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O. L. TAYLOR

2,865,010

WIRING DEVICE

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Fig.1.

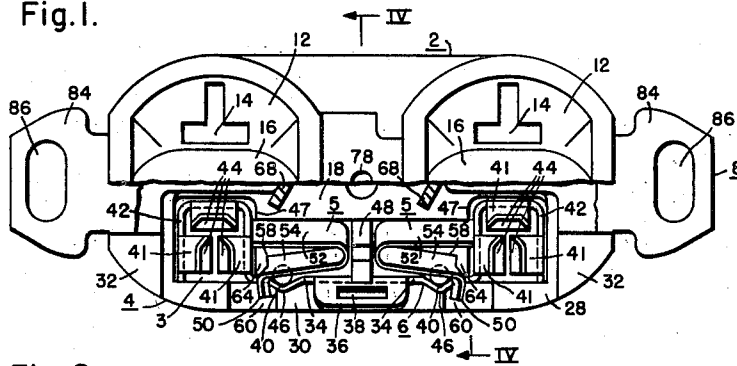


Fig.2.

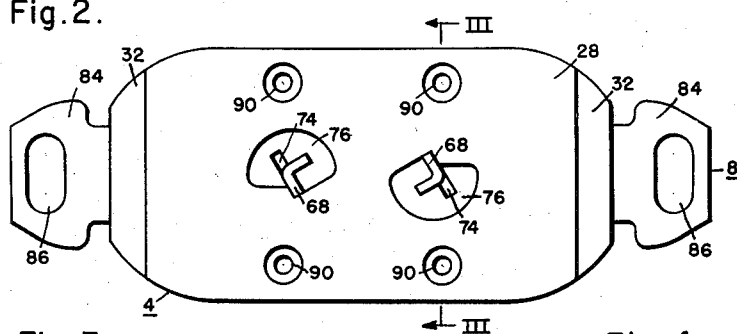


Fig. 3.

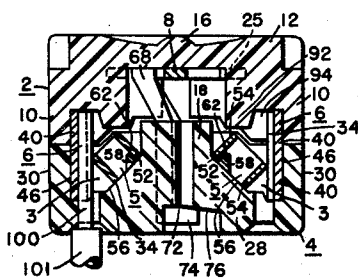


Fig.4.

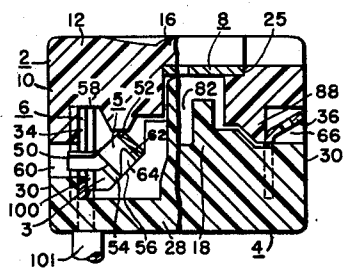


Fig.5.

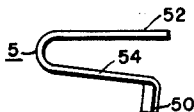
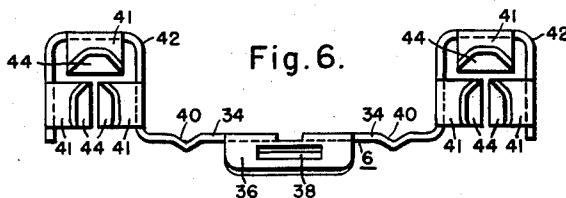


Fig. 6.



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2,865,010

WIRING DEVICE

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Application October 21, 1954, Serial No. 463,715

8 Claims. (Cl. 339—95)

My invention relates generally to electrical wiring devices and more particularly to a new and improved wiring device having a screwless terminal for electrically connecting such devices together and to a source of electrical power.

Although in principle my invention is applicable to a wide variety of wiring devices, it is more particularly suited for the small low voltage devices, such as household wiring devices, where the use of standard electrical connecting means, such as terminal screws, represents a substantial percentage of the cost of the complete wiring device. Such prior electrical connecting means have, in general, been independent of the electrical conducting means located inside the housing of the device and, consequently, have required both additional material and handling in order that all of the component parts may be properly secured together and secured to the housing. Some prior attempts to obtain a screwless terminal have not proven to be entirely satisfactory as they have required separate wire engaging means to accommodate various sizes of electrical conductors or have been of such a large size as to be impractical for a full line of wiring devices.

