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R. P. FLAGG

3,119,647

WIRE CONNECTOR

Filed Aug. 10, 1960

FIG. 1

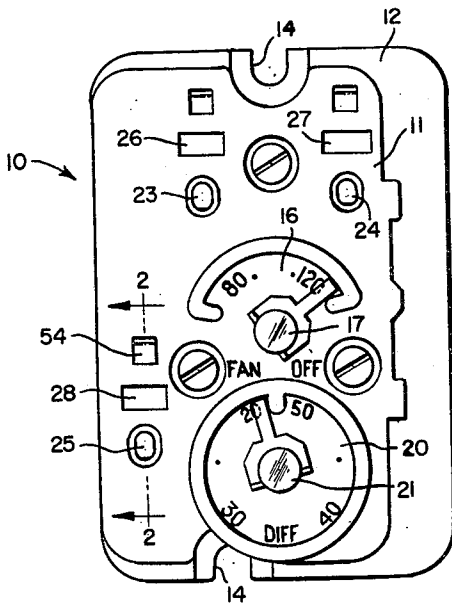


FIG. 2

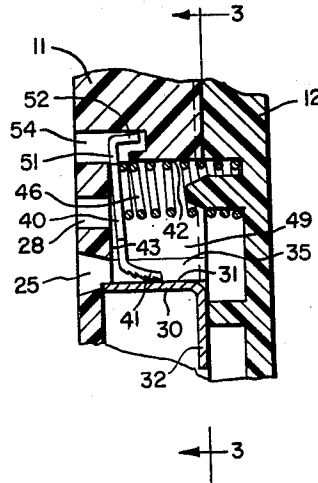


FIG. 4

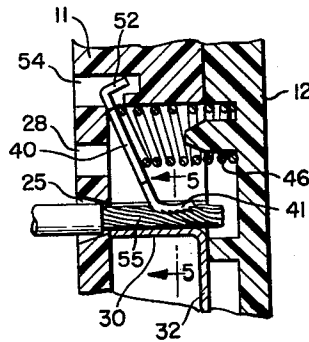


FIG. 3

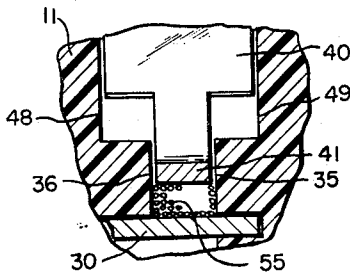
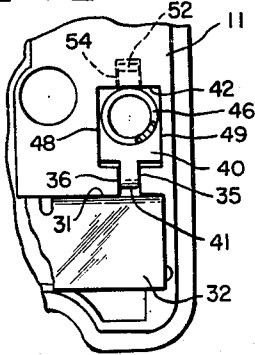


FIG. 5

INVENTOR.
RAYMOND P. FLAGG
BY *Robert S. Craig*
ATTORNEY

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3,119,647

WIRE CONNECTOR

Raymond P. Flagg, Golden Valley, Minn., assignor to Minneapolis-Honeywell Regulator Company, Minneapolis, Minn., a corporation of Delaware
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This invention relates to wire connectors and particularly to a connector adapted to securely hold stranded wire.

The object of the invention is to provide a wire connector of the type wherein the wire is secured by a spring biased wedging member which may be pushed aside to release the wire, and which is effective to secure both solid and stranded wires of various sizes.

Various wire connectors of the wedging type have been proposed but as far as is known, none are equally suitable for solid and stranded wire. In general those adapted for stranded wire involve means to crimp the wire after it is inserted. Those adapted for solid wire have a wedge that bites into the wire in a restricted area and provide no means to distribute the retaining force over a large number of strands as is necessary to hold stranded wire. Either the force is so high in a few strands that pulling on the wire cuts them off a few at a time, or the strands are so flexible that they are not effectively trapped. Likewise, no construction is known intended to hold solid wire that permit a stranded wire to be readily inserted therein.

