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H. HUBBELL ET AL

3,065,442

WIRE TERMINAL CLAMP FOR ELECTRIC WIRING DEVICES

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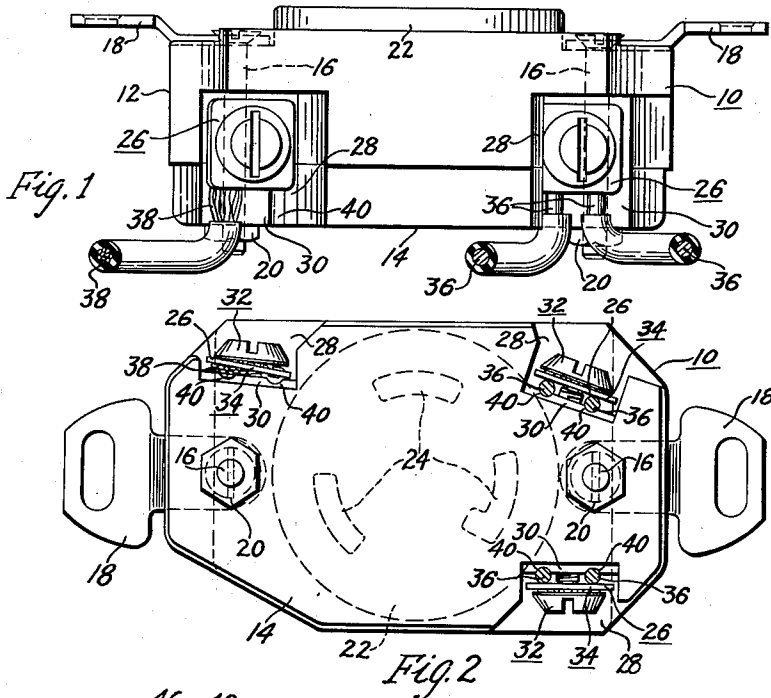
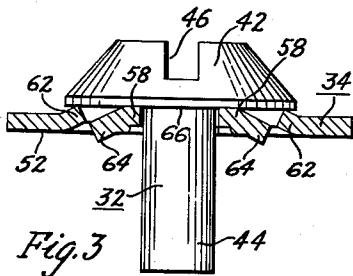
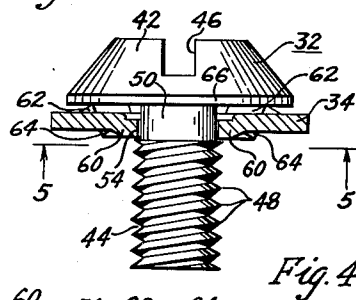
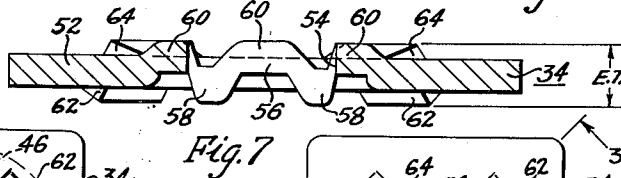
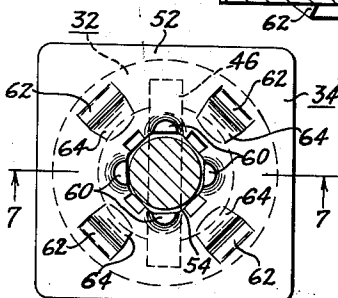
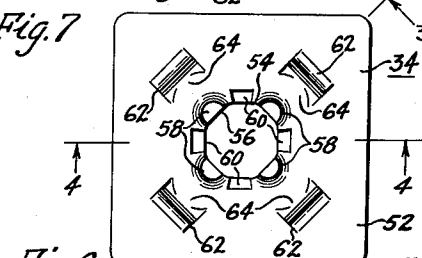


Fig. 5

Fig. 6
INVENTORS
Harvey Hubbell
and Charles Theodore Von Holtz
BY Norster, Davis & Cifelli ATTYS.

1

3,065,442

WIRE TERMINAL CLAMP FOR ELECTRIC WIRING DEVICES

Harvey Hubbell, Southport, and Charles Theodore von Holtz, Bridgeport, Conn., assignors to Harvey Hubbell Incorporated, Bridgeport, Conn., a corporation of Connecticut

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4 Claims. (Cl. 339-95)

This invention relates generally to electrical wiring devices, and particularly to electrical conducting wire terminal clamps therefor.

