July 16, 1968 A. L. MANICHL 3,393,397

TERMINAL BLOCK

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Fig. 1

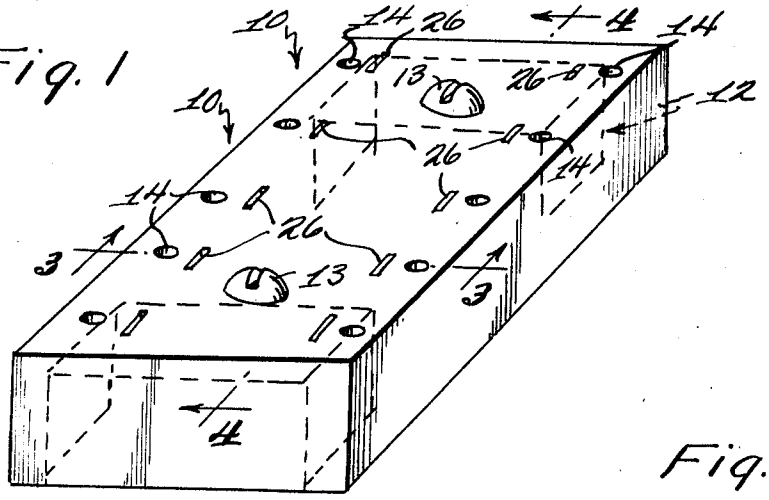



Fig. 2

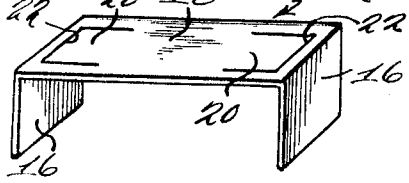



Fig. 3

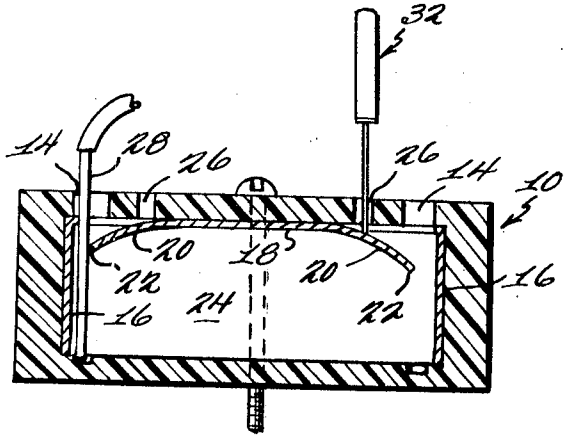



Fig. 4

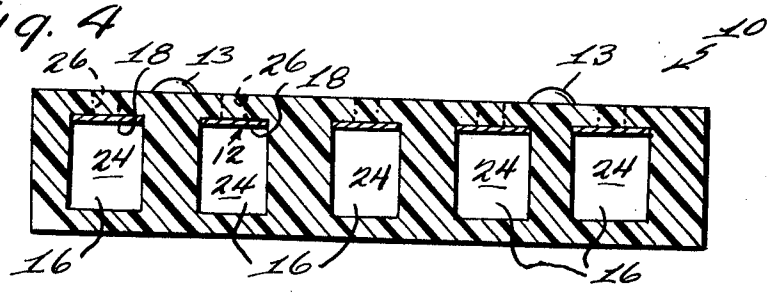
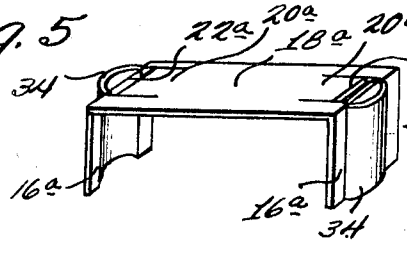