In the present invention the wire is inserted into a rectangular recess having two parallel side walls with a flat wall connecting them. The parallel walls are spaced by a distance slightly greater than the normal diameter of the largest wire to be accommodated. A wedging member forces the wire against the flat connecting wall, and in the case of stranded wire the strands are rearranged to have a cross section conforming to the area between the three walls and the wedge. By providing the wedge with a generally cylindrical wire engaging surface, the elements thereof that engage the wire are parallel to the flat connecting wall so that even a single layer of strands can be securely retained. The embodiment to be described is intended to secure size 14, 16 and 18 wire, either solid or stranded, but even smaller sizes would be held effectively. In the case of the stranded wire there are 41, 26 and 16 strands respectively in the aforementioned wire sizes, each strand being .01 inch in diameter. It will be appreciated that the strands do not arrange themselves perfectly to conform to the confining surfaces because there is considerable friction between strands. Nonetheless, the action of the wedge and cooperating surfaces effectively "bale" the bundle of strands and pulling on the wire results in the force being distributed between a high percentage of the strands.

In the drawing:

FIGURE 1 is a view of the front face of a temperature control device embodying the invention,

FIGURE 2 is a sectional view taken on line 2-2 of FIGURE 1,

FIGURE 3 is a view taken from the right of FIGURE 2 but with the cover removed,

FIGURE 4 is a view similar to FIGURE 3 shown with a stranded wire secured therein, and

FIGURE 5 is an enlarged fragmentary view taken on line 5-5 of FIGURE 4.

A furnace fan control shown in FIGURE 1 comprises a body 10 of insulating material made up of an outer housing 11 and an inner housing 12. The inner housing has openings 14 to facilitate mounting the device on a furnace. A temperature responsive element (not shown) extends from the back of the inner housing to sense

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furnace temperature and actuates a switching mechanism at temperatures selected on a main scale 16 by a knob 17 and on a differential scale 20 by a knob 21. Connecting wires may be inserted in openings 23, 24 and 25 in the outer housing 11. Associated with these openings are openings 26, 27 and 28, respectively, adapted to accommodate a tool to displace wire gripping members as will hereinafter appear.

The device incorporates three similar wire connectors. One of these is shown in detail in FIGURES 2, 3, 4, and 5. While it is entirely suitable for connecting solid wire, its particular advantage lies in its ability to accommodate and securely hold stranded wire, and it will be so described.

As seen in FIGURE 2, the outer housing 11 and inner housing 12, which are formed of insulating material, cooperate to hold a conducting terminal bar 30 having a flat surface 31 in alignment with one edge of the wire receiving opening 25. A transverse portion 32 of terminal bar 30 extends laterally to provide a stationary contact (not shown) for the switching mechanism.

As seen in FIGURE 3, the outer housing 11 is formed to have a slot having flat parallel wall portions 35 and 36 contiguous with and perpendicular to the surface 31 of the terminal bar 30. Walls 35 and 36 are spaced apart by a distance slightly greater than the diameter of the largest wire to be accommodated, and together with terminal bar surface 31 form a rectangular recess to receive a wire.

A conductor gripping member in the form of a strut 40 has a terminal end 41 that extends into the recess between walls 35 and 36. The opposite end of strut 40 engages a wall 42 in the outer housing 11, which wall is parallel to the terminal bar surface 31, and also engages a wall 43, normal to the wall 42, the intersecting surfaces of these walls forming a fulcrum in which the strut 40 may pivot. Since the fulcrum pivots the strut on an axis that is normal to the parallel walls 35 and 36, the terminal end 41 moves in a path parallel to the two walls.

The fulcrumed end of strut 40 is wider than the terminal end both to provide a long bearing to guide the strut in its pivotal movement and to provide a seat for a helical compression spring 46 which acts between the inner housing 12 and the strut 40. The spring 46 biases the strut in a direction to bring its terminal end 41 into engagement with the terminal bar 30. The outer housing 11 is provided with parallel walls 48 and 49 that laterally confine both the strut 40 and the spring 46.

The strut 40 is provided with an extension 51 extending beyond its fulcrum, which extension is narrower than the main body of the strut and is provided with a laterally extending ear 52. Extension 51 is adapted to prevent substantial translation of the fulcrumed end of strut 40 when a tool is inserted through opening 28 to deflect the strut 40 against the bias of spring 46. Likewise the ear 52 prevents substantial longitudinal movement of strut 40 under these circumstances. A cavity 54 is provided in the housing and has appropriate surfaces adapted to cooperate with the extension 51 and ear 52 for these purposes.

