April 27, 1965

B. K. FIELDER

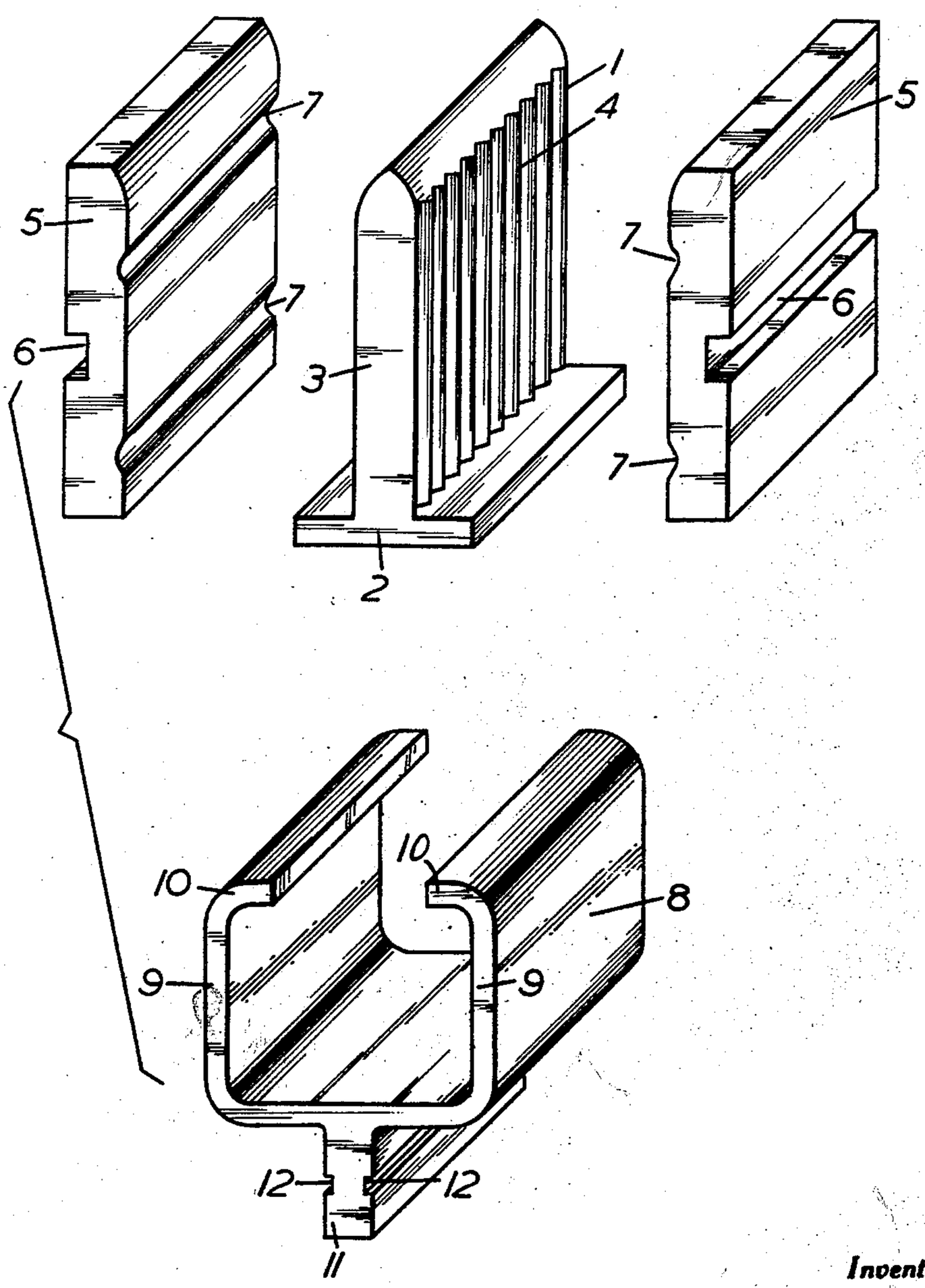
3,181,106

ELECTRICAL CONNECTORS

Filed April 26, 1963

4 Sheets-Sheet 1

FIG.I.



