May 26, 1970 K. H. WALTERICK ET AL 3,514,738

COMBINED CONTACT AND TERMINAL FOR CONVENIENCE OUTLETS

Filed April 3, 1968

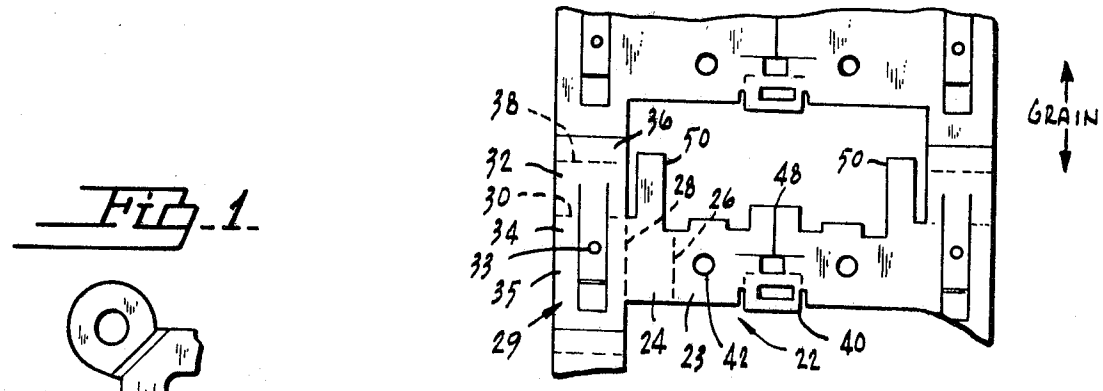
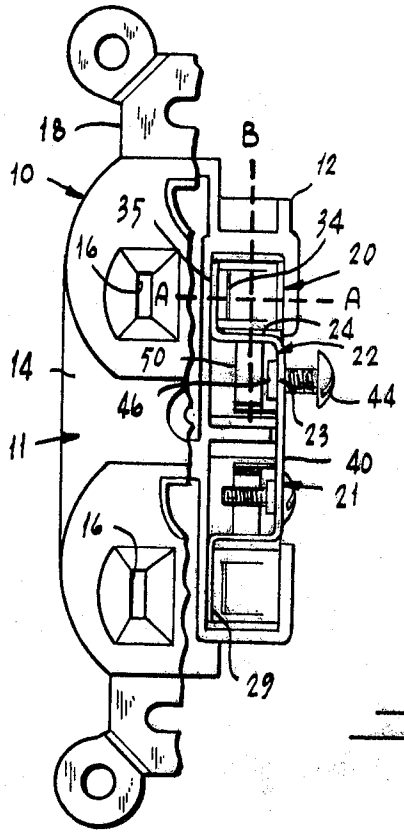


Fig. 5.

Fig. 1.



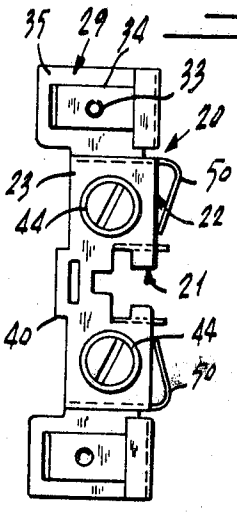


Fig. 2.

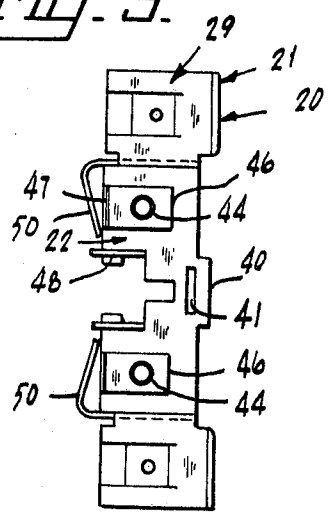


Fig. 3.