Fig. 5




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Fig. 6

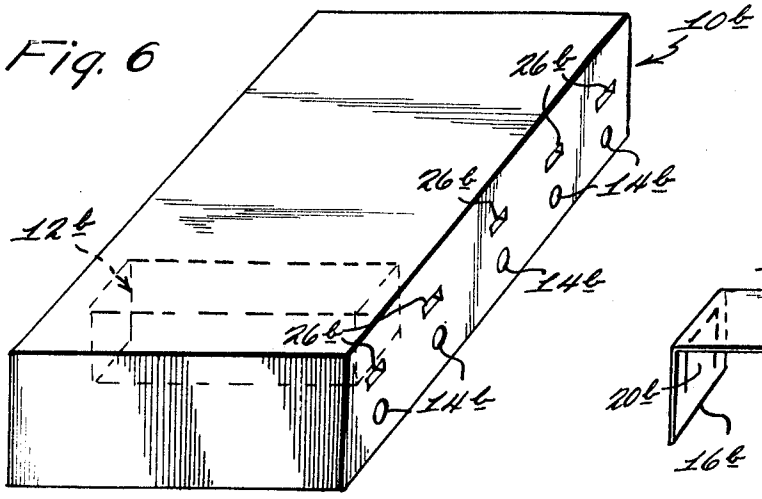



Fig. 7

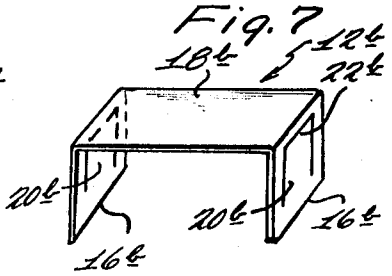



Fig. 8

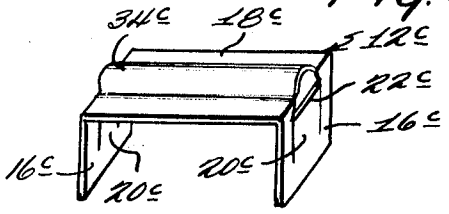
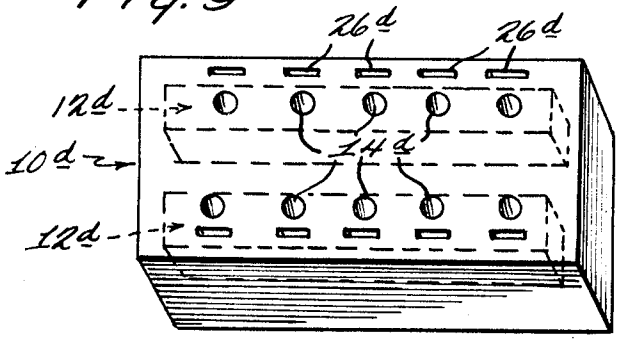



Fig. 9



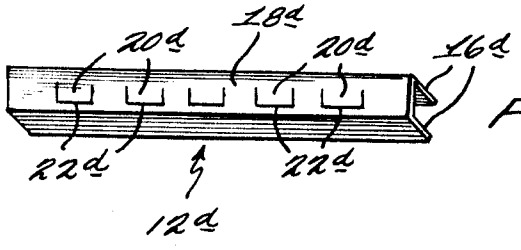
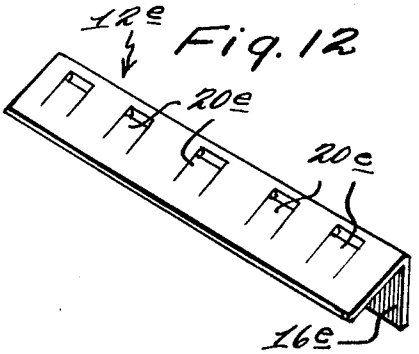




Fig. 10

Fig. 12




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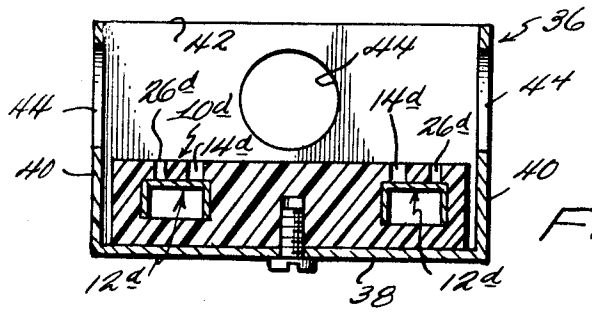



