig-8a

Fig-8b

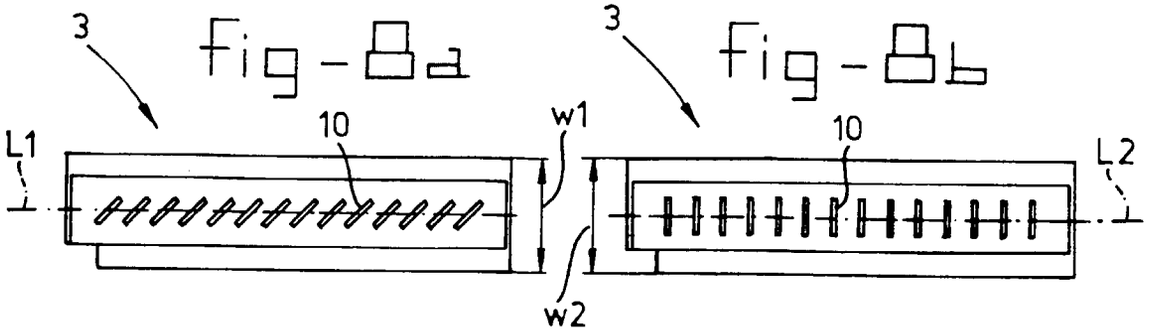


fig-9

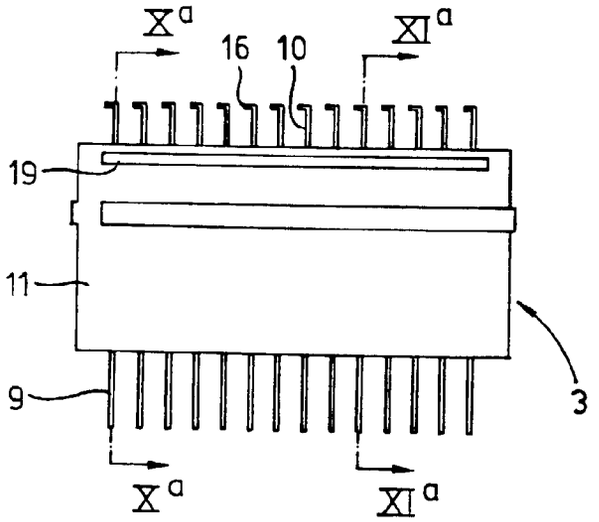


fig-10b fig-11b

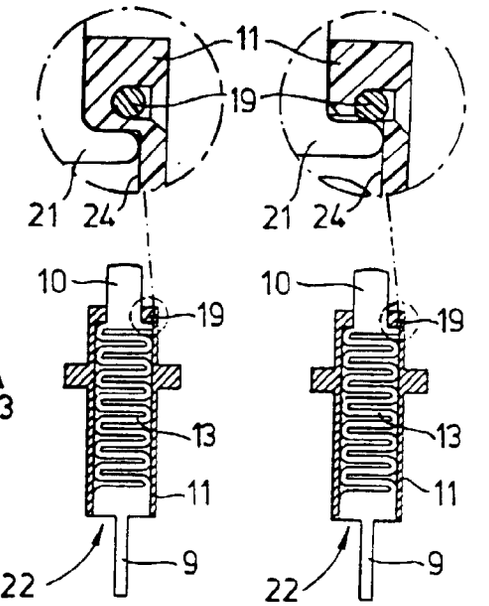


fig-12a

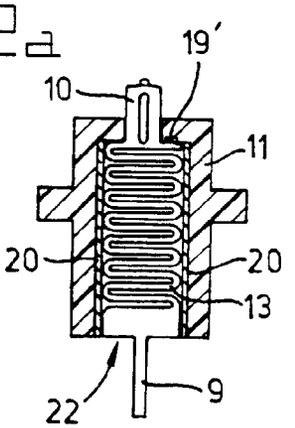


fig-10a fig-11a

fig-12c

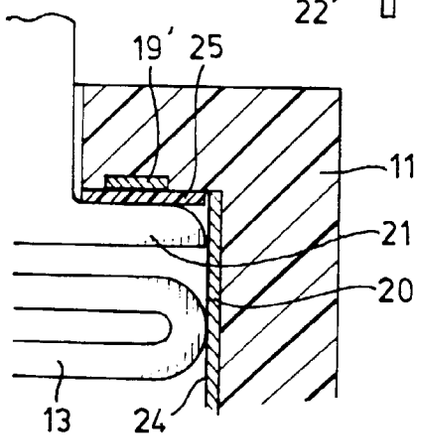
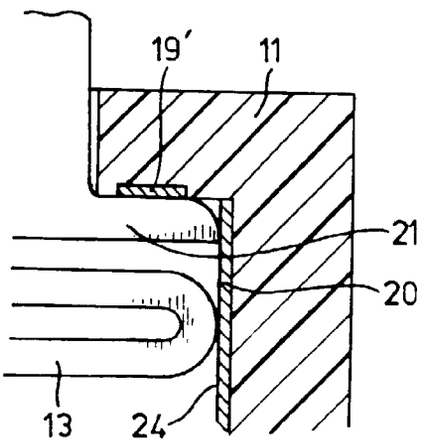