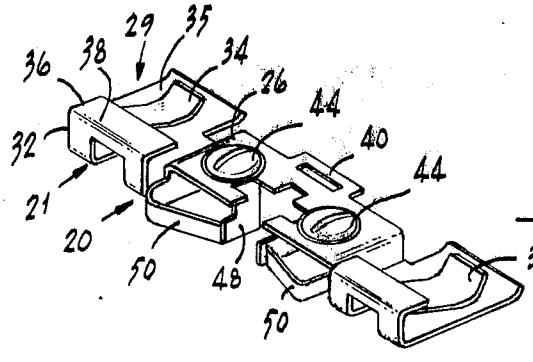


Fig. 6.

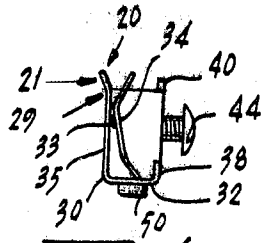


Fig. 4.

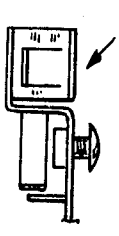


Fig. 7.

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COMBINED CONTACT AND TERMINAL FOR CONVENIENCE OUTLETS

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U.S. Cl. 339—32 6 Claims

ABSTRACT OF THE DISCLOSURE

A contact and terminal structure for a convenience outlet includes an integral copper or copper alloy strip, preferably about .020 inch thick. The strip has spaced spring arms having a longitudinal grain though deflecting in perpendicularly related planes. One of these contacts an inserted plug blade and the other grips a wire termination. The strip is formed with offset walls joined integrally by a connecting web. One spring arm is struck from one of the walls with the other extending from the web, adjacent an alternative terminal provided by a screw and nut carried by the other wall.

BACKGROUND OF THE INVENTION

(I) Field of the invention

The invention is in the field of electrical connectors, in particular single or duplex receptaces or convenience outets combining means for receiving the blades of an attachment plug cap and means for making a connection to a wire termination. Within this broad classification, the invention lies in the narrower field of contact and terminal strip assemblies for such receptacles, particularly those combining the functions of a plug blade contact, a pressure-lock terminal, and a screw terminal.

(II) Description of the prior art

Until comparatively recently, the combined contact and terminal strip assembly of a single or duplex receptacle utilized a screw terminal in association with resiliently yieldable means for engaging an inserted plug blade. The earlier forms of such assemblies often comprised a multiplicity of parts. This was due to the fact that the screw terminal portion of the assembly required a comparatively thick stock in order to permit maximum thread engagement with the screw. The contact end portion, desirably, was thin for the purpose of producing maximum springability in the blade-engaging area thereof. As a result, in some of the older forms of such contact and terminal structures, the practice was to attach separately formed, thin spring arms as blade-engaging contacts, to a body portion of relatively thick material, on the order of perhaps .035–.040 inch in thickness. In the body portion was an opening having the requisite number of threads for engaging the binding head screw. The number of said threads, it may be noted, was dictated by Underwriters' Laboratories requirements, local building codes, minimum standards established by industry groups, and the like.

In more recent times, the pressure-grip terminal has become popular, in view of the time saved by the electrician wiring the building in which the receptacle is used. One of the earlier showings of this type of terminal is found in Benander Pat No. 2,705,785 dated Apr. 5, 1955. In a receptacle of this type, there is provided, instead of a screw terminal, a spring arm deflected by a wire inserted through an opening of the receptacle housing, and gripping the wire tightly to prevent its accidental withdrawal while assuring a good electrical connection between the wire and the terminal assembly.

Economies were effected, in devices of the pressure-lock type exemplified in the Benander patent, by making the wire-grip spring integral with the contact and terminal strip of the receptacle. This was distinguished from the arrangement seen in the Benander patent utilizing a separately formed steel spring in association with the terminal strip, which must be copper or brass.

Such a construction is found in, for example, Bentley Pat 2,890,436 dated June 9, 1959.