Accordingly, one object of my invention is to provide a new and improved wiring device having improved means for making electrical connections thereto.

Another object of my invention is to provide a new and improved wiring device whereby electrical connections may be made thereto by inserting various sizes of electrical conductors through single sized openings.

A more specific object of my invention is to provide a new and improved wiring device which utilizes a U-shaped spring clamp to force various sizes, within a range, of electrical conductors into engagement with an electrical terminal within the device.

Another more specific object of my invention is to provide a new and improved wiring device having a small U-shaped spring clip located therein whereby electrical connections may be automatically made by the mere insertion of various sizes of wire, and which connections may easily be broken by moving an integral part of the spring clip by the insertion of a blunt instrument within the device.

These and other objects of my invention will become more apparent upon consideration of the following detailed description of the wiring device constructed in accordance with the principles of my invention, when taken in connection with the attached drawings, in which:

Figure 1 is a top plan view of an assembled receptacle constructed in accordance with the principles of my invention, with part of the receptacle broken away to show the electrical components mounted therein;

Fig. 2 is a bottom plan view of the duplex receptacle shown in Fig. 1;

Fig. 3 is a cross sectional view of the duplex receptacle shown in Fig. 2 taken substantially along the lines III—III thereof;

Fig. 4 is a cross sectional view of the duplex receptacle shown in Fig. 1 taken substantially along the line IV—IV thereof;

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Fig. 5 is an enlarged side elevational view of a spring for use in the receptacle shown in Fig. 1 constructed in accordance with the principles of my invention; and

Fig. 6 is an enlarged top plan view of an electrical terminal for use in the receptacle shown in Fig. 1 constructed in accordance with the principles of my invention.

Referring to Figs. 1 to 4, it will be noted that the receptacle constructed in accordance with the principles of my invention comprises an upper housing 2, a lower housing 4, a pair of electrical terminals 6 located within the housings 2 and 4, a pair of springs 5 adjacent each electrical terminal 6, and a yoke 8 for securing the entire assembly together. The particular construction of housings 2 and 4 and the cooperable structure of yoke 8 whereby the housings 2 and 4 are secured together does not form a part of this invention but is more completely shown, described and claimed in my copending application filed concurrently herewith, Serial No. 463,771, on a Wiring Device, and which has been assigned to the same assignee as this invention.

Both the housings 2 and 4 are formed from any suitable insulating material, preferably from a molded insulating material, which may readily be provided with the necessary external and internal structure as herein-after described. Electrical terminals 6 are formed from any suitable conducting material such as copper or brass which may readily be formed in a manner hereinafter described. Springs 5 are formed from any suitable material which has a sufficient resiliency, such as spring steel, to operate in a manner as hereinafter described, and yoke 8 may be formed of any suitable material which has sufficient structural strength and which may be bent as described, such as sheet steel.

Referring to Fig. 6, it will be noted that a terminal 6 constructed in accordance with the principles of my invention comprises, a pair of arms 34 which are spaced from each other and extend longitudinally outward in opposite directions from the center of the terminal 6. An upwardly angularly outwardly extending tab 36 is formed integral with the upper surface of each arm 34 and extends across the space therebetween, so as to electrically connect arms 34 together. If it is desired to electrically isolate the arms 34 from each other, the tab 36 need only be removed. In order to facilitate such removal, tab 36 is provided with a longitudinally extending slot 38 into which any suitable means, such as a blade or a screwdriver may be inserted. The joining line of tab 36 and arms 34 may also be provided with a groove (not shown) or any suitable formation to facilitate the breaking of tab 36 from arms 34 by bending of the tab 36. Each arm 34 is also provided with a wire guide groove 40 for receiving a wire therein which may readily be formed by indenting each arm 34 outwardly in the same direction as the tab 36 extends. In order to provide contact prong engaging means for the terminal 6, each arm 34 is provided with an integral U-shaped end 42 which is formed so that its right portion is approximately parallel to, but longitudinally displaced from, the arms 34 on the opposite side of arms 34 from which tab 36 extends. The open end of each U-shaped end 42 is approximately in the same plane as the longitudinally extending arms 34. Each arm and the right portion of the U-shaped end 42 is provided with an upwardly extending blade 41, each of which is bent inwardly towards the middle of the U-shaped end 42 so as to form a T-shaped opening therebetween. If desired, each blade 41 may be provided with an integral angularly upwardly extending projection 44 for guiding the prongs of an inserted conductor within the T-shaped opening.

