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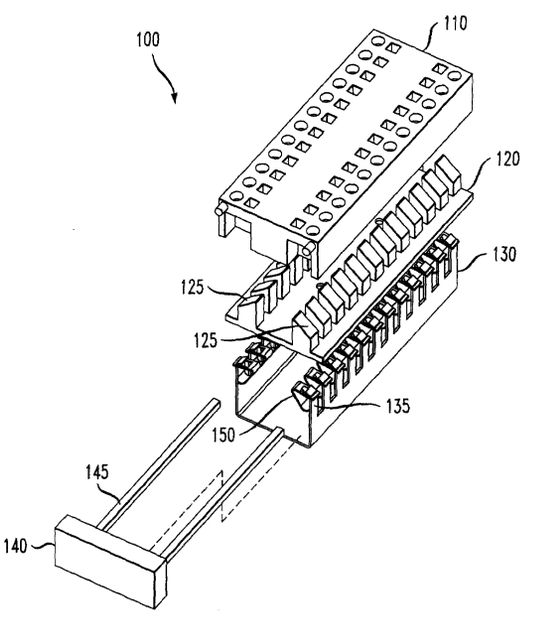
(54) Terminal block assembly with embedded busbar technical field of the invention

(57) For use in receiving a plurality of electrical wire terminations, a terminal block assembly comprises: (1) an outer shell (110) having a plurality of apertures, (2) a plurality of spring clamps (150) arranged laterally within said outer shell, said plurality of spring clamps associated with corresponding ones of said plurality of apertures and configured to receive and hold said plurality of electrical wire terminations and (3) a pry support (120), coupled to said outer shell and associated with said spring clamps, that is adapted to support, and act as a fulcrum for, a pry tool to urge at least one of said plurality of spring clips open to receive one of said plurality of electrical wire terminations.

FIG. 1A



EP 1 134 842 A2

Description

TECHNICAL FIELD OF THE INVENTION

[0001] The present invention is directed, in general, to a terminal block assembly and, more specifically, to a terminal block assembly that has a plurality of spring clips to receive electrical wire terminations.

BACKGROUND OF THE INVENTION

[0002] Telecommunication and electrical distribution networks (such as may be found in industrial and household systems) are frequently provided with common collection and distribution points at which electrical signals in the network of wires are gathered together or distributed. The most frequently used termination point for the network of electrical wires takes the form of a collective connection device. Collective connection devices typically have a frame to which are attached the terminals used to terminate electrical wiring and route or distribute electrical signals through the network. Although the actual configuration of collective connection devices may vary depending on system requirements, a feature shared by all such devices is that a mechanism must be provided to accept and hold the terminal ends of the wires that form the network.

[0003] The ends of the electrical wires in a wiring network are generally terminated in terminal blocks mounted on the collective connection device. Because the network can consist of a large number of electrical wires, the collective connection device must have sufficient capacity to receive all the electrical wire terminations in the network. These terminal blocks are usually mounted in rows on the collective connection device frame in direct mechanical and electrical contact with a bus bar coupled to the collective connection device.

[0004] Terminal blocks are designed to receive either flexible or rigid wire conductors. In most cases, the terminal block uses a spring clamp or clip to capture and secure the wire termination. Because the most frequently used terminal block is designed to receive only a single electrical wire termination, it is not unusual for a collective connection device to have a large number of terminal blocks that occupy a considerable amount of bus bar space. Typically terminal blocks are located adjacent to other terminal blocks in a tightly arranged relationship. In large distribution systems the space devoted to terminal blocks can be the limiting factor on the size of the collective connection device and dictate the amount of facility space that is required to house the device.

[0005] The most widely used terminal block design accommodates a single spring clamp configured to secure a single electrical wire termination. The spring clamp is housed in a plastic cover that also serves to secure the terminal block to the bus bar. In the front of the plastic cover are two apertures, one of which provides access to the spring clamp to receive and secure the electrical wire termination. The second aperture receives the end of a pry tool, such as a screwdriver, that is inserted in the spring clamp to urge the clamp into an open position while an electrical wire termination is inserted. After the end of the electrical wire is inserted into the open spring clamp, the pry tool is removed and the spring clamp is permitted to return to a neutral position to capture and secure the electrical termination in the clamp.

[0006] When a pry tool is inserted into the aperture and displaced to urge the spring clamp into an open position, some portion of the cover must necessarily serve as a fulcrum to support the pry tool, so that sufficient force can be exerted against the spring clamp to open it. If the cover is used as the fulcrum for the pry tool, it usually is not strong enough to withstand excessive or repeated pry force. If excessive or repeated force is applied, the cover will ultimately break and the entire terminal block must be replaced. Therefore, what is needed in the art is a terminal block assembly that is able to secure a number of electrical wire terminations, while using less space than that used by prior art devices. The terminal block assembly should also be sturdy enough to withstand the prying force applied to urge the spring clamp into an open position.