Although obviously the pressure-lock terminal brought about many economies in material, tooling, assembly procedures, and labor costs for wiring buildings, the pressure lock terminal nevertheless leaves something to be desired. It is generally conceded that the connection made to a wire termination by a pressure-lock terminal can rarely be depended upon to match the efficiency of the connection made by looping the stripped wire end about the shank of the binding head screw, and turning the screw tightly thereagainst. The screw-type terminal provides a particularly strong, permanent gripping of the wire, with relatively low heat rise characteristics, and as a result many electricians still prefer this type of terminal despite the fact that it has the disadvantage of adding to the wiring time.

The result has been that manufacturers have made, and continue to make, separate lines of receptacles, one with the pressure-lock terminal and the other with the screw terminal.

The most recent innovation, in the evolution of receptacle manufacture, has been into an arrangement wherein in one receptacle, the electrician can have the choice of either a pressure-lock terminal or a screw terminal. This is shown, by way of example, in Munroe Pat. 3,325,768 dated June 13, 1967.

The contact and terminal assembly in the Munroe patent might, thus, be considered as the ultimate development in a receptacle component of this type, especially since it includes the desirable feature of forming both the plug-blade-engaging contact, and the pressure-lock terminal, from a single piece of strip stock. As a matter of fact, however, the construction shown in the Munroe patent has left for solution certain problems in respect to tooling, material costs, and operating efficiency of the pressure-lock terminal. To meet requirements, the stock is comparatively heavy, being on the order of approximately .030 inch in thickness for the specific purpose of affording the requisite number of threads in the screw-receiving opening of the stock.

The use of heavy stock naturally adds, measurably, to the materials cost of the contact and terminal assembly. Of perhaps equal importance, however, is the fact that a wire-grip spring formed of a comparatively heavy brass, is lacking in good spring characteristics. Such material, particularly when the thickness thereof is relatively great in comparison to the length of the spring arm, tends to take a set, even upon a single use thereof, thereby detracting markedly from the wire-gripping function and adding materially to the heat rise at the point of connection to the wire. And, a further undesirable characteristic results from the fact that the form and dimensions of the spring are difficult to hold in high speed, mass production, and the tooling is difficult to maintain.

Adding even more to the loss of good spring characteristics is the fact that in a contact assembly such as shown in the Munroe patent, as well as in other patents in which the wire-grip spring is integral with the contact strip, the form, location, and dimensions of the standard convenience outlet militate against extension of the grain of the stock longitudinally of the contact and wire-grip spring arms. As will be noted from the Munroe patent, extension of the grain longitudinally of the contact spring arm produces a grain transverse of the wire-grip spring arm, and

vice versa. A grain extending transversely of a spring arm reduces its resiliency, promotes the taking of a set, and hastens spring fatigue.

(III) Summary of the invention

The present invention comprises a combined contact and terminal structure of the type shown in the Munroe patent, having both a pressure-lock terminal means and a screw terminal, either of which can be used at the option of the electrician. The invention, however, aims to eliminate the problems noted with respect to the prior art construction, by so forming the contact strip as to provide a contact spring arm and a wire-gripping spring arm both of which have a longitudinal grain despite the fact that they meet the design requirements dictated by conventional convenience outlet construction, which requirements typically necessitate deflection of these spring arms in perpendicularly related planes. The invention, further, aims to solve the problem of excessive stock thickness, lack of resiliency of the spring arms, tendency of the arms to take a set, and difficulty in maintaining the form of the part, by the provision of a simplified design utilizing relatively thin stock on the order of .015–.025 inch in thickness. Still further, the invention aims to solve the problems of high material and labor costs involved in manufacture of this important component of a single or duplex receptacle, while at the same time meeting all requirements imposed by Underwriters' Laboratories, industry standards, etc.

To this end, the invention comprises a strip of integral formation, the thickness of which is preferably on the order of about .020 inch, said strip being so designed as to have both the contact spring arm and the wire-gripping spring arm extended in directions to incorporate a longitudinal grain therein, thus adding materially to their springable characteristics. Summarized further, the construction includes a screw terminal means incorporating a conventional binding head screw rotatably engaged in an opening provided in the strip stock, and threadedly engaged in a nut held against rotation by a projection formed upon the strip in close proximity thereto. The construction is such as to further facilitate assembly procedures, through the provision of a partial thread in the thin strip stock, which temporarily engages the screw shank, to hold the same in proper position for assembly of the nut with the screw and the strip stock, and for subsequent insertion of the assembled nut, screw and strip in the housing of the receptacle. Following such assembly, ordinary rotation of the screw for the purpose of engaging a wire loop thereunder may or may not break the fragmentary thread provided in the strip stock. It is, in fact, immaterial whether the thread in the strip stock breaks at this time.