Referring to Figs. 1, 3 and 4, lower housing 4 comprises an approximately rectangular base 28 having up-

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wardly extending formed side walls 30 which, in turn, are joined together at each end of the base 28 by upwardly extending end walls 32. Lower housing 4 is provided with a central longitudinally extending barrier 18 on approximately its longitudinal center line which extends between the end walls 32 so as to form a longitudinally extending chamber 3 between each side wall 30 of housing 4 and the barrier 18. In order to support and receive a longitudinally extending terminal 6 within each chamber 3, the inner surface of side wall 30 of housing 4 is provided with a longitudinally spaced pair of upwardly extending grooves 46 which extend from the inner surface of base 28 to the top of side walls 30 for the purpose of receiving wire guides 40 therein when inserted from the open side of housing 4. Barrier 18, at each longitudinal end of each chamber 3, is provided with an inwardly offset notch 47 extending longitudinally adjacent the longitudinal center line of housing 4 for receiving the bight portion of each U-shaped end 42 of terminal 6. As can readily be appreciated, as housing 4 is preferably a molded part, a slight taper may easily be provided on the inner surface of end walls 32 to force the outer arms of the U-shaped ends 42 toward each other to slightly frictionally bias the terminal 6 within the chamber 3. If desired, additional integral locating means may be provided on the inner surface of base 28 and on the barrier 18 to properly locate the various parts of terminal 6 within the chamber 3 of housing 4, as is more fully described in the above-identified copending application. As shown, an integral barrier 48 is provided on each side of barrier 18, which extends transversely between the inner surface of the side walls 30 and central barrier 18 on approximately the lateral center line of housing 4. By such construction the outer end of a barrier 48 is located between each arm 34 of the terminal 6 towards which it extends, to insure that the arms 34 cannot move toward each other within the housing 4.

Referring to Fig. 5, it will be noted that a spring 5 constructed in accordance with the principles of my invention comprises a generally U-shaped member having a straight anchoring leg 52 and a straight wire engaging leg 54 which has a tab 50 extending transversely outwardly therefrom. As shown in Figs. 1, 3 and 4, a pair of springs 5 are located on each side of barrier 18 with their bight portions opposed from each other and located adjacent the lateral sides of the barrier 48. Each side of the longitudinal barrier 18 between the lateral barrier 48 and each notch 47 is provided with a downwardly sloping surface 56 which extends outwardly toward the side walls 30 but terminates inwardly thereof for supporting the legs 52 and 54 of the springs 5 at an angle with the adjacent terminals 6 within the chambers 3. In order to prevent the anchoring leg 52 of springs 5 from slipping downward on surface 56, the surface 56 is provided with an outwardly and upwardly irregularly formed projection 58 which extends longitudinally along the greater portion of surface 56. In assembling the springs 5 within the wiring device, the inner surface of anchoring leg 52 is initially placed on the upwardly extending surface 62 of projection 58. It should be noted that surface 62 is substantially parallel to the longitudinal center line of housing 4 and that it extends longitudinally therein and terminates at a point spaced longitudinally from the transverse barrier 48. The bight portion of spring 5 is thereby permitted to extend around the end of projection 58 spaced from lateral barrier 48 on surface 56 so that its wire engaging leg 54 is also supported by the surface 56. As shown in Fig. 4, the end 64 of projection 58 opposite the above terminal end has a substantially greater width to prevent leg 52 of spring 5 from being deflected beyond a certain point. Finally, in order to permit tabs 50 of springs 5 to be located when inserting springs 5 from above housing 4, each side wall 30 of housing 4 is provided with a pair

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of spaced grooves 60 which are opened to the top surface of side walls 30 to permit the tabs to extend outward therein.