In electrical wiring devices which are constructed to handle relatively heavy electrical currents, such as thirty amperes or more, it is normally not feasible to utilize a screw wrap-around type of terminal connection between the terminal clamps of the devices and the electrical conducting wires which are connected thereto. Such wiring devices usually include electrical conducting wire in the form of a solid wire of substantial diameter and/or in the form of a cluster of wire strands which in the aggregate have a substantial diameter. When connecting the latter type of electrical conducting wires to wiring device terminal clamps, it is frequently expedient to employ a flat terminal washer and dispose it on the usual terminal binding screw of the terminal clamp so as to generally form with the usual terminal binding plate a pair of generally parallel flat walls which are adjustable toward and away from each other by turning the terminal binding screw, and between which an electrical conducting wire may be disposed and clamped. In such known terminal clamp arrangements, several serious problems have developed among which are: (1) the tendency of the electrical conducting wire to be unintentionally mounted between the head of the terminal binding screw and the terminal washer and thereby render the terminal connection defective, and (2) the tendency of the electrical conducting wire to work itself free of the terminal clamp during use of the wired device because it is not effectively locked.

It is an object of this invention to eliminate the referred-to problem in known terminal clamps of the type set forth.

The object of this invention is accomplished in one form by providing a unique terminal washer on a unique terminal binding screw, and structurally relating these parts so as both: (1) to preclude the possibility of an electrical conducting wire being inadvertently mounted between the head of the terminal binding screw and the terminal washer, which would result in a defective terminal connection, and (2) to insure firm contact of the electrical conducting wire by the terminal washer, which aids in locking the electrical conducting wire in place.

The above and other objects of our invention and further details of that which we believe to be novel and our invention will be clear from the following description and claims taken with the accompanying drawings wherein:

FIG. 1 is a side elevational view of an electrical receptacle which includes improved terminal clamps that incorporate our invention;

FIG. 2 is a bottom plan view thereof;

FIG. 3 is an enlarged side elevational view of a terminal binding screw and a terminal washer, which are part of an improved terminal clamp, during a stage of manufacture, with the terminal washer shown in section taken substantially on line 3-3 of FIG. 6;

FIG. 4 is an enlarged side elevational view of the terminal binding screw and the terminal washer after they have been fully assembled to each other into a unit,

2

with the terminal washer shown in section taken substantially on line 4-4 of FIG. 6;

FIG. 5 is a sectional view taken substantially on line 5-5 of FIG. 4;

FIG. 6 is an enlarged plan view showing one side of the terminal washer, and

FIG. 7 is a still further enlarged sectional view of the washer per se taken substantially on line 7-7 of FIG. 5.

Referring to the drawings, in FIGS. 1 and 2 there is illustrated an electrical wiring device in the form of a three-wire electrical receptacle which includes terminal clamps that incorporate the invention. It should be clearly understood at the outset that the improved terminal clamps may be incorporated into any one of a large variety of other electrical wiring devices, and that they are herein illustrated and will be described as being incorporated into an electrical receptacle for the purposes of explanation only.

The illustrated electrical receptacle 10 generally comprises a two-part body that is made of electrical insulating material and which supports the remaining receptacle elements. As illustrated, the electrical receptacle body comprises a main body member 12 and a detachable base plate 14 which are secured to each other, as by the screws 16 which pass through appropriate openings that are formed in the usual receptacle mounting brackets 18, body member 12, and the base plate 14, and which receive securing nuts 20 to rigidly secure the receptacle body parts together. The body member 12 includes a circular wall 22 on its front which has a plurality of circumferentially spaced, generally arcuate slots 24 formed therein that are adapted to receive the male electrical contact fingers of an electrical plug (not shown) that may be connected to the receptacle, the slots communicating with a plurality of female electrical contacts which are disposed within the receptacle body, all in a known manner. It will be observed that in view of the fact that the illustrated receptacle is designed for use with three wires, there are three slots 24 which are adapted to receive three male electrical contact fingers, and it will be understood that three female electrical contacts (not shown) are disposed within the receptacle body. The female electrical contacts are electrically connected to three terminal clamps respectively, which are generally indicated by reference numeral 26. Terminal clamps 26 are individually generally disposed in boxy recesses 28 which are formed in the sides of the receptacle body.