(IV) Brief description of the drawing

FIG. 1 is a top plan view of a duplex receptacle in which the combined contact and terminal comprising the present invention is mounted, a portion of the cover and strap of the receptacle being removed;

FIG. 2 is a side elevational view of the combined contact and terminal per se;

FIG. 3 is a side elevational view of the combined contact and terminal showing the other side thereof;

FIG. 4 is an end elevational view of the combined contact and terminal;

FIG. 5 is a fragmentary plan view of the stock strip for the combined contact and terminal, showing the same as it appears in blank during manufacture thereof;

FIG. 6 is an isometric view of the combined contact and terminal; and

FIG. 7 is a top plan view of a modified construction adapted for mounting in a single rather than a duplex receptacle.

(V) Description of the preferred embodiments

Conventionally, a typical duplex receptacle generally designated **10** includes a housing **11** normally of a phenolic material, said housing including a hollow body **12**, and a cover **14**. Cover **14** has two pairs of plug-blade-receiving slots **16**, the dimensions, location, and spacing of which are rigidly prescribed by Underwriters' Laboratories, industry standards, and local and state building codes. A metal strip **18**, illustrated fragmentarily, is assembled with the housing, through the provision of drive screws, rivets, or equivalent fasteners, not shown.

All this is conventional construction, and does not constitute part of the present invention.

The invention comprises the combined contact and terminal structure generally designated **20**, provided within housing **11** for the purpose of effecting the necessary electrical connections between the inserted plug blades or prongs, and the wiring of the building structure in which the receptacle is mounted.

In accordance with the invention, structure **20** includes an integral, elongated strip **21** of copper or copper alloy material, usually brass of selected hardness and copper content. Since each end of a contact strip for a duplex receptacle is identical to the other end, the construction at one end of the strip **21** will be described herein. This construction includes, adjacent the mid-length point of the strip, a terminal generally designated **22**, where the connection is made to a wire or wires, not shown, extending into the outlet box (also not shown) in which the receptacle would normally be mounted. Terminal **22** includes a wall **23**, extending in contact with the inner surface of the side wall of the phenolic body **12** of the receptacle. Wall **23** merges into a connecting web **24** extending laterally inwardly from the wall within the housing, substantially normally to the plane of the wall **23**. Connecting web **24**, as will be noted from the fragmentary view of the stock strip relating to structure **20** (FIG. 5), is bent along line **26**, to dispose the same in the described perpendicular relationship to the wall **23**.

Connecting web **24**, at the inner end theerof, is bent along a line **28**, to merge into the contact, generally designated **29**. Contact **29** is disposed below one of the slots **16**, for the purpose of engaging an inserted blade of an attachment plug cap, not shown.

Contact **29** (see FIGS. 4 and 5) has a bend line **30** normal to the bend lines **26**, **28**, defining on the contact a flat base **32** seated upon the bottom of body **12** of housing **11**. Lanced out of the material of base **32** is the proximal end of an elongated spring arm **34**, the distal end portion of which is lanced out of the material of wall **35** of the contact. Walls **23**, **35**, as will be noted from FIG. 1, are laterally offset, being integrally joined by the connecting web **24** that extends therebetween at right angles thereto.