The upper housing 2 is an irregularly formed member having a pair of irregularly formed downwardly extending laterally spaced sides 10, and a pair of upwardly offset longitudinally spaced approximately circular faces 12 in each of which are located a pair of spaced T-shaped slots 14. Slots 14 are provided in order that the prongs of a male connector plug (not shown) may be inserted to engage the blades 41 of terminal 6 when the upper housing 2 is secured to the lower housing 4. It is believed obvious that by the formation of the slots 14 and blades 41 that various types of standard connectors may be easily engaged by the blades 41. In order to facilitate the insertion of such prongs, the outer faces 12 of upper housing 2 are slightly dished inwardly and an integral divider projection 16 is provided on each face 12 between the slots 14. Divider 16 serves to provide additional insulation between the two slots 14.

As shown in Fig. 4, each side wall 10 is provided with an opening 66 whereby tab 36 of each longitudinally extending terminal 6 is accessible from the outside of the assembled receptacle. Side walls 10 of upper housing 2 are adapted to engage side walls 30 of housing 4 so as to form a unitary structure with the lower edges of side walls 10 forming a top for openings 60 and the upper edges of side walls 30 forming a bottom for openings 66.

Upper housing 2 is provided with a slot 25 on its undersurface to slidably receive and support a yoke 8 therein. Yoke 8 is provided with a pair of downwardly extending legs 68 each of which has an integral outwardly extending projection 74 at its free end which extends through openings 72 in the barrier 18 of base 28 of lower housing 4, so that the lowermost projections 74 are accessible from outside of the assembled receptacle. The outer surface of base 28 of housing 4 is provided with a pair of recessed cam surfaces 76 over which projections 74 are movable to hold housing 2 tightly against housing 4. The particular structure of housings 2 and 4 and yoke 8 for holding housings 2 and 4 together does not form a part of this invention and for a more complete description of such structure, reference is again made to the above-identified copending application. In a somewhat similar manner, yoke 8 is provided with any suitable means for securing a covering plate thereto, such as a centrally located tapped opening 78 for threadedly receiving a screw therein. In order that such a screw may have sufficient space within the housing 4, the central portion of housing 4 is provided with a recess 32. Yoke 8 is also provided with a pair of arms 84 which extend outwardly from each end of the assembled receptacle and which have located therein any suitable means, such as openings 86, whereby the receptacle may be secured to a suitable support (not shown).

In assembling the upper housing 2 to the lower housing 4, the underside of housing 2 must obviously be formed to clear the various parts of the upper surface of lower housing 4. The undersurface of housing 2 is formed so as to be cooperable with the various parts within lower housing 4 for various functions. Thus, it will be noted (Figs. 1 and 4) that the undersurface of housing 2 is provided with a downwardly projecting support 88 on its lateral center line which clears the lateral barrier 48 and supports the inner side of tab 36 so that tab 36 cannot be forced inwardly into the chamber 3 of housing 4. The undersurface of housing 2 is also provided with a pair of longitudinally extending projections 92 (Fig. 3) centrally of each chamber 3 of housing 4 for engaging the upper edge of leg 52 of spring 5 in the event that the spring 5 is forced upwardly, whereby further upward movement of spring 5 is prevented. The slot 94 between each projection 92 and its adjacent side wall 10 is also adapted

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to receive the upper end of a terminal 6. It will further be noted from Figs. 2 and 3 that the base 28 of lower housing 4 is provided with a number of openings 90 extending therethrough which are located immediately below the wire guides 40 on terminals 6.

From the above description, it is believed obvious that, except for the formation of housing 2 for receiving yoke 8, the upper and lower housings 2 and 4 are symmetrical around their longitudinal center line and, accordingly, terminal 6 and springs 5 may be inserted in either side of lower housing 4 without reference to any left and right hand members thereof, whereby both the cost of producing and assembling such a receptacle may be substantially reduced.