Each terminal clamp 26 comprises a terminal binding plate 30 which is rigidly supported by the receptacle body, one in each recess 28, and a unit comprising a terminal binding screw 32 and a terminal washer 34 which is adjustably supported by a terminal binding plate. The three illustrated terminal clamps 26 are substantially identical and each is adapted to support electrical conducting wire which is either of the solid type 36 or a cluster of strands type 38. As will become apparent subsequently, each terminal binding screw and its associated terminal washer when fully assembled comprises a self-contained unit which is individually adjustably mounted on its associated terminal binding plate. These mountings are effected by a threaded opening (not shown) which is provided in each terminal binding plate 30, and which threadedly receives a terminal binding screw of one of the units. Each terminal binding plate 30 includes a pair of spaced parallel arcuate grooves 40 which straddle the threaded opening formed therein and which are adapted to receive and position electrical conducting wire which is to be connected to the terminal clamps.

Each terminal binding screw 32 comprises a head 42 having a kerf 46 formed therein and a shank 44 having a plurality of threads 48 formed thereon and covering the

entire axial length of said shank other than a limited portion 50 which is adjacent to the head 32. The portion 50 has a plain, cylindrical outer surface and has an axial length which is approximately equal to the axial length of one and one-half of one of the threads 48.

Each terminal washer 34 comprises a generally flat, thin, square member 52 (see particularly FIGS. 5, 6 and 7) the thickness of the material of which it is made being substantially less than the axial length of the screw shank the units. Each terminal binding plate 30 includes a pair 54, which is illustrated as being noncircular, the minimum internal diameter of which slightly exceeds the outer diameter of screw shank portion 40. The member 52 has a unique configuration, and may be formed by any suitable metal forming method, such as stamping; and includes a rim portion 56 which is deformed from its original flat configuration so as to have a plurality of spaced offset portions 58 which extend toward one side of the member 52, and a plurality of spaced offset portions 60 which extend to the other side thereof. The portions 58 and 60 alternate and cooperate to render the edge of the rim portion 56 generally sinuous (see particularly FIG. 7). Spaced outwardly from the central opening 54 the member 52 has a plurality of circumferentially spaced, inwardly facing offset portions 62 which extend to one side of the member 52 (the same side that the offset portions 58 extend to) and a plurality of circumferentially spaced outwardly facing offset portions 64 which extend to the other side of the member 52 (the same side that the offset portions 60 extend to). The offset portions 62 and 64 may conveniently comprise tangs which are struck out of the material of which the member 52 is made.

The terminal washers 34 are assembled to the terminal binding screws 32 by a unique method and cooperate therewith to form unique units. The unique method of assembling the terminal screws and terminal washers comprises first forming the terminal washers into their final configuration illustrated in FIGS. 5, 6 and 7, and dimensioning the openings 56 in the terminal washer members 52 so that the latter freely slide onto the shanks 44 of the screws 32 before the threads 48 are formed on the shanks. The threads 48 are then formed on the shanks 44 to cover all except the plain cylindrical portions 50 of each shank, which as pointed out above have axial lengths approximately equal to the axial length of one and one-half threads. As can best be seen in FIG. 4, after the threads 48 are formed on the shank 44, the outer diameter of the threads exceeds the minimum inner diameter of the central opening 54 formed in each terminal washer member 52. Therefore, each terminal screw 32 and terminal washer 34 forms a self-contained unit, because each terminal washer is permanently mounted on a terminal screw, because of the interference of the screw threads 48 and the terminal washer.