Referring to FIG. 4, contact spring arm **34** is so formed as to extend from base **32** in converging relation to the contact wall **35**, for the major part of the length of said arm **34**. Adjacent the distal extremity of arm **34**, it is provided with a reverse bend, so as to diverge from wall **35** for the remainder of its length, thus to provide a V-shaped entranceway for a plug blade inserted through slot **16**. Slot **16**, as will be understood, is disposed immediately above the entranceway, so as to guide the plug blade to the proper position for engagement between wall **35** and contact spring arm **34**. Upon insertion of the blade, arm **34** deflects in plane A—A, against the inherent spring tension thereof, so that the inserted blade is effectively, frictionally gripped between the wall **35** and the arm **34**. A dimple **33** is provided upon arm **34** to engage in the opening normally provided in a plug blade, whereby to increase the gripping action so as to meet requirements of Underwriters' Laboratories and industry standards with respect to pull tests and the like.

To stabilize the position of the blade-contacting portions

34, 35 of contact 29, there is provided an upstanding lip 36 bent upwardly from base 32 along a bend line 38.

Medially between the opposite ends of the contact strip, there is provided a breakoff tab 40. This is integral with the respective end portions of the strip, and in conventional fashion is rockable by a screw driver (not shown) or the like inserted in its slot 41 along a weakened line of connection to the body part of the strip, so as to be broken off if desired, for the purpose of electrically separating the respective end portions of the receptacle.

Terminal 22 is so designed as to permit the electrician to make his connections to the receptacle either by means of a screw terminal, pressure-lock wire grip, or both, at his option. The screw terminal means includes an opening 42 formed in the wall 23, to receive a binding head screw 44 threaded into a nut 46 held against rotation by a projection or stop 47 integral with and extending laterally inwardly from one edge of wall 23.

In assembly of strip 21, screw 44 and nut 46, it is proposed that the nut and strip would first be properly positioned with the opening of the nut and opening 42 in registration, in a suitable nest or jig, after which a tapping tool, not shown, would be directed through the registered openings so as to tap both the opening 42 and the nut opening simultaneously with a continuous thread. Screw 44 is then fed through the tapped openings. Since the strip is on the order of .020 inch in thickness, in a preferred embodiment, the thread formed in opening 42 would be only fragmentary, and obviously would not be possessed of sufficient strength to constitute the only means that threadedly engages the screw in the structure 20. The thread in opening 42, however, does serve an important purpose, in that it temporarily holds screw 44 and nut 46 against movement in a direction axially of the screw while the structure 20, completely assembled in the manner described above, is being subsequently assembled with the body 12 of the receptacle. Heretofore, the insertion of a contact strip of the type having a binding head screw and nut, in the body of a duplex receptacle, has required considerable care and special dexterity on the part of the assembler, for the reason that the interior of the body is compartmented to produce a snug fit of the contact strip therein. The result has been that when the screw and nut are loose, they tend to shift to positions in which they engage some portion of the receptacle body, while the strip is being inserted, thereby preventing movement of the strip into its proper position within the receptacle body.

By reason of the arrangement described above, this difficulty is obviated by the temporary maintenance of the screw and nut against deviation axially of the screw, in respect to the strip. Once the complete structure 20 has been inserted in the body, there is no further concern as to retention of the fragmentary thread formed in opening 42. Rather, during normal wiring of the receptacle by the electrician, this thread might very possibly break away, so that the opening 42 then becomes the conventional unthreaded aperture loosely receiving the screw and permitting the screw to swivel freely therein. But if it does not, there is no impedance of the normal wiring function in any event.

Terminal 22, as previously noted, also includes a pressure lock wire grip means usable alternatively to or in combination with the binding screw terminal means described above. To this end, a lip 48, integral with a second edge of wall 23, is projected laterally inwardly from wall 23, in confronting relation to the distal end of a wire grip spring 50 which can alternatively be termed a terminal spring arm to distinguish the same from the contact spring arm 34. Terminal spring arm 50 is integral at its proximal end with connecting web 24, and extends from the connecting web in parallel relation to wall 23, as shown in FIG. 1. As seen from FIG. 3, terminal spring arm 50 is spaced from projection 47 and nut 46 a distance sufficient to permit deflection of the spring arm when a

wire is inserted between lip 48 and the distal end of said spring arm 50. Deflection of the arm occurs in a plane B—B, perpendicular to plane A—A in which contact spring arm 34 deflects.