As has been indicated, the receptacles constructed in accordance with the principles of my invention are best suited for household or similar use where low alternating current voltages are customarily supplied. Although such wiring systems do not have a polarity in the technical sense of the word, it is necessary to keep each side of the supply line independent throughout the system as one side of the line is customarily grounded. Thus each terminal 6 within the receptacle must be connected to different sides of the supply line. In making such electrical connections, a bare electrical conductor 100 is initially inserted into any opening 90 in the base 28 of housing 4 until conductor 100 engages the lower sloping edge of the wire engaging leg 54 of the adjacent spring 5. By exerting an additional force upon the conductor 100 the upper end of conductor 100 will force the leg 54 upward on surface 56 of barrier 18 toward leg 52 of spring 5, whereby conductor 100 may slip past leg 54 upwardly toward housing 2. It will be noted that leg 52 of spring 5 is restrained from moving upward by engaging the vertical side wall of barrier 18 at the juncture of surface 56 and barrier 18, so that the force exerted by conductor 100 bends spring 5 but does not cause the spring 5 to be bodily displaced within housing 4. Once conductor 100 has slipped past leg 54, it is obvious that the upper edge of leg 54 will be resiliently forced against the conductor 100 to hold the conductor 100 within the housing 4. Inasmuch as leg 54 is angularly disposed with relation to conductor 100, any reverse force applied to the conductor 100 will tend to jam the conductor 100 into further engagement with the leg 54, thereby preventing the conductor 100 from being removed from the housing 4. It is also obvious that the force exerted by the leg 54 upon conductor 100 is dependent upon the force necessary to initially deflect the leg 54, and accordingly it is a matter of design as to the material used for the spring clip 5 and the position of spring 5 with respect to conductor 100. Although spring 5 may be located at various angles with relation to conductor 100, an angle of about 45° has proven to be satisfactory and, accordingly, surface 56 is at 45°. Once the conductor 100 has been so inserted within the housing 4, it is desirable that the portion of conductor 100 located outside the housing 4 be provided with insulation 101 to prevent an electrical hazard.

As can be appreciated, in using conductor 100 to exert a force upon spring 5, and in view of the relative softness of commercially available conductors, wire guides 40 are located directly above each opening 90 whereby the inserted conductor is initially located supported therein. As has also been indicated, the lower leg 54 of each spring 5 extends longitudinally along the adjacent arm 34 of terminal 6 and across the wire guide 40. Thus, the conductor 100 is supported at all times within the housing 4 by the wire guide 40, so that when such force is exerted therein, the conductor 100 is not bent under the leg 54 of a spring 5, but is guided and supported so as to slip past the leg 54. Also, as leg 54 of spring 5 is merely deflected, various sizes of commercially available conductors may be held by the spring 5 inasmuch as the larger diameter wires will merely cause the leg 54 to be deflected a greater amount. It is obvious, of course, that extremely large

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conductors would not be satisfactory for such service, and such are prevented from being inserted by the limitations of the size of openings 90. Also, such U-shaped construction provides sufficient length of the springs 5 so that the spring will not assume a permanent set under normal use and release. A still further advantage of the U-shape is that it may be used in other types of wiring devices such as switches wherein the space available is relatively limited.

In order to release the conductor 100 from the leg 54 of a spring 5, it is only necessary to insert a blunt instrument, such as a screwdriver, within the adjacent opening 60 of the side walls 30 of lower housing 4, and engage the tab 50 at the end of leg 54 of spring 5. Tab 50 may then be forced inwardly to cause the leg 54 of spring 5 to move inwardly on the surface 56, whereby the clamping force on the conductor 100 is removed and the conductor 100 may easily be withdrawn. Inasmuch as each spring 5 has an accessible tab 50, the conductors 100 may be removed individually from their various positions within the housing 4. It will be noted that with the conductor 100 removed from the housing 4, the spring 5 is restrained from sliding downward by the engagement of leg 54 with the arm 34 of terminal 6 and the engagement of leg 52 with the projection 58. Further, in the event that the receptacle is moved, the upper leg 52 of each spring 5 is prevented from being angularly rotated within the chamber 3 by the projection 92 engaging the upper leg 52.