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April 27, 1965 B. K. FIELDER 3,181,106

ELECTRICAL CONNECTORS

Filed April 26, 1963 4 Sheets-Sheet 2

FIG. 2.

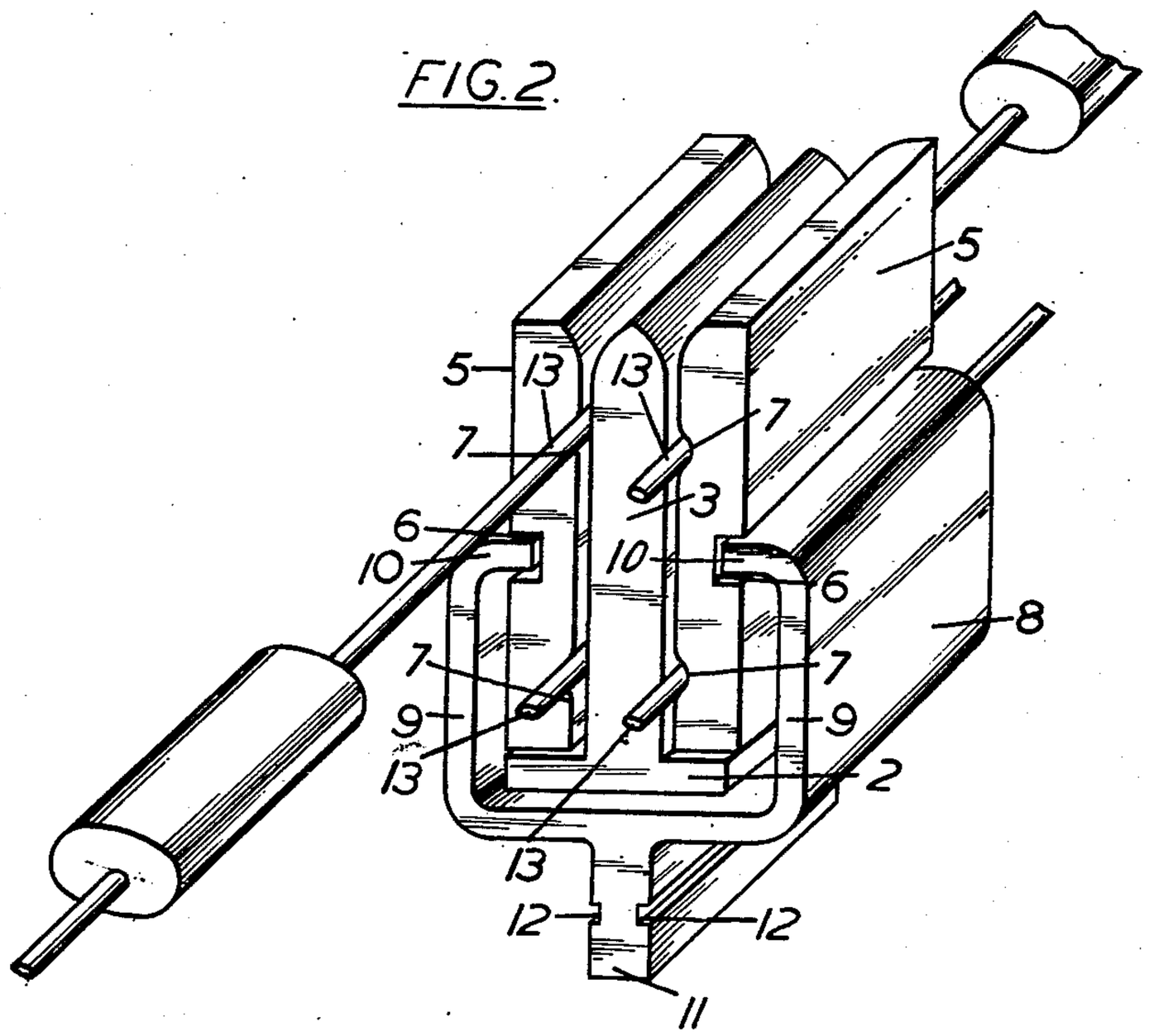
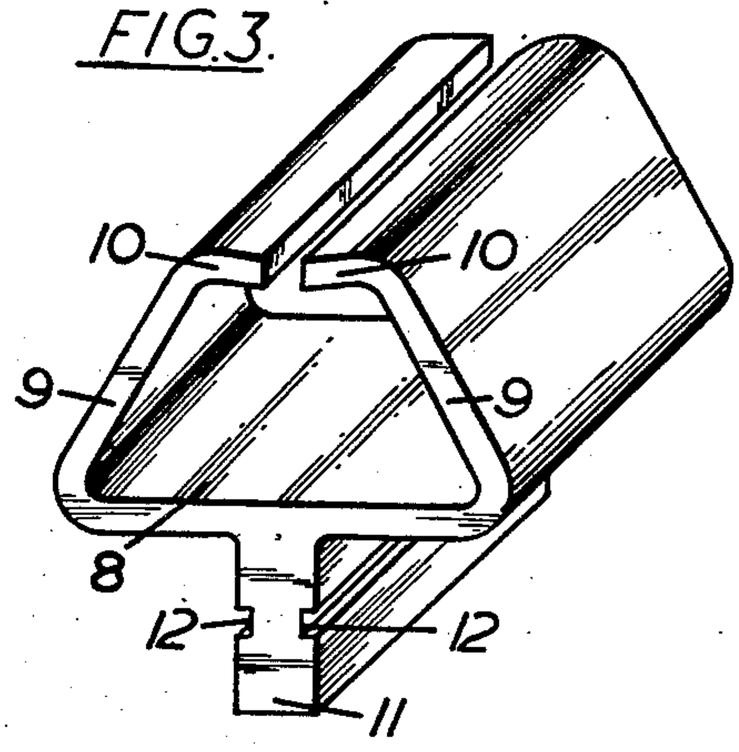