It is important to note the dimensional relationship of the thickness of the material of which the terminal washer member 52 is made relative to the axial length of the screw portion 50, which, as is set forth above, is that said thickness is less than the axial length of the screw portion 50. Also, it is important to note the dimensional relationship of the "effective thickness" of the terminal washer member 52 after it is fully formed relative to said axial length. As can most clearly be seen in FIG. 4, the "effective thickness" of the fully formed terminal washer 34 is substantially equal to the axial length of the screw portion 50. The term "effective thickness" as it applies to the terminal washers is intended to mean the distance between parallel spaced planes that respectively pass through the opposite outer edges of the offset portions 62 and 64, and which is indicated in FIG. 7 as the dimension ET. When each unit is fully assembled and secured to its associated terminal binding plate in one of the recesses 28, as shown in FIGS. 2, 4 and 5, the offset portions 62 contact the face 66 of the screw head 42 near the pe-

riphery thereof, and the offset portions 64 extend toward a terminal binding plate 30. When so assembled and secured, the units are disposed in recesses 28 and are adjustable therein by turning of their terminal binding screws. During such turning, the terminal binding screws rotate in their associated terminal washers, and the latter are non-rotatably guided in or out of said recesses by side walls thereof.

It will, therefore, be observed that due to the cooperative action of each terminal binding screw 32 and terminal washer 34 of each unit, it is not possible to inadvertently dispose an electrical conducting wire, of the type herein being dealt with, between a terminal washer and the head of a terminal binding screw, for this is prevented by the offset portions 62 which are in contact with the face 66 of the terminal screw head. It will also be observed that it is, therefore, necessary to mount the electrical conducting wire between a terminal washer and a terminal binding plate, and that when this is done, the electrical conducting wire may be conveniently received in a groove 40 formed in said terminal binding plate. When so disposed, the electrical conducting wire may be securely locked in the terminal clamp by turning the terminal binding screw to adjust it and its associated terminal washer toward its associated terminal binding plate. Such locking is significantly aided and the inadvertent separation of the electrical conducting wire and its terminal clamp is avoided by the offset portions 64 which have sharp edges that are arranged to bite into the electrical conducting wire and prevent relative movement of the latter and its terminal clamp.

In view of the foregoing, the construction and operation of our improved terminal clamp, which is particularly well suited for use with large amperage wiring devices, will be apparent. It will also be apparent that the object of this invention has been fully satisfied.

As will be evident from the foregoing description, certain aspects of our invention are not limited to the particular details of construction of the example illustrated, and we contemplate that various and other modifications and applications will occur to those skilled in the art. It is, therefore, our intention that the appended claims shall cover such modifications and applications as do not depart from the true spirit and scope of our invention.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. An electrical wiring device including a terminal clamp for an electrical conducting wire to be connected to the electrical wiring device comprising: a terminal binding plate having a threaded opening formed therein; a terminal binding screw threadedly secured in said opening and arranged to be selectively adjusted toward and away from said plate; said screw having a head and a shank; said shank being threaded except for a limited portion thereof which is adjacent to said head; said screw portion having a plain cylindrical outer surface; the diameter of the threads on said shank being greater than the diameter of said screw portion, and a washer in the form of a thin generally planar plate-like member having a central opening of slightly greater diameter than the diameter of said screw portion but of less diameter than that of said threads and a thickness which is substantially less than the axial length of said screw portion mounted on said screw portion; said member having a rim portion which surrounds said central opening that is deformed out of the general plane of said member so as to have offset circumferentially spaced portions which alternately extend to opposite sides of said washer to increase the effective thickness of the washer at said rim portion to substantially the same as the axial length of said screw portion; some of the said offset portions being in contact with said head and the others of said offset portions being in contact with the first thread which is adjacent to said screw portion, whereby said washer effectively fills the

5

space between said head and said first thread and is mounted on said screw so as not to be normally removable therefrom for joint movement with said screw toward and away from said plate on adjustment of said screw so as to clamp an electrical conducting wire between said plate and said washer or release it; and additional offset portions struck out of said member and spaced radially outwardly from the offset portions of said deformed rim portion; some of said additional offset portions extending to one side of the member into contact with said head 10 adjacent its periphery to thereby prevent an electrical conducting wire from being inadvertently inserted between said member and said head, and others of said additional offset portions extending to the other side of said member in position to contact an electrical conducting wire that is 15 disposed between said plate and said member.

2. A device as defined in claim 1 wherein the edge of said rim portion is formed in a sinuous path.

3. A device as defined in claim 1 wherein said plate

6

includes groove means for positioning an electrical conducting wire so as to be in position to be contacted by some of the others of said additional offset portions.

4. A device as defined in claim 1 wherein the wiring device includes means for preventing rotation of said washer.

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