As has also been indicated, the terminals 6 may readily be electrically isolated from each other. Such purpose is readily accomplished by inserting any suitable blunt instrument such as a screwdriver within the openings 66 of side walls 10 of upper housing 2, and engaging the slot 38 of the tab 36. Thereafter, tab 36 may be rocked about the top of the arms 34 of terminal 6 until it breaks free of the arms 34. Thereafter, the tab 36 may be removed whereby the arms 34 are electrically insulated from each other within the housing 4 as has been previously indicated. With such a system it is, of course, obvious that separate supply conductors must be utilized for energizing both halves of each terminal 6.

Although I have shown and described one particular modification of my invention in accordance with the patent statutes, I am aware that modifications thereof are possible without departing from the broad spirit and scope of my invention. Accordingly, it is desired that my invention be not restricted except insofar as is necessitated by the prior art.

I claim as my invention:

1. A wiring device comprising a hollow casing having a substantially flat terminal located therein in fixed relationship, a U-shaped leaf spring located in said casing, means within said casing for supporting said spring with the lateral extent of the arms thereof being at an angle to said terminal and with one side of one arm thereof freely located closely adjacent to said terminal and with the lateral extent of said one arm diverging outwardly relative to said terminal in one direction from said one side, and an opening in said casing adjacent the divergent portions of said terminal and said one arm whereby an electrical conductor may be inserted therethrough in the opposite direction to deflect said one arm toward the other to stress said spring in a cantilever fashion as well as in a torsional manner about a longitudinal axis of at least said one arm so as to be held by said one arm in engagement with said terminal.

2. A wiring device comprising a hollow casing having a substantially flat terminal located therein in fixed relationship, a U-shaped leaf spring located in said casing, means within said casing for freely supporting one side edge of said spring with the lateral extent of the arms thereof being at an angle to said terminal and with one side of one arm thereof freely located closely adjacent to said terminal and with the lateral extent of said one arm diverging outwardly relative to said terminal in one di-

rection from said one side, an opening in said casing adjacent the divergent portions of said terminal and said one arm whereby an electrical conductor may be inserted therethrough in the opposite direction to deflect said one arm toward the other to stress said spring in a cantilever fashion as well as in a torsional manner about a longitudinal axis of at least said one arm so as to be held by said one arm in engagement with said terminal, and means on said casing engageable with the outside of the other arm of said spring for limiting bodily movement of said spring away from said terminal when a conductor is so inserted while permitting deflection of said one arm to set up the aforesaid stresses in the spring.

3. A wiring device comprising a hollow casing having a substantially flat terminal located therein in fixed relationship, an elongated interior surface within said casing spaced beside said terminal and extending angularly with relation thereto, a U-shaped leaf spring having one elongated arm with one side edge thereof supported only by said surface and the other side edge thereof closely adjacent said terminal and with the lateral dimension of said arm extending divergently in one direction therefrom, an opening in said casing adjacent the divergent portions of said terminal and said elongated arm whereby an electrical conductor may be inserted therethrough in the opposite direction to deflect said elongated arm over said surface so as to be held into engagement with said terminal, and means engaging the outer side of the other arm of said spring to prevent bodily movement of the spring away from said terminal.

4. A wiring device comprising a hollow casing having a substantially flat terminal located therein in fixed relationship, an elongated interior surface within said casing spaced beside said terminal and extending divergently therefrom in one direction, a U-shaped leaf spring having one arm with one side edge thereof supported only by said surface and the other side thereof located closely adjacent said terminal and with the lateral dimension of said one arm extending divergently therefrom in the opposite direction, said one arm being movable over said surface, means integral with said casing engaging the outer side of the other spring arm for substantially preventing bodily movement of the said spring away from said terminal, and an opening in said casing adjacent the divergent portions of said terminal and said elongated arm whereby an electrical conductor may be inserted therethrough in said one direction to deflect said elongated arm over said surface so as to be held into engagement with said terminal.