FIG. 3.



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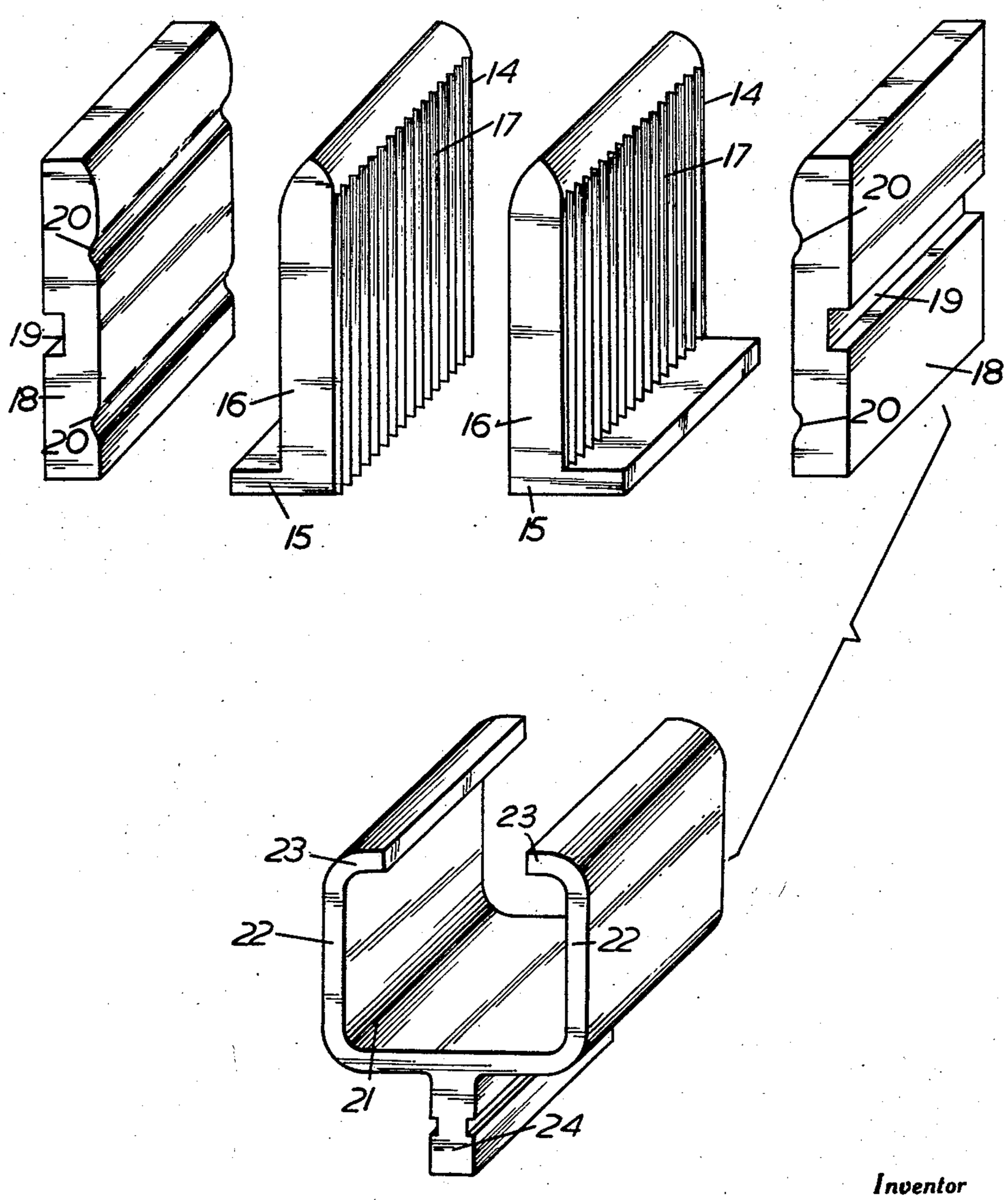
April 27, 1965 B. K. FIELDER 3,181,106