Fig. 11

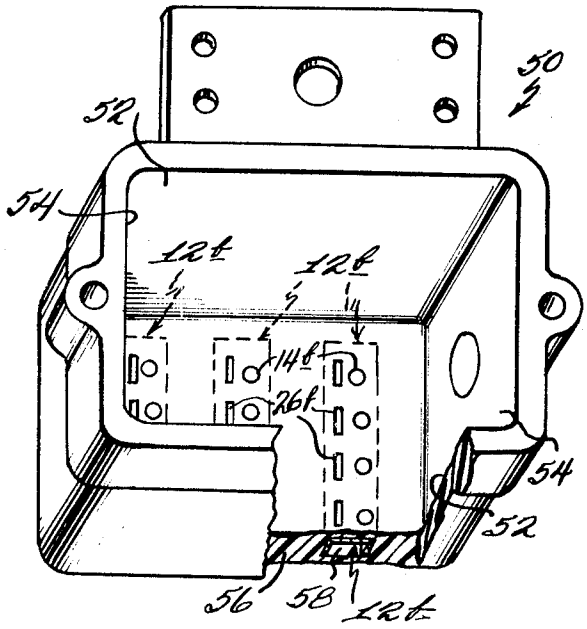



Fig. 13

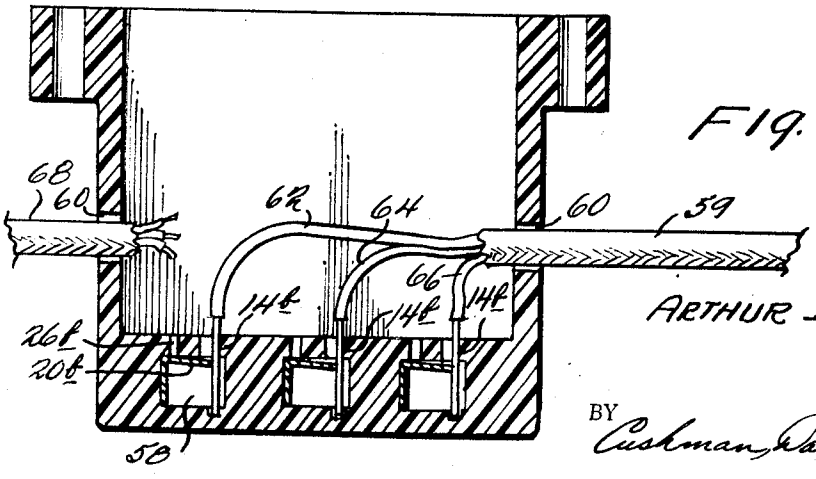



Fig. 14

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3,393,397

# TERMINAL BLOCK

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14 Claims. (Cl. 339—95)

This invention relates to connections between electric wires and in particular to improvements in terminal blocks, junction boxes and the like employing screwless wire connections.

It is known in the prior art to replace the terminal screws of household wall receptacles with a screwless, pressure-locking terminal in which the conducting wires are connected to the device by merely inserting the bared ends through an opening in the housing or body of the device. These pressure-locking terminals conventionally include a flexible metal locking tongue whose free end frictionally engages the end of the wire as the latter is inserted through the opening and holds it against a conducting surface within the receptacle. The tongue also bites into the wire and strongly resists its withdrawal until a screwdriver or other pointed tool is inserted through another opening to displace the tongue from its locking position.

It is one object of the present invention to provide an improved terminal block of simple and economic construction which employs pressure-lock terminals and which is adapted to effect a large number of electrical connections in a small space. Terminal blocks constructed according to the principles of this invention may be readily substituted for existing screw type terminal blocks found in household and commercial junction boxes and the like and are advantageous from the standpoint of providing for a larger number of connections than the original equipment and from the standpoint of reducing the time required for making connections. In addition the terminal blocks of the present invention may be employed in such devices as ceiling boxes, wall outlets and fluorescent light fixtures for the purpose of making connections which are conventionally made by splicing.