It will be seen that the conductor gripping member is housed in a recess in the outer housing 11, the main portion of this recess having two parallel walls 48 and 49, a flat bottom wall 43, and an end wall 42. The recess has a rectangular slot extending therefrom at the end opposite end wall 42, the slot being bounded on its sides by the more spaced walls 35 and 36 and being closed at its end by the terminal bar 30 which extends across the end of the slot.

The terminal end 41 of strut 40 presents a generally cylindrical serrated surface to the flat surface 31 of the terminal bar, the axis of the cylinder being parallel to

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the fulcrum for the strut. Hence, the portion of the end 41 of the strut closest to the surface 31 of the terminal bar is in a line parallel thereto regardless of the thickness of wire that separates them. Likewise, the cylindrical surface is of sufficient radius that elements thereof along a substantial length of the wire are effective in securing the wire. This is important in the case of stranded wire as the load is more evenly distributed on the wire strands.

FIGURE 4 shows a stranded wire 55 inserted in and held by the connector. It will be noted that the terminal end 41 of the strut engages the wire for some distance along its length so that there is no sharp deformation of the wire. FIGURE 5 is a section taken through the point where the wire is compressed to the greatest extent. It will be noted that the cross section of the wire is altered from circular to the shape of the confining area of the connector defined by walls 35 and 36, terminal bar surface 31 and the terminal end 41 of the strut. An outward axial pull on the wire 55 adds to the force of the spring 46 to increase the wedging action of strut 40 and more firmly compact the wire within this area. The strands of the wire are "baled" tightly together so that friction between the strands distributes the axial force between them. While perfect "baling" is not ordinarily attained, the disclosed construction easily meets all safety requirements for wiring devices of this type. In FIGURE 5 some clearance is shown between the walls 35 and 36 and the sides of the strut terminal end 41. Ideally, no such clearance would be desirable, but manufacturing tolerance requirements dictate some normal clearance to accommodate variation in size and alignment of the cooperating parts. Even when there is sufficient clearance to permit escape of a wire strand no adverse effects are noted as only a very few ever escape and a sufficiently high percentage of the strands are always securely held to fulfill all requirements.

While the connector has been described as incorporated in a furnace fan control, it is obviously of general utility in wiring devices.

I claim:

1. In an electrical wiring device, a housing of insulating material having a generally rectangular recess therein including a bottom wall, two flat sides and an end wall, the portion of said recess opposite said end wall having a rectangular slot extending therefrom with parallel walls more closely spaced than the sides of the recess, a flat terminal bar of conducting material disposed across the end of the slot opposite said end wall, said housing having a conductor wire receiving opening extending through the bottom wall of said recess adjacent said terminal bar so that a wire extending through said opening will lie along the surface of said bar, a conductor gripping member of sheet metal and of generally flat rectangular form of the same general configuration as but slightly smaller than said recess and having one end engaging and pivotally supported by the intersection of said bottom wall and

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said end wall of the recess in said housing, the opposite end of said gripping member having a narrower portion extending into and closely fitting between the walls of the slot, said portion being formed to terminate in a cylindrical serrated surface to cooperate with said terminal bar to grip a conductor wire, and a spring seated on the rectangular portion of said gripping member biasing said member toward engagement with said terminal bar.

2. In an electrical wiring device, a housing of insulating material having a generally rectangular recess therein including a bottom wall, two flat sides and an end wall, the portion of said recess opposite said end wall having a rectangular slot extending therefrom with parallel walls more closely spaced than the sides of the recess, a flat terminal bar of conducting material disposed across the end of the slot opposite said end wall; said housing having a conductor wire receiving opening extending through the bottom wall of said recess adjacent said terminal bar so that a wire extending through said opening will lie along the surface of said bar, a conductor gripping member of sheet metal and of generally flat rectangular form of the same general configuration as but slightly smaller than said recess and having one end engaging and pivotally supported by the intersection of said bottom wall and said end wall of the recess in said housing, the opposite end of said gripping member having a narrower portion extending into and closely fitting between the walls of the slot, said portion being formed to terminate in a cylindrical serrated surface to cooperate with said terminal bar to grip a conductor wire, and a helical spring seated at one end on the rectangular portion of said gripping member and at its other end on a cover portion of said housing, said spring being confined laterally by the sides and end wall of the recess.

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