SUMMARY OF THE INVENTION

[0007] To address the above-discussed deficiencies of the prior art, the present invention provides for a terminal block assembly to use in receiving a plurality of electrical wire terminations. The terminal block assembly comprises: (1) an outer shell having a plurality of apertures, (2) a plurality of spring clamps arranged laterally within said outer shell, said plurality of spring clamps associated with corresponding ones of said plurality of apertures and configured to receive and hold said plurality of electrical wire terminations and (3) a pry support, coupled to said outer shell and associated with said spring clamps, that is adapted to support, and act as a fulcrum for, a pry tool to urge at least one of said plurality of spring clips open to receive one of said plurality of electrical wire terminations.

[0008] The present invention therefore introduces the broad concept of a terminal block assembly with a pry support incorporated into the assembly that can be used as a fulcrum to open spring clamps to receive an electrical wire termination. By incorporating a pry support into the assembly avoids having to use the case of the terminal block assembly to support a pry tool to open a spring clamp. This provides the advantage of adding to the life of a terminal block assembly by providing a stronger, more durable device.

[0009] In one embodiment of the invention, the spring clamps in the terminal block assembly are associated with corresponding ones of the plurality of apertures configured to provide an access point for the pry tool.

Of course other apertures are associated with the portion of the spring clamps that receive the electrical wire terminations. Another aspect of the invention provides for the plurality of spring clamps to be WAGOJ cage clamp springs.

[0010] In a particularly advantageous embodiment of the present invention, located within the outer shell of the terminal block assembly is a bus bar that provides electrical interconnectivity with a plurality of the spring clamps. In another particularly advantageous embodiment of the invention, the terminal block assembly includes a plurality of bus bars within the outer shell. Each one of the plurality of bus bars electrically contacts at least one of the spring clamps. In still another embodiment of the invention, the terminal block assembly is couplable to an electronics equipment chassis. One aspect of the invention, provides for a bullet connector to be associated with the terminal block assembly. This permits the terminal block assembly to be couplable to the electronics equipment chassis by the bullet connector.

[0011] The present invention also provides a method of manufacturing a terminal block assembly to receive a plurality of electrical wire terminations. In one embodiment of the method, an outer shell having a plurality of apertures is formed. A plurality of spring clamps is arranged laterally within the outer shell so that the plurality of spring clamps are associated with the plurality of apertures. The plurality of spring clamps is configured to receive and hold the plurality of electrical wire terminations. A pry support is coupled to the outer shell and associated with the plurality of spring clamps. The pry support is adapted to support, and act as a fulcrum for, a pry tool that can be used to urge at least one of the plurality of spring clips open in order to receive one of the plurality of electrical wire terminations.

[0012] The foregoing has outlined, rather broadly, preferred ' and alternative features of the present invention so that those skilled in the art may better understand the detailed description of the invention that follows. Additional features of the invention will be described hereinafter that form the subject of the claims of the invention. Those skilled in the art should appreciate that they can readily use the disclosed conception and specific embodiment as a basis for designing or modifying other structures for carrying out the same purposes of the present invention. Those skilled in the art should also realize that such equivalent constructions do not depart from the spirit and scope of the invention in its broadest form.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] For a more complete understanding of the present invention, reference' is now made to the following descriptions taken in conjunction with the accompanying drawings, in which:

FIGURE 1A illustrates an exploded isometric view of an embodiment of a terminal block assembly for use in receiving a plurality of electrical wire terminations;

FIGURE 1B illustrates an isometric view of the terminal block assembly illustrated in FIGURE 1A as an exploded isometric view;

FIGURE 1C illustrates the embodiment of a spring clamp used in the terminal block assembly illustrated in FIGURES 1A and 1B;

FIGURE 2 illustrates an isometric view of a portion of an electronics equipment chassis to which a terminal block assembly is coupled;

FIGURES 3A-3C illustrate isometric views with an accompanying planar side view of three different variations of the terminal block assembly 100 encompassed by the invention; and

FIGURE 4 illustrates a flow diagram of one embodiment of a method of manufacturing a terminal block assembly to receive a plurality of electrical wire terminations.

DETAILED DESCRIPTION

[0014] Referring initially to FIGURE 1A, illustrated is an exploded isometric view of an embodiment of a terminal block assembly 100 adapted to receive a plurality of electrical wire terminations. The illustrated terminal block assembly 100 has four major components as well as several spring clamps 150. The four major components are: an outer shell 110, a pry support 120, a bus bar 130 and an end cap 140. Mounted on the bus bar 130 are a plurality of laterally-arranged spring clamps 150. The spring clamps 150 are mounted on the bus bar 130 by placing the individual spring clamps 150 over a spring clamp support 135 located on the bus bar 130 that is configured to receive and secure the spring clamps 150 in position.