It is a further object to provide a unitary molded plastic junction box incorporating, broadly, a plurality of molded-in pressure type terminals for connecting the lead-in wires to other wires. More specifically, it is an object to provide a molded box having a plurality of molded-in pressure type terminals of an improved, economical construction.

It is a still more specific object to provide a plastic terminal block having a plurality of molded-in pressure type terminals in which the terminals are constructed of a strip of metal bent at a right angle to form two arms, one of the arms having a tongue punched therefrom for gripping a wire between its free end and the other arm.

The invention will be further understood from the following detailed description taken with the drawings in which:

FIGURE 1 is a perspective view of a plastic terminal block having a plurality of pressure type terminal bars each of which is adapted to connect one incoming wire to one outgoing wire.

FIGURE 2 is a perspective view of one of the terminal bars of FIGURE 1;

FIGURE 3 is a sectional view, on an enlarged scale, taken on the line 3—3 of FIGURE 1 and illustrating the operation of a terminal bar;

FIGURE 4 is a sectional view taken on the line 4—4 of FIGURE 1;

FIGURE 5 is a perspective view of a modified form of the terminal bar of FIGURE 2;

FIGURE 6 is a perspective view of another form of



plastic terminal block having pressure type terminal bars each of which is adapted to connect one incoming wire with one outgoing wire;

FIGURE 7 is a perspective view of one of the terminal bars of FIGURE 6;

FIGURE 8 is a perspective view of a modified form of the terminal bar of FIGURE 7;

FIGURE 9 is a perspective view of a terminal block having pressure terminal bars adapted to connect a pair of incoming wires to a plurality of outgoing wires;

FIGURE 10 is a perspective view of one of the terminal bars of the block of FIGURE 9;

FIGURE 11 is a transverse sectional view of the block of FIGURE 10 shown retained in a ceiling box or the like;

FIGURE 12 is a perspective view of a modified form of the terminal bar of FIGURE 10;

FIGURE 13 is a perspective view of a molded plastic junction box in which pressure type terminal bars have been incorporated during the molding operation; and

FIGURE 14 is a vertical sectional view of the junction box of FIGURE 13 illustrating its manner of use.

Referring to FIGURES 1–4 there is shown a small terminal block **10** adapted to connect five incoming wires to five outgoing wires by means of pressure terminal bars **12** embedded in the block **10**. Connection of one wire with another is effected by simply inserting the bare ends of each wire into an appropriate hole **14**, as will be more fully described hereinafter. The particular block which is illustrated may be, for example, 3¼ inches long, 1½ inches wide and ½ inch thick and may be employed with or without a housing wherever connections between one set of wires and another set are to be made. Connections of this kind are conventionally made by splicing with the aid of wire nuts or by means of a terminal block provided with conventional screw-type terminals. These conventional operations effect satisfactory connections, but they are time consuming and require a housing of substantial size for enclosing the connections. When a large number of connections is to be made, the use of either wire nuts or screw terminals becomes cumbersome and confusing due to the crowding of the wires in the housing. On the other hand, the use of the pressure type terminal block of the present invention permits the connections to be made or released with a minimum of time and with little or no excess lengths of wire as is required for splicing or for attaching to screw terminals.

The block **10** of FIGURES 1–4 is constructed of electrically non-conductive plastic material which is molded about the five terminal bars **12** to insulate them from each other. A pair of screws **13** extends downwardly between the outer pairs of terminal bars **12** for securing the block **10** to a base (not shown). As best shown in FIGURE 2 each terminal bar **12** is formed of a short thin strip of metal, the ends of which have been bent at right angles to form a channel configuration having a pair of relatively short depending flanges **16** joined by a web **18**. The web **18** is somewhat elongated with its axis extending at a right angle to the flanges **16**. A tongue **20** is cut in the web **18** adjacent its junction with each flange **16**. The tongues **20** have free ends **22** terminating substantially at the planes of the flanges **16** and are sufficiently flexible to be pivoted downwardly by the force of an electric wire pressed against the top surface thereof.