fig-12b



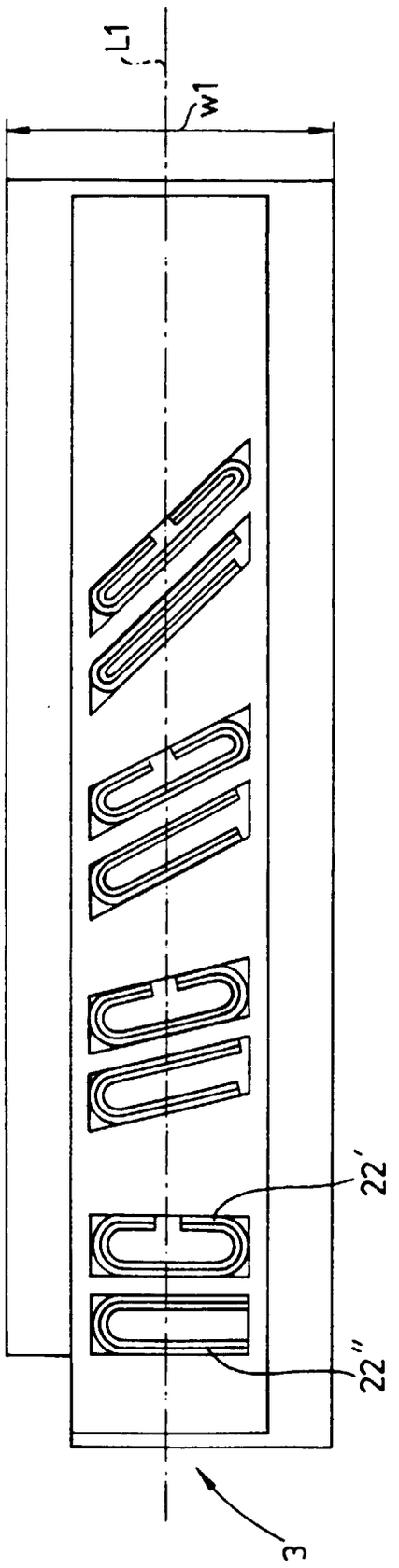


Fig-14

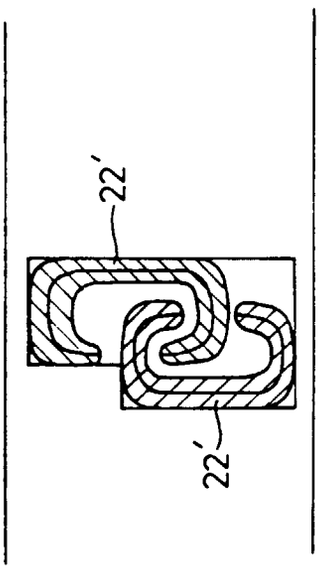


Fig-15

Fig-13c

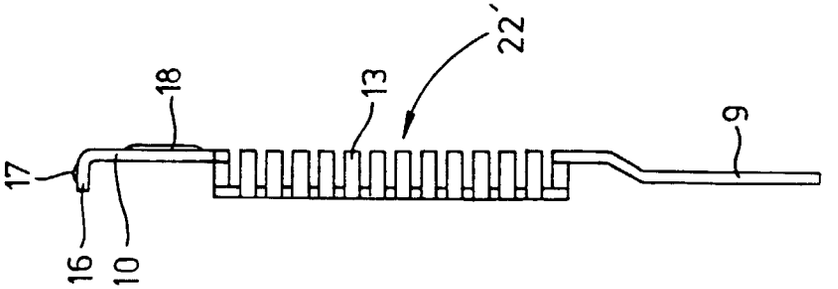


Fig-13b