Referring now to FIG. 5, it will be observed that the particular formation of strip 21 is such that in the blank or stock strip fed through the die in which the part is made, the contact spring arm 34 and the terminal spring arm 50 have their lengths in parallel relation. Hence, they are grained identically, and since their lengths run lengthwise of the stock fed through the press, the grain extends longitudinally of said arms 34, 50.

This is of considerable importance, since brass, the material of which components of this type are usually made, is not by nature a good spring material in any event. The springability, and the resistance to set, are enhanced in accordance with the present invention by extension of the grain longitudinally of both of the spring arms incorporated in the strip, despite the fact that said arms are required, due to the confines of space and dimensional requirements of a receptacle, to deflect in perpendicularly related planes.

Of importance, also, is the fact that the spring arms are formed from a stock sufficiently thin to further enhance the spring characteristics of arms 34 and 50 (particularly arm 50), despite the fact that the structure 20 incorporates a screw terminal. Incorporation of a screw terminal normally militates against use of thin stock, as readily apparent from a perusal of the prior art such as the Munroe patent, due to the requirement for a specified number of threads in engagement with the binding head screw. The present invention obtains the screw terminal, the pressure lock terminal, and the plug blade contact, with maximum springiness in the pressure lock and the plug blade contact arms, and does so while utilizing thin, less expensive material and while keeping assembly costs at a desirably low level.

What is claimed is:

1. A combined contact and terminal structure for an electrical receptacle comprised mainly of an integral strip of electrically conductive metal formed with a plug blade contact and a wire terminal each of which includes, at least in part, a spring arm having a longitudinal grain, said arms being resiliently deflectable in generally perpendicularly related planes, the spring arm of the wire terminal being part at least of a pressure-grip wire terminal means that constitutes a portion of the terminal, the remaining portion thereof being of the binding head screw type, said remaining terminal portion including a binding head screw and an internally threaded screw-engaging means formed separately from the strip, said internally threaded means comprising a nut held against rotation by an adjacent projection formed upon the strip.

2. A combined contact and terminal structure for electrical receptacles, comprised mainly of an integral strip of electrically conductive metal formed with a plug blade contact and a wire terminal each of which includes, at least in part, a spring arm having a longitudinal grain, said arms being resiliently deflectable in generally perpendicularly related planes, said strip including a body part formed with generally parallel walls offset transversely of the strip by a connecting web and comprising part of the contact and terminal respectively, at least the distal end portion of the spring arm of the contact being struck out of the wall of the contact, the spring arm of the wire terminal extending from said connecting web parallel to the wall of the terminal.

3. A combined contact and terminal structure for electrical receptacles as in claim 2 wherein the contact wall and the spring arm of the contact are in confronting relation to grippingly engage a plug blade inserted therebetween.

4. A combined contact and terminal structure for an electrical receptacle as in claim 3 wherein the said contact further includes a base extending from said wall, the

proximal end portion of the contact spring arm being struck out of said base.

5. A combined contact and terminal structure for electrical receptacles as in claim 2 further including a lip projecting laterally from the wall of the terminal transversely of the terminal spring arm in confronting relation to the distal end thereof, for gripping of a wire inserted between said distal end and lip.

6. A combined contact and terminal structure for electrical receptacles comprised mainly of an integral strip of electrically conductive metal formed with a plug blade contact and a wire terminal each of which includes, at least in part, a spring arm having a longitudinal grain, said arms being resiliently deflectable in generally perpendicularly related planes, said strip including a body part formed with generally parallel walls offset transversely of the strip by a connecting web and comprising part of the contact and terminal respectively, said structure including a binding head screw rotatably engaged in the wall of the terminal and a nut engaging the screw, the strip being formed with a projection extending from

a first edge of the terminal wall and engaging the nut against rotation, said spring arm extending from the connecting web adjacent but out of engagement with the lip and nut, the strip being further formed with a lip extending laterally from a second edge of the terminal wall in confronting relation to the distal end of the terminal spring arm to cooperate therewith in gripping a wire inserted therebetween.

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U.S. Cl. X.R.

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