As best seen in FIGURES 3 and 4, each of the terminal bars **12** extends transversely of the block **10** within a box-like hollow space **24**, the outer surfaces of the flanges **16** and the upper surface of the web **18** being in contact with the plastic so as to hold the terminal bars **12** in place. Each vertical, wire-receiving hole **14** extends through the top of the block **10** to the free end **22** of each tongue **20**, and a release slot **26** is provided near the base of each tongue **20**.

The operation of the tongue **20** in making an electrical connection is clearly illustrated in FIGURE 3 where, on the left side, there is shown a bare-ended electric wire **28** frictionally held between the free end **22** of one of the tongues **20** and the adjacent flange **16**. This locked-in position is effected by manually inserting the end of the wire **28** into the hole **14** and pushing it downwardly so as to deflect and slide past the free end **22** of the tongue. A very slight upward pull on the wire **28** after it has been fully inserted causes the free end **22** of the tongue to bite into the surface of the wire and simultaneously forces the wire **28** firmly against the adjacent flange **16**. As a further aid in aligning and holding the wire **28**, a small socket **30** is formed in the plastic below the tongue **20** for receiving the end of the wire **28**. For clarity, clearance between the wire **28**, flange **16** and tongue **20** have been shown, but it will be apparent that the wire **28** is, in fact, frictionally engaged by the terminal parts.

When it is desired to disconnect a wire **28** from the block **10**, a screwdriver **32** or other pointed tool is inserted in the appropriate release slot **26** and pushed downwardly against the tongue **20**. This action, as seen on the right in FIGURE 3, pivots the free end **22** of the tongue downwardly and away from the wire **28** thus releasing the latter so that it may be withdrawn from the hole **14**. It will thus be seen that the block **10** of FIGURES 1–4 may be employed to connect from one to five incoming wires to a corresponding number of outgoing wires, each connection being effected by locking the ends of an incoming and outgoing wire to the opposite ends of one of the terminals **12**.

A second form of terminal bar **12*a*** which may be employed in the block of FIGURE 1 is shown in FIGURE 5. In this construction there is also provided a web **18*a***, a pair of right angle, depending flanges **16*a*** and a tongue **20*a*** associated with each flange **16*a***. Here, however, each of the flanges **16*a*** has an outwardly bulging center portion **34** which provides an inner convex surface against which a wire will be held by the free end **22*a*** of the tongue **20*a***. Also, the free end of the tongue is cut away so that a relatively wide space, suitable for receiving heavy gauge wire, exists between the convex surface of the flange **16*a*** and the end **22*a*** of the tongue. In operation, the terminal bar **12*a*** of FIGURE 5 is the same as that of the terminal **12** of FIGURES 1–4, except that wire of less than a predetermined diameter cannot be locked in place.

In FIGURE 6 there is shown a terminal block **10*b*** which is similar to that of FIGURES 1–4, but which differs in that the incoming and outgoing wires may be attached at opposite sides of the block rather than both sets of wires being attached along the same surface. In this construction, as best seen in FIGURE 7, there are provided terminal bars **12*b*** which, as before, are formed of a strip of metal bent to provide a web **18*b*** and a pair of parallel flanges **16*b***. These terminal bars **12*b*** differ somewhat from those previously described in that rectangular locking tongues **20*b*** are cut from the flanges **16*b*** rather than from the web **18*b*** and have free ends **22*b*** lying substantially in the plane of the web **18*b***. The principle of operation is the same as previously described, except that an electric wire will be clamped between the web **18*b*** and the end **22*b*** of a tongue rather than between a flange and a tongue end. The terminal bars **12*b*** are disposed within the block **10*b*** in longitudinally spaced positions such that the flanges **16*b*** are parallel to the vertical sides of the block. The wire-receiving holes **14*b*** and the release slots **26*b*** are, accordingly, horizontal in this embodiment.

FIGURE 8 shows a slightly different terminal bar **12*c*** which may be employed in the block **10*b*** of FIGURE 6. The terminal bar **12*c*** is analogous to that of FIGURE 5 in that the surface against which a wire is clamped is concave. As shown, a longitudinal center portion of the web **18*c*** has been deformed outwardly at **34*c*** to form a groove in which both wires of the connection will be held by the free ends **22*c*** of the tongues **20*c***.