[0015] Referring now to FIGURE 1B, illustrated is an isometric view of the terminal block assembly 100 of FIGURE 1A. Arranged laterally within the outer shell 110 of the terminal block assembly 100 are a plurality of spring clamps 150 (not visible). The outer shell 110 has a plurality of apertures 115 that provide access to the spring clamps 150 associated with corresponding apertures 115. The spring clamps 150 are configured to receive an electrical wire termination 160 through an associated aperture 115. In the illustrated embodiment of the present invention, the apertures 115 are arranged in pairs, each pair associated with an individual spring clamp 150. One aperture 115 in the pair receives the electrical wire termination 160 while the second aperture 115 provides a pry tool 170 access to the spring clamp 150. The pry tool 170 is used to urge the spring clamp 150 into an open position. While the spring clamp 150 is in an open position, an electrical wire termination 161 is inserted into the open spring clamp 150 through the second aperture 115 associated with that particular

spring clamp 150.

[0016] Turning now to FIGURE 1C, illustrated is the embodiment of a spring clamp 150 used in the terminal block assembly 100 that is illustrated in FIGURES 1A and 1B. The spring clamp illustrated is a WAGOJ cage clamp spring. Those of ordinary skill in the art will understand that other spring clamp configurations are within the scope of the current invention. For example, the spring clamps 150 can be configured to receive other configurations of an electrical wire termination 161. The WAGO™ clamp 150 has an aperture 151 thereon that receives the spring clamp support 135 on the bus bar 130. As noted above, the spring clamp support 135 is configured to support and secure the spring clamp 150 in a predetermined position.

[0017] Referring back to FIGURE 1A, the pry support 120 is coupled to the outer shell 110 and positioned so that it is associated with the plurality of spring clamps 150. The illustrated pry support 110 has individual supports 125, each of which is associated with a spring clamp 150. Each individual support 125 is positioned so that it serves as a fulcrum for the pry tool 170 to act against when the spring clamp 150 associated with that particular support 125 is being urged into a open position. Those of ordinary skill in the art will understand that other configurations of a pry support 120 can be used and still be within the scope of the present invention.

[0018] Continuing to refer to FIGURE 1A, when assembled the spring clamps 150 in the terminal block assembly 100 are positioned so they each are associated with an individual support 125. In addition to serving as the fulcrum for the pry tool 170, the pry support 120 also secures the spring clamps 150 into position by capturing them between the outer shell 110 and the pry support 120. To hold the terminal block assembly together, spacer legs 145 on the end cap 140 are positioned between the bottom of the pry support 120 and the inside surface of the bus bar 130. The end cap 140 secures the outer shell 110, the pry support 130 and the bus bar 140 together in a single unit while securing the spring clamps 150 in a lateral position inside the outer shell 110. When completely assembled, the illustrated embodiment of a terminal block assembly has the bus bar 130 located within the outer shell 110 in electrical contact with the plurality of spring clips 150 located therein.

[0019] Turning now to FIGURE 2, illustrated is an isometric view of a portion of an electronics equipment chassis 200 to which a terminal block assembly 100 is coupled. The illustrated electronics equipment chassis 200 is part of collective connection apparatus with a frame 210 to which the terminal block assembly 100 is coupled so that it can receive a plurality of electrical wire terminations 160.

[0020] Turning now to FIGUREs 3A-3C, illustrated are isometric views with an accompanying planar side view of three different variations of the terminal block assembly 100 encompassed by the invention. FIGURE 3A illustrates an isometric view 310 and a planar side view 320 of the embodiment of the-terminal block assembly 100 previously described herein. The illustrated embodiment depicts a single bus bar 130 located within the outer shell 110 electrically contacting the plurality of spring clamps 150 (not visible) arranged laterally within the outer shell 110. Each aperture 115 in the outer shell is associated with a spring clamp 150 in contact with the bus bar 130.

[0021] FIGURE 3B illustrates an isometric 330 and planar side view 340 of an embodiment of a terminal block assembly 100 with multiple bus bars 131, 132, 133, 134 located within the outer shell 110. The illustrated terminal block assembly 100 has four bus bars 131-134, but those of ordinary skill in the art will understand that a terminal block assembly 100 can have any number of bus bars 130 within the outer shell 110 and be within the scope of the present invention. Multiple bus bar 131-134 configurations are particularly advantageous, because each bus bars 131-134 can be carrying a different current or be of a different voltage potential. Each of the bus bars 131-134 is associated with apertures 115 associated with spring clamps 150 arranged laterally with the outer shell 110 that are in electrical contact with one of the bus bars 131-134.