ELECTRICAL CONNECTORS

Filed April 26, 1963 4 Sheets-Sheet 3

FIG.4.



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4 Sheets-Sheet 4

FIG.5.

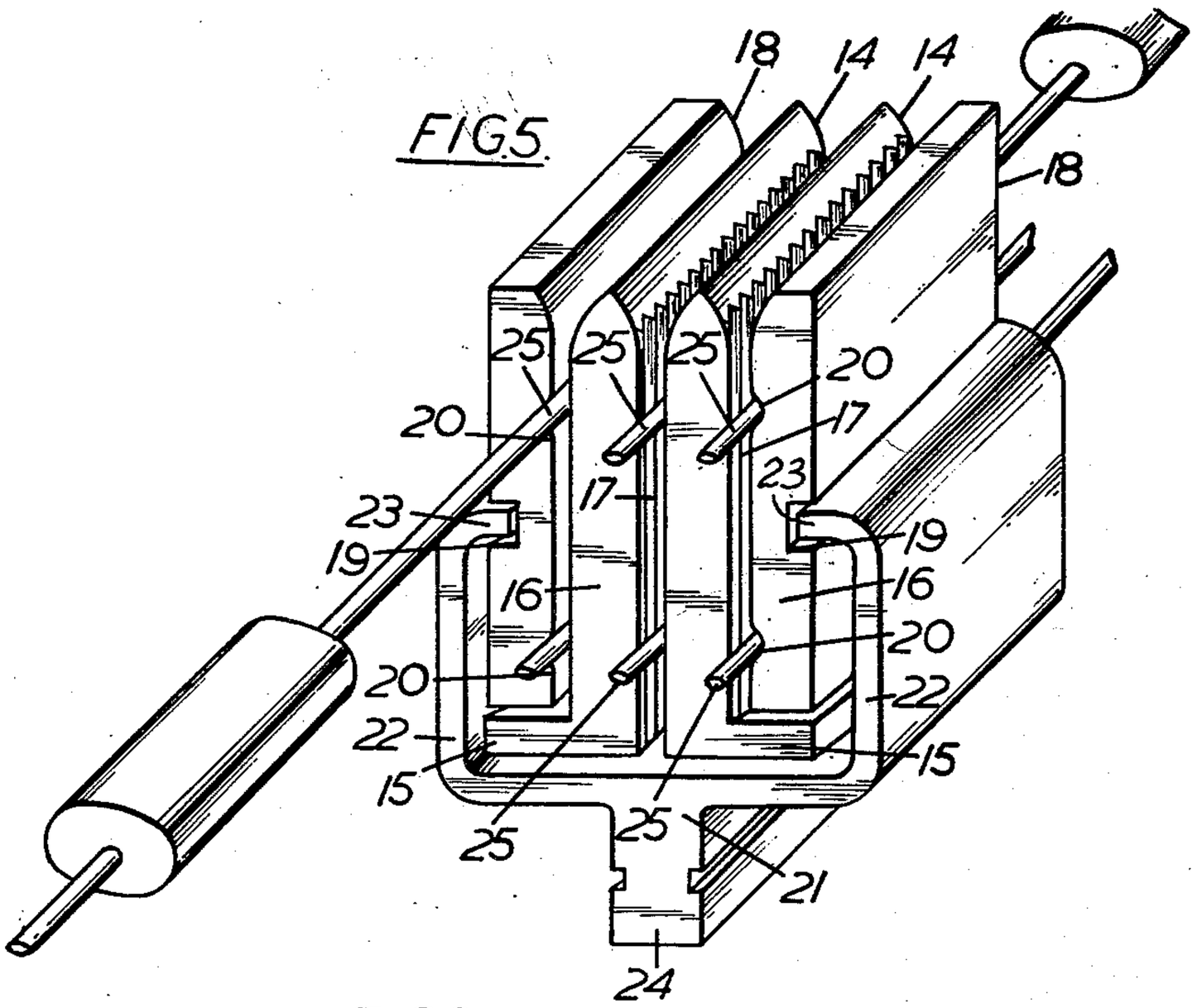
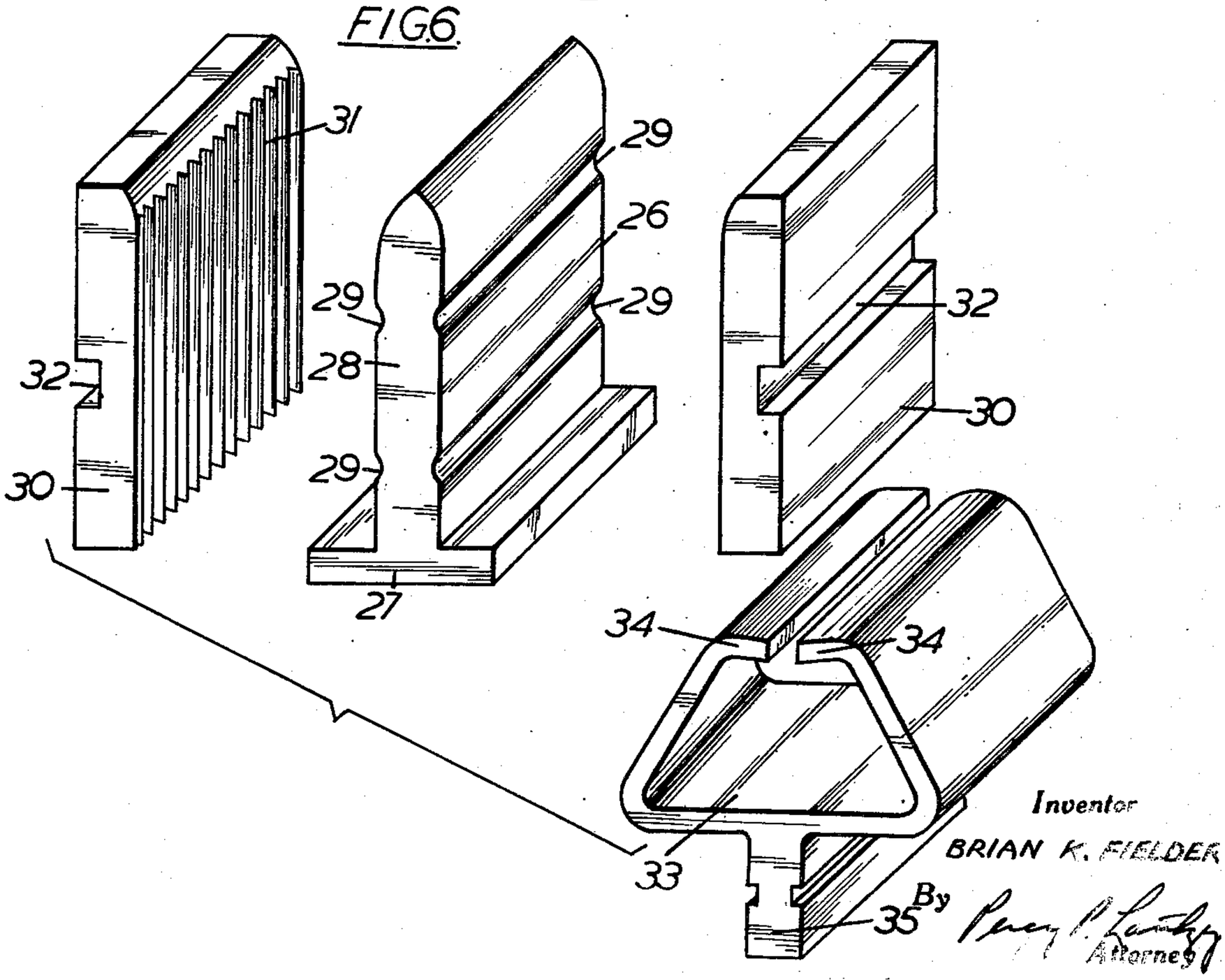