FIGURE 9 illustrates another terminal block **10*d*** which is adapted to connect each of two incoming wires to four outgoing wires. In this construction there are provided two spaced terminal bars **12*d*** extending longitudinally within the block, each of which has five locking tongues **20*d***. As shown in FIGURE 10 each terminal bar is an elongated channel-shaped member having a web **18*d*** and a pair of parallel right angle flanges **16*d*** lying in planes which are parallel to the axis of the web **18*d***. The locking tongues **20*d*** are cut in the web **18*d*** at intervals along its length with their free ends **22*d*** adjacent one of the flanges **16*d*** so as to provide for the connection of five wires to each terminal bar **12*d***.

In FIGURE 11 the terminal block **10*d*** is shown in transverse cross section carried as an insert in a metal ceiling box **36** or the like. The box **36** is representative of any of a variety of housings which are embedded in or attached to building ceilings or walls for the purpose of inclosing connections between electric wires. As shown, the box **36** has a bottom wall **38**, upstanding side walls **40** and upstanding end walls, one of which is shown at **42**. As is conventional in box construction the walls are provided with circular knock-outs **44** which may be punched out as desired.

The terminal block **10*d*** is secured in the box **36** in any suitable manner depending on the details of the box construction. As shown, one or more screws **46** are inserted through holes in the bottom wall **38** and screwed into tapped holes **48** in the lower surface of the block **10*d***. However, clips or brackets or other mounting means may be employed. Electrical connections are made by removing the desired number of knock-outs **44**, passing the ends of the wires into the box through the resulting holes and inserting the bare ends into the appropriate hole **14*d*** in the top of the block **10*d***. For example, a two-wire, current-bearing cable may be inserted through the knock-out hole in the end wall **42** and one of the wires connected to each of the two terminal bars **12*d*** by insertion into the nearest hole **14*d***. Two wire cables, up to a total of four, for conducting current to various ceiling fixtures, wall receptacles and the like may then be brought in through the knock-out holes in the side walls and connected across the two terminal bars **12*d*** by insertion into the remaining holes **14*d***.

In FIGURE 12 there is illustrated a terminal bar **12*e*** which may be substituted for the terminal bars **12*d*** shown in FIGURE 9. The modified construction differs from the bars **12*d*** in that the flange which does not cooperate with the tongue to lock a wire in place is omitted. In addition, the tongues **20*e*** are cut slightly shorter so that there is a narrow space between their ends **22*e*** and the remaining flanges **16*e***. It will be appreciated at this point that all of the terminal bars which have been described are very easily fabricated inasmuch as only simple bending and cutting operations are required. A further economic advantage is that different types of terminal bars may be fabricated from a single more complex bar by dividing the original after the tongues have been cut. For example, if a strip of metal is first bent into the form of a channel having flanges lying in planes which are parallel to the longitudinal axis of the web, a row of tongues may be punched along the web adjacent each flange. The resulting terminal bar may be employed in that form, or it may be cut to form smaller bars of the kinds shown in FIGURES 2 and 12. That is, if the channel-shaped bar is cut along planes which are at right angles to the flanges, a plurality of bars each like that of FIGURE 2 results. If the channel-shaped bar is cut along a central plane which is parallel to the flanges, two bars each like that of FIGURE 12 result.

Referring to FIGURES 13 and 14 there is shown an insulating plastic junction box **50** in which terminal bars

12*f* are incorporated in the plastic material of the box rather than in a separate terminal block insert. As shown, the box **50** includes parallel side walls **52**, parallel end walls **54** and a relatively thick, integral bottom wall **56** in which the terminal bars **12***f* are embedded. Preferably the complete box is molded as a unit with the bars **12***e* incorporated in the plastic during the molding operation. However, the bars **12***f* may be inserted longitudinally into appropriately molded recesses in the bottom wall **55** after the molding operation. In either case, the box **50** is very economical to fabricate because it requires less material and fewer assembly steps than conventional junction boxes which employ a separate screw-type terminal block. In conventional practice the terminal block is made by a series of fabricating and assembly steps and must then be incorporated into a junction box with screws, brackets or other fastening means. Since the pressure type connections require less wire and may be easily effected, the box **50** can be smaller than existing boxes thereby providing further economies.