[0022] FIGURE 3C illustrates an isometric view 350 and a planar side view 360 of a terminal block assembly 100 with bullet type connectors 370. The bullet type connectors 370 are fastened to the bus bar and are configured to connect the terminal block assembly 100 to a frame or chassis of a collective connection device.

[0023] Turning now to FIGURE 4, illustrated is a flow diagram of one embodiment of a method of manufacturing 400 a terminal block assembly to receive a plurality of electrical wire terminations. The method commences with a start step 410. In the illustrated embodiment, an outer shell is formed with a plurality of apertures in a form outer shell step 420. In a provide and arrange spring clamps step 430, a plurality of spring clamps configured to receive and hold a plurality of electrical wire terminations is provided and arranged laterally within the outer shell so that the spring clamps are associated with the plurality of apertures in the outer shell. In a form pry support step 440, a pry support is formed that is coupled to the outer shell and associated with the plurality of spring clamps. The pry support is formed so that it is adapted to support, and act as a fulcrum for, a pry tool that can be used to urge at least one of the plurality of spring clips open in order to receive one of the plurality of electrical wire terminations. The manufacturing method concludes with an end step 450. Those of ordinary skill in the art will readily understand that additional steps covering additional embodiments of the invention can be made and that the steps provided herein can be reordered, augmented, streamlined or otherwise changed and still be within the scope of the intended invention.

[0024] Although the present invention has been described in detail, those skilled in the art should under-

stand that they can make various changes, substitutions and alterations herein without departing from the spirit and scope of the invention in its broadest form.

Claims

1. For use in receiving a plurality of electrical wire terminations, a terminal block assembly, comprising:

an outer shell having a plurality of apertures;
a plurality of spring clamps arranged laterally within said outer shell, said plurality of spring clamps associated with corresponding ones of said plurality of apertures and configured to receive and hold said plurality of electrical wire terminations; and
a pry support, coupled to said outer shell and associated with said spring clamps, that is adapted to support, and act as a fulcrum for, a pry tool to urge at least one of said plurality of spring clips open to receive one of said plurality of electrical wire terminations.

2. The terminal block assembly as recited in Claim 1 wherein said terminal block assembly is couplable to an electronics equipment chassis.

3. The terminal block assembly as recited in Claim 2 further comprising a bullet connector associated with said terminal block assembly, said terminal block assembly couplable to said electronics equipment chassis using said bullet connector.

4. For use in receiving a plurality of electrical wire terminations, a method of manufacturing a terminal block assembly, comprising:

forming an outer shell having a plurality of apertures;
providing a plurality of spring clamps arranged laterally within said outer shell, said plurality of spring clamps associated with corresponding ones of said plurality of apertures and configured to receive and hold said plurality of electrical wire terminations; and
forming a pry support, coupled to said outer shell and associated with said plurality of spring clamps, that is adapted to support, and act as a fulcrum for, a pry tool to urge at least one of said plurality of spring clips open to receive one of said plurality of electrical wire terminations.

5. The method of manufacturing as recited in Claim 4 wherein said plurality of spring clamps are associated with corresponding ones of said apertures, said plurality of apertures being configured to provide access for said pry tool.

6. The method of manufacturing as recited in Claim 4 wherein said plurality of spring clamps are WAGOJ cage clamp springs.

7. The method of manufacturing as recited in Claim 4 further comprising forming a bus bar within said outer shell that electrically contacts said plurality of spring clamps.

8. The method of manufacturing as recited in Claim 4 further comprising forming a plurality of bus bars within said outer shell, each of said plurality of bus bars electrically contacting at least one of said plurality of spring clamps.

9. The method of manufacturing as recited in Claim 4 further comprising coupling said terminal block assembly to an electronics equipment chassis.

10. The method of manufacturing as recited in Claim 9 further comprising forming a terminal block assembly with a bullet connector, said terminal block assembly couplable to said electronics equipment chassis using said bullet connector.

11. An electronics equipment chassis, comprising:

a frame; and
a terminal block assembly to receive a plurality of electrical wire terminations, including:

an outer shell having a plurality of apertures,
a plurality of spring clamps arranged laterally within said outer shell, said plurality of spring clamps associated with corresponding ones of said plurality of apertures and configured to receive and hold said plurality of electrical wire terminations, and
a pry support, coupled to said outer shell and associated with said spring clamps, that is adapted to support, and act as a fulcrum for, a pry tool to urge at least one of said plurality of spring clips open to receive one of said plurality of electrical wire terminations.