FIG.6.



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ELECTRICAL CONNECTORS

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12 Claims. (Cl. 339—95)

The present invention relates to wire connectors, and more particularly connectors of the kind in which an electrical connection is made between two or more conductors by the application of mechanical pressure.

According to the invention there is provided a wire connector comprising a pair of end plates, at least one further plate intermediate said end plates, and a clip-type spring having inwardly extending lips adapted to engage in recesses in the outer faces of said end plates for maintaining pressure between said end plates, wherein two adjacent plates are adapted to have wires placed therebetween, wherein one of said two adjacent plates is made of electrically conductive material and is provided with ridges in the face adjacent to the other one of said two plates, and wherein said ridges are adapted to penetrate the surfaces of any wires placed between said two plates when said spring is in the operative condition.

Embodiments of the present invention will now be described with reference to the accompanying drawings in which:

FIG. 1 shows a first embodiment of the connector dismantled.

FIG. 2 shows the first embodiment assembled connecting four wires together.

FIG. 3 shows a connector spring in the release position.

FIG. 4 shows a second embodiment of the connector dismantled.

FIG. 5 shows the second embodiment of the connector assembled connecting six wires together.

FIG. 6 shows a third embodiment of the connector dismantled.

Referring to FIG. 1, a connector, for electrically connecting together a maximum of four wires, is shown. A T-shaped centre plate **1**, made of conducting material, has a horizontal flange **2** forming the base, and a vertical web **3**. Side faces of the web **3** have sharp V-shaped vertical ridges **4** formed on them extending the height of the web **3**, and the top of the web **3** is bevelled on both sides.

Rectangular side plates **5**, which may be made of conducting or insulating material, are shown, one on each side of the centre plate **1**. Each side plate **5** has one centrally-disposed horizontal channel **6**, of rectangular cross-section, extending the width of one side, and two horizontal channels **7**, each equidistant from the central horizontal axis of the plate **5**, extending the width of the other side. The top of each side plate is bevelled on the same side as the channels **7**. A clip shaped spring **8** of insulating material, is shown in the working position i.e. with the sides **9** substantially perpendicular to the base. The top of each side **9** of spring **8** is bent over inwards to form a lip **10**. From the base a centrally-disposed flange **11** extends vertically downwards providing means for securing the spring, for example to a base board. The flange extends the width of the spring and has a rectangular channel **12** formed on each side to locate arms of a retaining clip (not shown).