The box **50** illustrated in FIGURES 13 and 14 is intended for use with conventional Romex cable or other three-wire cable and to this end there are provided three terminal bars **12***f* disposed within separate cavities **58** in the bottom wall **56** in parallel relationship. Each of the bars **12***f* is identical with that of FIGURE 10 with the exception of the number of tongues, the bars **12***f* having only four tongues **20***f*. The inner surface of the bottom wall **56** is provided with wire-receiving holes **14***f* and release slots **26***f* extending to the tongues **20***f* in the same manner as the equivalent holes and slots in the previously described terminal blocks.

In use, a three-wire cable **59** is first brought into the box **50** through a hole **60** provided in one of the side or end walls for that purpose. Each of the wires **62**, **64**, **66**, one of which is a ground wire, is connected to a different terminal block **12***f* by inserting its ends into one of the holes **14***f* and pushing it downwardly until the end lies in one of the recesses provided for that purpose. In this position, the tongues **20***f* prevent removal of the wires. As many as three other cables, one of which is shown at **68** may then be brought into the box through other holes and their wires connected to the corresponding wires of the first cable by inserting the ends in the appropriate holes **14***f*.

It will be appreciated that the junction box **50** is illustrative of a variety of electrical devices employed for making connections and that the principle of providing molded-in terminal bars may be applied to other devices such as outlet receptacles, traffic controller terminal blocks, ceiling and wall boxes and fuse boxes. The terminal bars may be embedded in a side or end wall in some arrangements or in an integral projection on any of the walls. For example, a projection on a bottom wall might take the form of the block of FIGURE 6 in which case wires would be inserted into the sides of the projection.

It will be appreciated also that the separate terminal blocks of the present invention may be employed in a variety of ways either as inserts for existing junction boxes or other electrical enclosures where they supplant conventional screw-type terminal blocks, or as additional equipment to take the place of spliced connections. Accordingly, the details of the described terminal bars, terminal blocks and junction boxes are not intended to be limiting except as they appear in the appended claims.

What is claimed is:

**1.** A molded plastic junction box or the like for effecting and enclosing electrical connections between wires, said box comprising: integrally molded side, end and bottom walls of electrically insulating plastic material; at least two conductive terminal elements within said box for effecting electrical connections between ends of wires said terminal elements being embedded in spaced-apart relationship within one of said walls, each of said elements being constructed in the form of an electrically conductive strip having two leg portions defined by a straight line bend of approximately 90° in the material of the strip, each of said terminal elements having at least two pressure type couplings, said couplings being defined by locking tongues struck out of the material of one of said leg portions, said locking tongues being disposed in side by side relationship, said tongues having their base along a line generally parallel to the straight line bend of the respective terminal element and having their free ends facing toward the other leg portion of the respective terminal element and spaced equidistant from said other leg portion and sufficiently close thereto such that each of said free ends is operable to clamp a wire end against said other leg portion, said one wall having a wire-inserting hole extending from the interior of said box to the free end of each of said tongues whereby insertion of the end of a wire into said hole effects locking of the end in the respective coupling, said one wall further having a wire release hole extending from the interior of said box to near the base of each of said tongues whereby insertion of a pointed tool in said release holes moves said tongues away from a locking position.

**2.** A device as in claim **1** wherein each of said terminal elements is channel-shaped having a web member and a pair of flange members, said tongues being formed in one of said members and having free ends facing and positioned close to the other member.

**3.** A device as in claim **1** wherein the surface of said other leg portion which said tongues face is concave adjacent each tongue end.

**4.** A device as in claim **1** wherein each of said terminal elements is an elongated strip of generally L-shaped cross section, said tongues being formed in one of the legs of the L and having free ends facing and positioned close to the other leg.