12. A terminal block as claimed in claim 1 or a chassis as claimed in claim 11, wherein said spring clamps are associated with corresponding ones of said plurality of apertures, said apertures being configured to provide access for said pry tool.

13. A terminal block as claimed in claim 1 or a chassis as claimed in claim 11, wherein said plurality of spring clamps are WAGOJ cage clamp springs.

14. A terminal block as claimed in claim 1 or a chassis

as claimed in claim 11, further comprising a bus bar, located within said outer shell, that electrically contacts said plurality of spring clamps.

15. A terminal block as claimed in claim 1 or a chassis as claimed in claim 11, wherein said terminal block assembly further includes a plurality of bus bars within said outer shell, each of said plurality of bus bars electrically contacting at least one of said spring clamps.

16. The electronics equipment chassis as recited in claim 11 wherein said terminal block assembly further includes a bullet connector, said terminal block assembly coupled to said frame using said bullet connector.

FIG. 1A

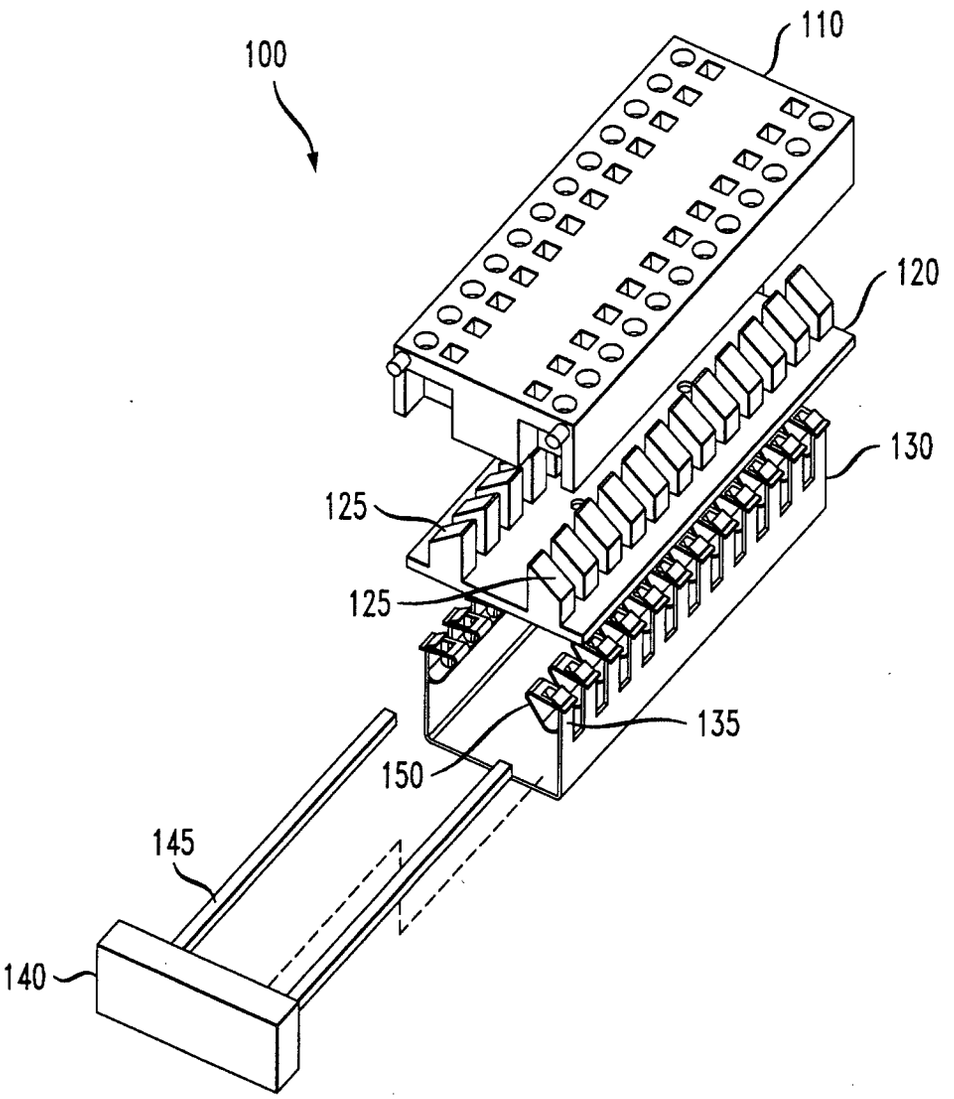


FIG. 1B

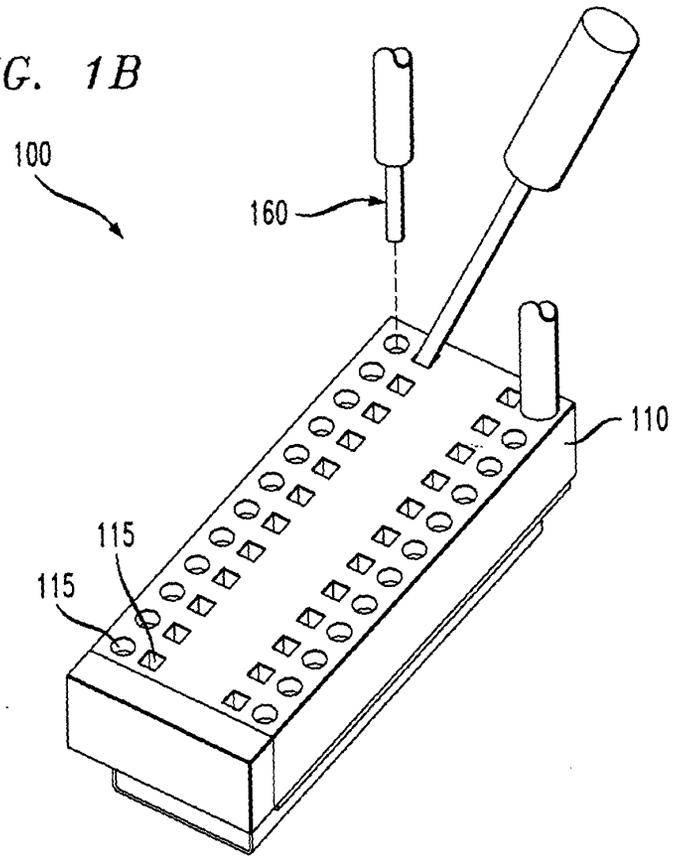


FIG. 1C

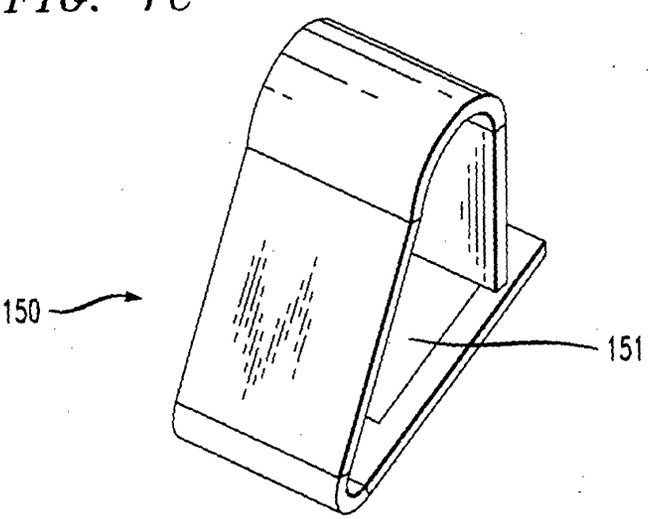


FIG. 2

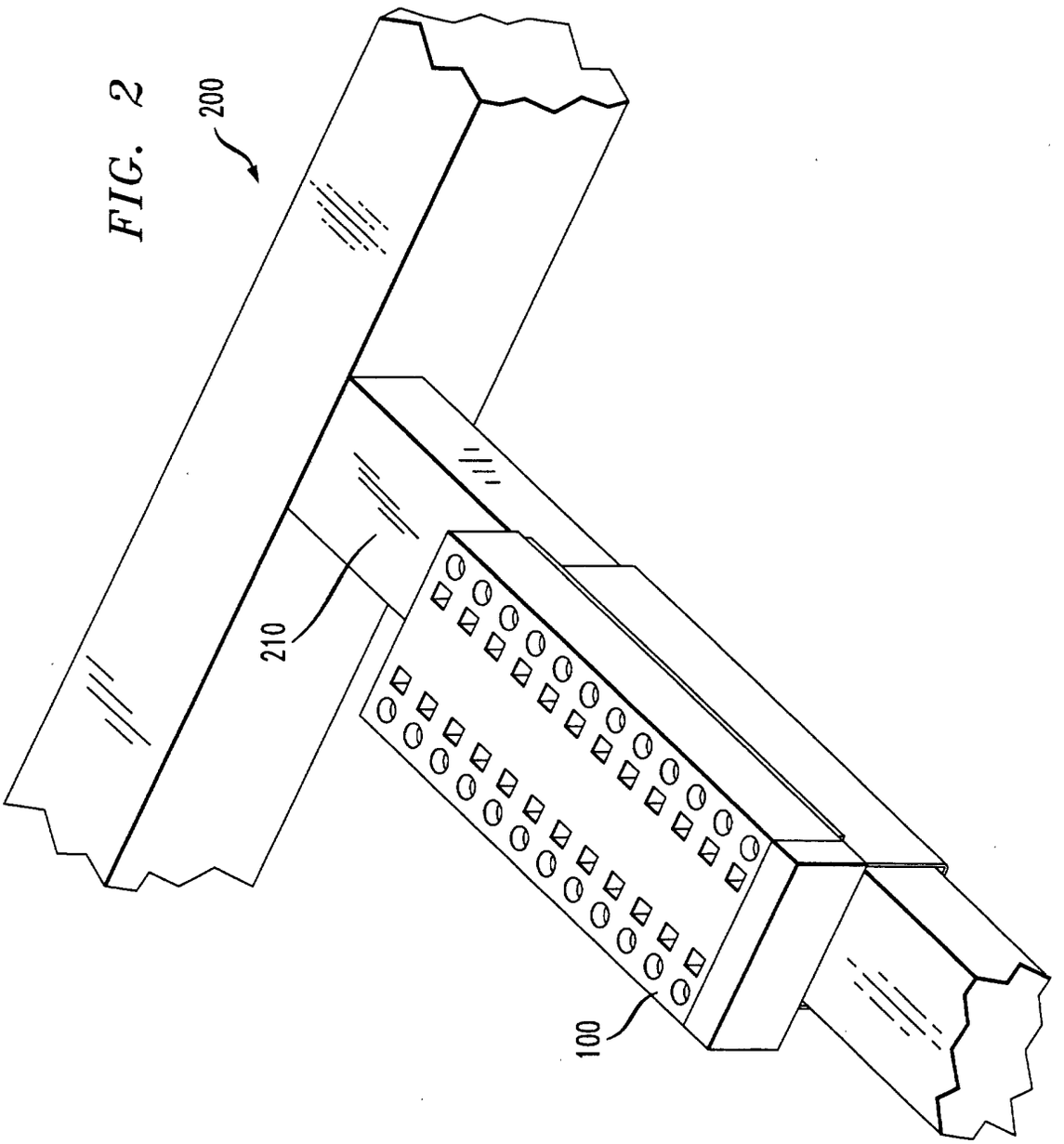
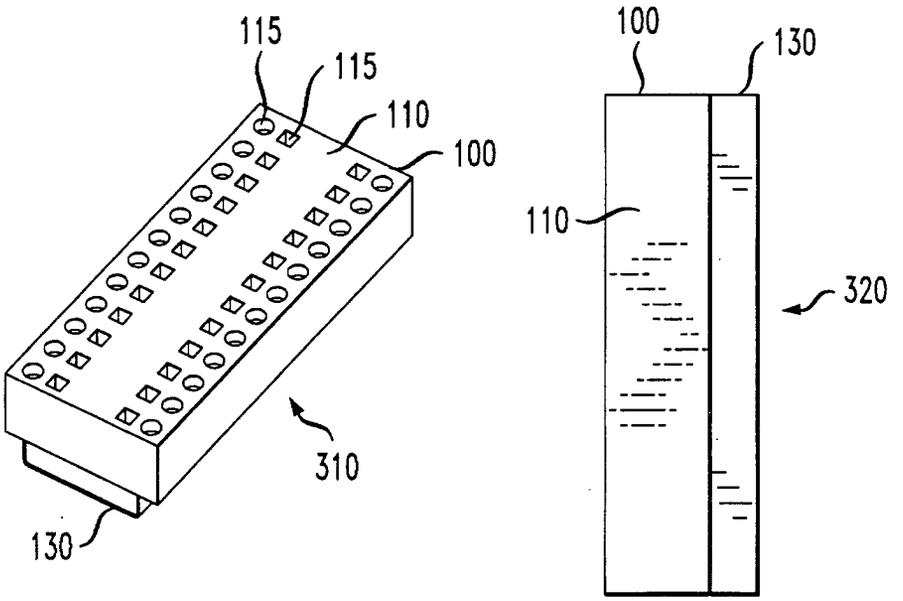