To assemble the connector the side plates **5** are located on the flange **2** of the centre plate **1**, one on each side of the web **3**, with the sides carrying the channels **7** adjacent to the ridges **4** of the web **3**. This assembly is

then slid endwise into the spring **8** while the spring sides **9** are held in the working position. On releasing the spring **8** the lips **10** engage the channels **6** of the side plates **5** preventing any vertical movement of the assembly while being inserted and when in use.

Referring now to FIG. 2, connecting wires **13** are shown located in the connector. In this case all four wires are connected together, the conducting path being via the centre plate **1**. The wires are insulated from any conducting parts of the base on which the spring is mounted by the spring **8**.

Referring now to FIG. 3, each side **9** of the spring **8**, shown in the "release" position, makes an acute angle with the base of the spring.

Referring now to FIG. 4, a second embodiment of the connector, adapted to electrically connect together a maximum of six wires, is shown. Two identical L-shaped centre plates **14**, made of conducting material are shown back-to-back having flanges **15** forming the bases of the centre plates **14**. Each web **16** of the centre plates **14** has sharp vertical V-shaped ridges **17** formed on both sides and the top of each web **16** is bevelled on both sides. Two identical rectangular side plates **18**, made of either conducting or insulating material are shown, one on each side of the centre plates **14**. These side plates **18** have a centrally-disposed horizontal channel **19**, of rectangular cross-section, extending the width of one side, and two horizontal channels **20**, equidistant from the central horizontal axis of each side plate, extending the width of the other side. The top of each side plate is bevelled on the same side as the channels **20**.

A clip shaped spring **21**, made of an insulating material, is shown in the working position i.e. with sides **22** substantially perpendicular to the base. The top of each side **22** is bent over inwards to form a lip **23**. From the base a centrally-disposed flange **24** extends vertically downwards providing means for securing the spring **21**, for example, to a base board. The flange extends the width of the spring and has a rectangular channel formed on each side to locate arms of a retaining clip (not shown).

To assemble the connector, the side plates **18** are located on the base flanges **15** of the centre plates **14**, with the sides carrying the channels **20** adjacent to the ridges **17** of the centre plates **14**. The centre plates **14** are brought together back to back and the whole assembly is slid end wise into the spring **21**, while the spring sides **22** are held in the working position. On releasing the spring **21**, the lips **23** engage the channels **19** of the side plates **18** preventing any vertical movement of the assembly while being inserted and when in use.

Referring now to FIG. 5 connecting wires **25** are shown located in the connector. In this case all six wires are connected together the conducting paths being via the centre plates **14**.

Referring now to FIG. 6, a third embodiment of the connector adapted to electrically connect together two pairs of wires, each pair being insulated from the other. A T-shaped centre plate **26**, made of insulating material has a horizontal flange **27** forming the base and a vertical web **28**. Each side of the web **28** has two horizontal channels **29** equidistant from the central horizontal axis of the web **28**, and the top of the web **28** is bevelled on both sides. Two rectangular side plates **30**, made of conducting material, are shown, one on each side of the centre plate **26**. Each side plate **30** has sharp vertical V-shaped ridges **31** extending the height of one side of the web and a horizontal centrally-disposed channel **32**, of rectangular cross-section extending the width of the other side. The top of each side plate is bevelled on the same side as the ridges **31**.

A clip-shaped spring **33**, made of insulating material,

is shown in the "release" position. The top of each side is bent over to form a lip 34 and a centrally-disposed flange 35 extends vertically downwards from the base of the spring 33 providing means for securing the spring 33 for example to a base board.

To assemble the connector the side plates 30 are located on the flange 27 on either side of the web 28 of the centre plate 26 with the ridges 32 adjacent to the web 28. The whole assembly is then slid into the spring 33 which is held in the working position. On releasing the spring 33 the lips 34 engage the channels 32 of the side plates 28 preventing any vertical movement of the assembly while it is being inserted and when in use.