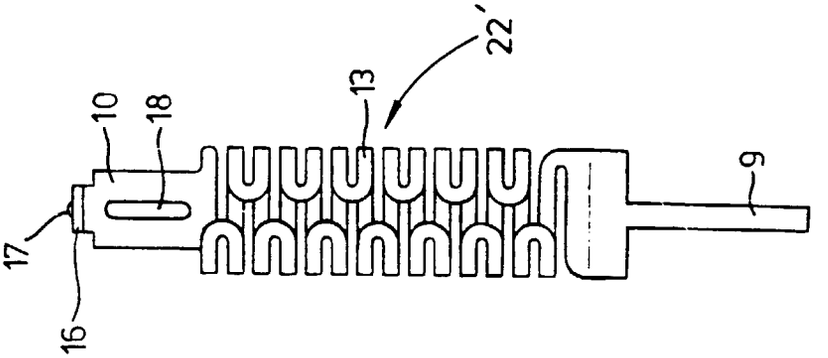


Fig-13d

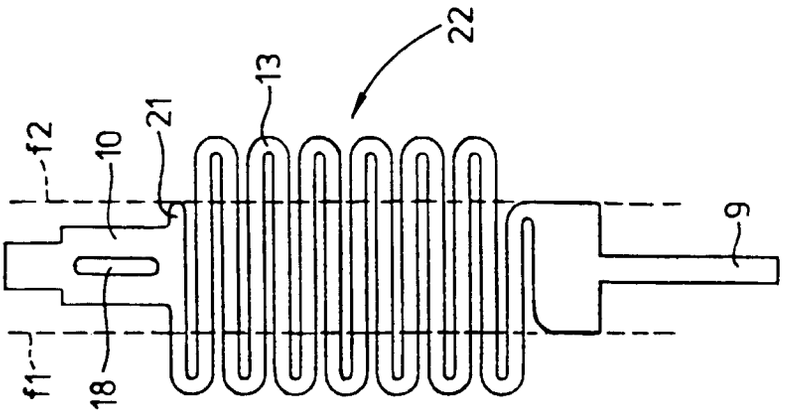


Fig-17b

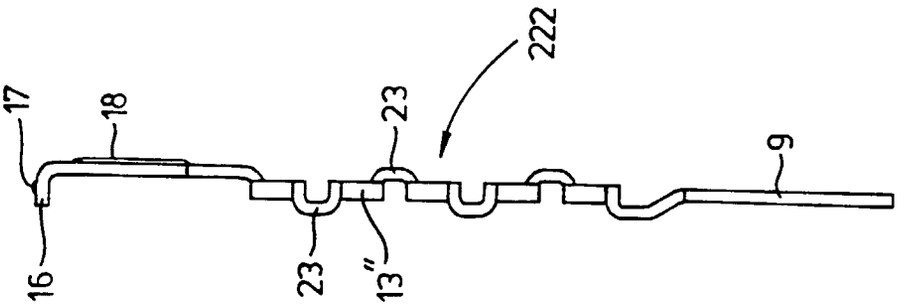


Fig-17a

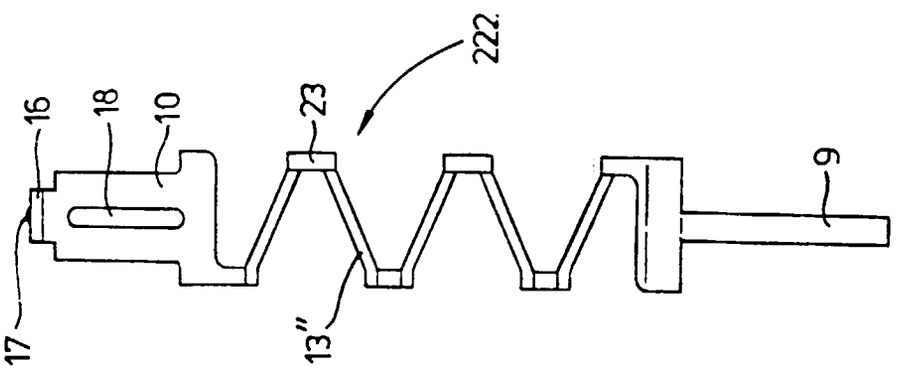


Fig-16