5. A wiring device comprising a hollow casing having a substantially flat terminal located therein in fixed relationship, an elongated interior surface within said casing spaced beside said terminal and extending divergently therefrom in one direction, a U-shaped leaf spring having one arm with one side thereof supported only by said surface and the other side thereof closely adjacent said terminal and with the lateral dimension of said one arm extending divergently therefrom in the opposite direction, said one arm being movable over said surface, a first supporting means on said surface between said spring arms for locating the other arm of said spring on said surface, a second supporting means in said casing located at the outer side of the other arm of said spring to prevent any substantial movement of said spring bodily away from said terminal, and an opening in said casing adjacent the divergent portions of said terminal and said elongated arm whereby an electrical conductor may be inserted therethrough in said one direction to deflect said elongated arm over said surface so as to be held into engagement with said terminal.

6. A duplex receptacle comprising elongated upper and lower dish-shaped insulating housings which are adapted to be secured together, a pair of elongated electrical terminals adapted to be located in fixed relationship at each side of said housings, respectively, longitudinally extend-

ing elongated sloping surfaces in said lower housing inwardly spaced from each of said terminals, respectively, a pair of spaced U-shaped leaf springs located on each of said surfaces respectively so as to be supported thereby in cooperable relationship with the adjacent terminal, one side of one arm of each of said springs being freely located closely adjacent to its cooperating terminal and with the lateral dimension of said one arm diverging relative to said cooperating terminal from said one side to the opposite side thereof in one direction, means integral with said upper and lower housings closely spaced from the other arm of said springs for preventing any substantial movement thereof in said housing, and an opening in said lower housing located between the divergent portion of each of said one arms of said springs and their cooperating terminal whereby separate electrical conductors may be inserted therethrough in the opposite direction to deflect said one arms so as to be held into engagement with said terminals.

7. A duplex receptacle comprising elongated upper and lower dish-shaped insulating housings which are adapted to be secured together, a pair of elongated electrical terminals adapted to be located in fixed relationship at each side of said housings, respectively, a longitudinally extending elongated surface within said lower housing inwardly spaced from each of said terminals, respectively, a pair of leaf springs located on each of said surfaces, respectively, having at least an elongated arm with one side thereof supported only by said surfaces and the other side thereof freely located closely adjacent its terminal and with the lateral dimension of said one arm extending divergently in one direction therefrom, and an opening in said casing adjacent the divergent portions of said terminal and each of said elongated arms whereby separate electrical conductors may be inserted therethrough in the opposite direction to deflect said elongated arms over said surface so as to be held into engagement with said terminals.

8. An electrical wiring device comprising, a hollow casing of insulating material having at least one electrical contact mounted therein, a substantially flat terminal member also mounted in said casing for said contact, an opening in said casing adjacent said terminal member for receiving a conductor when inserted in said opening in one direction to be located closely adjacent one side of said terminal member, an elongated leaf spring member having a bent end portion which is supported in said casing adjacent said one side of the terminal member and extending longitudinally across said opening from a point spaced from said opening and lying in a plane which is at a convergent angle transversely of said spring with respect to said terminal in said one direction so that one side edge of said spring is the closest part of the spring to said terminal, so that when a conductor is inserted in said opening it is guided into engagement with and between said terminal and said one side edge of the spring to deflect said spring laterally and longitudinally so that the spring biases the conductor into engagement with said terminal, and upon attempted withdrawal of the conductor said one side edge of the spring will act to more firmly engage the conductor against said terminal.

References Cited in the file of this patent

UNITED STATES PATENTS

1,678,745	Schellenger	July 31, 1928
1,950,826	Smart	Mar. 13, 1934
2,262,712	Shenton	Nov. 11, 1941
2,617,844	Sanda	Nov. 11, 1952
2,671,204	Hubbell	Mar. 2, 1954
2,713,668	Gibilisco	July 19, 1955

OTHER REFERENCES

General Electric Review, January 1953, page 55, "Wiring Devices."