Pairs of wires to be connected in this connector are located one in each side of the centre plate, each wire being located in one of the channels 29. Electrical connection is made between the wires via the side plates 28, each pair being insulated from the other by the centre plate 26.

Wires to be connected by means of any of the embodiments described above are pressed into the connector either by hand or a suitable tool, for example, a screwdriver. The wires are located in the channels 7, 20, and 29 of FIGS. 1, 4 and 6 respectively. Each of side plates 5, 18 and 30 of FIGS. 1, 4 and 6 respectively pivots about its corresponding lip of the spring so that when the wires are in position in the channels 7, 20 and 29 equal force is exerted on each wire. In each embodiment the wires are clamped between two plates at least one of which has ridges. The force between the plates provided by the spring is such as to make the ridges penetrate the wire surfaces thus breaking through the oxide layers to make good electrical connection between the wires and the plate which has the ridges on it.

If wires of different diameters are to be connected, the channels locating the wires may conveniently have a V-shaped cross section. The forces exerted on wires of different diameters inserted in the connector will all be equal because of the positions of the channels.

If necessary the channels may be omitted altogether. The wires may then be positioned in the connector by a special tool or by hand. The top edges of the side plates and centre plates may be left unbevelled. In this case the wires must be located in the connector by a special tool.

A special tool may be used to keep the plates of the connector apart while the wires are being inserted to prevent the ridges of the plates damaging the surfaces of the wires before they are in position in the connector.

The flange of each spring, although shown as rectangular in shape extending the width of the spring, may take any convenient shape, and need not necessarily extend the width of the spring.

If more than six wires are required to be connected together then two or more connectors are used.

It is to be understood that the foregoing description of specific examples of this invention is not to be considered as a limitation on its scope.

What I claim is:

1. A wire connector comprising a pair of end plates, at least one further plate intermediate said end plates, and a clip-type spring having inwardly extending lips adapted to engage in recesses in the outer faces of said end plates for maintaining pressure between said end plates, said clip-type spring having means for supporting and mounting said plates wherein two adjacent plates are

adapted to have wires placed therebetween, wherein one of said two adjacent plates is made of electrically conductive material and is provided with ridges in the face adjacent to the other one of said two plates, and wherein said ridges are adapted to penetrate the surfaces of any wires placed between said two plates when said spring is disposed in said recesses in said outer faces.

2. A wire connector as claimed in claim 1, comprising a single further plate of electrically conductive material and provided with ridges on both faces thereof.

3. A wire connector as claimed in claim 1, comprising a second further plate of electrically conductive material both said further plates having ridges on both faces thereof, said second further plate being disposed adjacent said further plate.

4. A wire connector according to claim 1, wherein said end plates are made of electrically insulating material.

5. A wire connector as claimed in claim 1, wherein said end plates are made of electrically conductive material, and wherein the inner faces of said end plates are each provided with grooves.

6. A wire connector as claimed in claim 5, comprising a single further plate of electrically insulating material.

7. A wire connector according to claim 1, wherein said other one of said two adjacent plates is provided with a groove in the face adjacent to said one of said two adjacent plates, wherein said groove is adapted to have a wire placed therein and has a depth which is less than the thickness of said wire.

8. A wire connector according to claim 1, wherein said other one of said two adjacent plates is provided with two substantially parallel grooves in the face adjacent to said one of said two adjacent plates, wherein said two grooves are substantially parallel to and to either side of a plane defined by said recesses, wherein each of said two grooves is adapted to have a wire placed therein and has a depth which is less than the thickness of said wire.

9. A wire connector according to claim 1, wherein one or more plates are provided with a flange along one edge of the plate or plates for locating the corresponding edge of an adjacent plate.

10. A wire connector according to claim 1, wherein said clip-type spring is made of electrically insulating material.

11. A wire connector as claimed in claim 10, wherein said clip type spring comprises a flange extending outwards to provide means for mounting said spring.

12. A wire connector as claimed in claim 11, wherein each side of the flange of said spring has a channel formed therein.

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