FIG. 3A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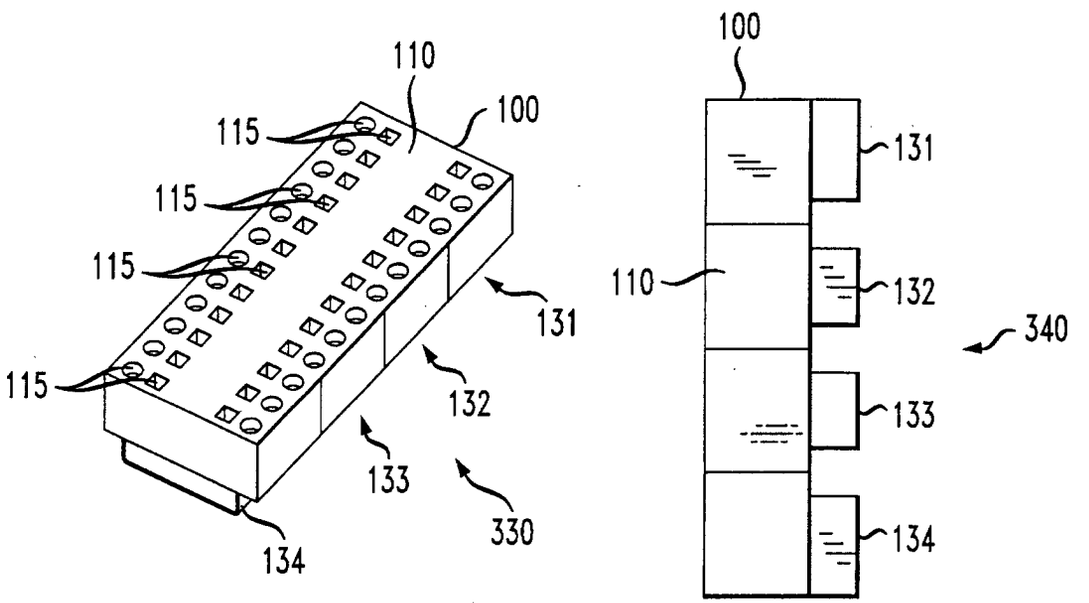
115
110
100
310
130
100
130
110
320

FIG. 3B


110
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115
115
131
132
133
330
134
100
131
110
132
340
133
134

FIG. 3C

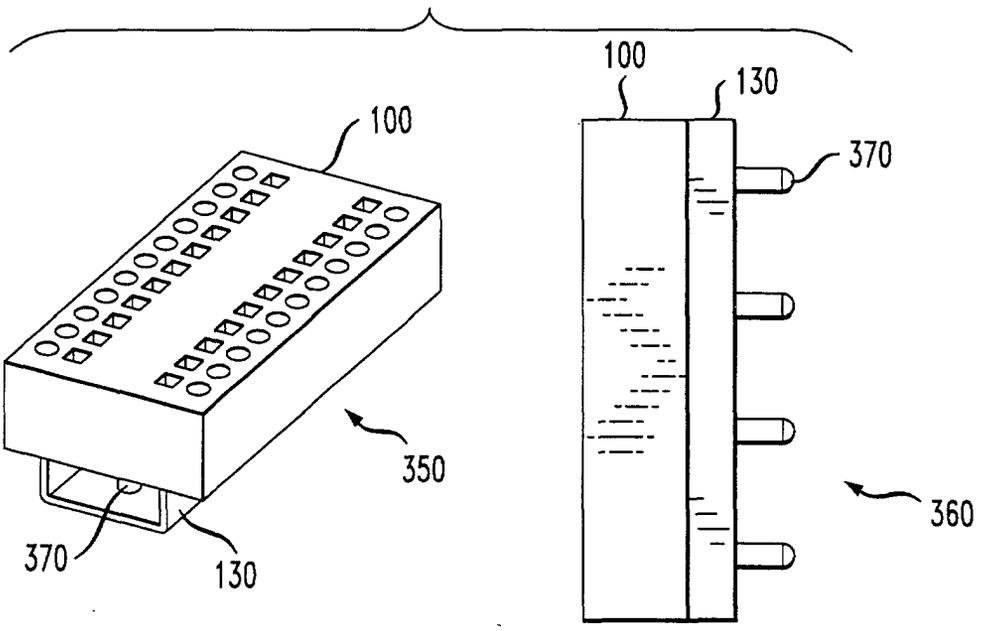
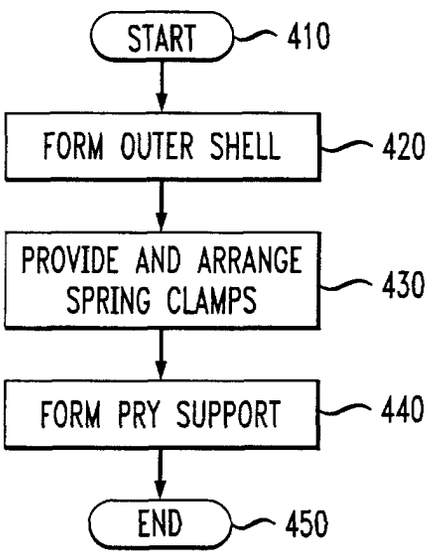

100
130
370
100
350
370
130
360

FIG. 4


START
410
FORM OUTER SHELL
420
PROVIDE AND ARRANGE SPRING CLAMPS
430
FORM PRY SUPPORT
440
END
450