**5.** A terminal block for effecting electrical connections between wires comprising: a relatively thin plate of electrically insulating plastic material having embedded therein a plurality of spaced apart conductive terminals for effecting electrical connections between ends of wires; each of said terminal elements being formed of a single strip of resilient conductive material bent and cut to form a pair of leg portions extending at substantially a right angle to each other, each of said terminal elements having at least two pressure type couplings, said couplings being defined by locking tongues struck out of the material of one of said leg portions, said locking tongues being disposed in side by side relationship, said tongues having their bases along a line generally parallel to the junction line between the leg portions of the respective terminal element and having their free ends facing toward the other leg portion of the respective terminal element and spaced equidistant from said other leg portion and sufficiently close thereto such that each of said free ends is operable to clamp a wire end against said other leg portion, said plate having a wire-inserting hole extending from a surface thereof to the free end of each of said tongues whereby insertion of the end of a wire into said hole effects locking of the end in the respective coupling, said plate further having a wire-releasing hole extending from a surface thereof to near the base of each of said tongues whereby insertion of a pointed tool in said releasing holes moves said tongues away from a locking position.

**6.** A terminal block or the like in combination with walls defining an open top box, for effecting electrical connections between wires comprising a relatively flat thin plate of electrically insulating plastic material; a plurality of spaced apart conductive terminal strips disposed side by side within and surrounded on all exterior surfaces by the material of said plate, each of said terminal strips being constructed as a single strip of metal shaped to provide a plurality of pressure type couplings of the kind which have a movable element for frictionally gripping a

wire end when the latter is inserted into the coupling and for releasing the wire when deflected out of a gripping position by a tool, said plate having a plurality of wire inserting apertures each of which extends from a surface of said plate to one of said pressure type couplings, said plate also having a plurality of release apertures each of which extends from a surface of said plate to one of said pressure type couplings for providing access to the respective coupling by a release tool, said plate and apertures being arranged so that all of said apertures are accessible from the inside of the box, at least one of said walls having at least one hole therethrough for the passage of a multiwire cable.

7. The combination of claim 6 wherein said plate forms one wall of said box.

8. An electrical terminal comprising a single strip of electrically conductive material bent to form two arm portions extending at substantially a right angle to each other and at least one resilient tongue struck out of the material of one of said arm portions thereby providing an opening in said one arm for the insertion of an electrically conductive wire, said tongue having a base which is integral with said one arm at a location remote from said bend an having a free end disposed adjacent said bend, said tongue at least partly closing said opening and being resiliently deflectable by an electrical wire inserted into said opening, said free end of said tongue terminating in a gripping edge which is disposed sufficiently close to the other of said arm portions that an electrical wire inserted into said opening in a direction parallel to said other arm automatically becomes clamped between said gripping edge and said other arm due to the resilience of said tongue, said gripping edge strongly resisting withdrawal of the wire.

9. An electrical terminal as in claim 8 wherein there are a plurality of said tongues and openings in said one arm portion, said tongues being arranged in side-by-side, spaced-apart relationship.

10. An electrical terminal as in claim 8 wherein the length of said tongue is less than the length of the opening whereby heavy gauge wire may be received within said opening.



11. An electrical terminal as in claim 8 wherein there are at least two resilient tongues and further including a block of insulating material surrounding the external surfaces of said electrically conducting strip, said block having at least four holes therein, two of said holes extending in a straight line from the free ends of said tongues to the surface of said block to receive electrically conducting wires and two of said holes extending in a straight line from the bodies of said tongues to the surface of said block to receive a tool for deflecting the free ends of said tongues away from clamped wires.

12. An electrical terminal as in claim 8 wherein said terminal is channel shaped so as to define a web portion and a pair of flange portions, said bend defining the junction line between said web portion and one of said flange portions and another bend defining the junction line between said web and the other flange portion, and wherein there is at least one tongue associated with each bend, the free end of each tongue facing its respective bend.

13. An electrical terminal as in claim 12 wherein both said tongues are formed in said web portion, the free ends of said tongues facing in opposite directions.

14. An electrical terminal as in claim 12 wherein one of said tongues is formed in one of said flange portions and wherein the other of said tongues is formed in the other flange portion, the free ends of said tongues facing in the same direction.


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