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Mason

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[54] **ELECTRICAL TERMINAL CONNECTOR**

[75] Inventor: **John R. Mason,** Los Angeles, Calif.

[73] Assignee: **Dracon Industries,** Chatsworth, Calif.

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[52] **U.S. Cl.** ..... **339/59 R,** 339/75 R, 339/244 R

[51] **Int. Cl.** **H01r 13/48**

[58] **Field of Search** 339/36, 39, 59-61, 339/75, 244

[56] **References Cited**

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Primary Examiner—Joseph H. McGlynn

Attorney, Agent, or Firm—Allan M. Shapiro

[57] **ABSTRACT**

Electric terminal connector with base having receptacle therein accepts a pair of spade or forked wire connectors on the ends of different wires. Top fits into receptacle to clamp connectors together and totally enclose them for releasable and reusable fully insulated connector structure.

10 Claims, 6 Drawing Figures

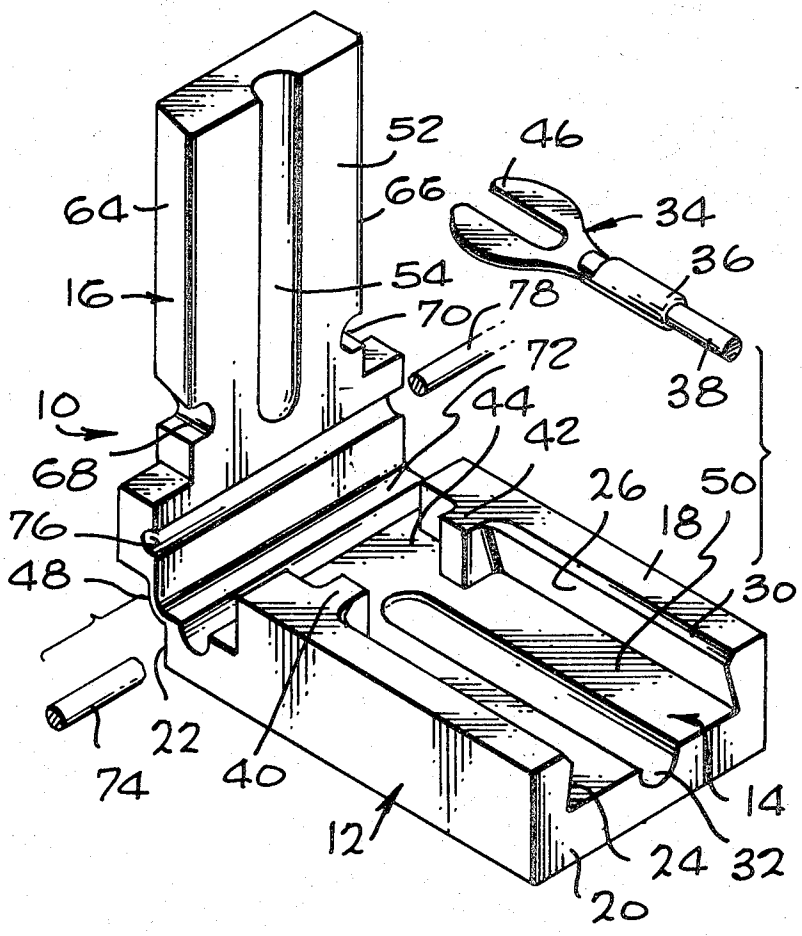

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Fig. 1

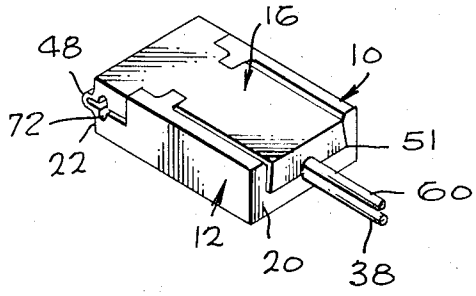


Fig. 2

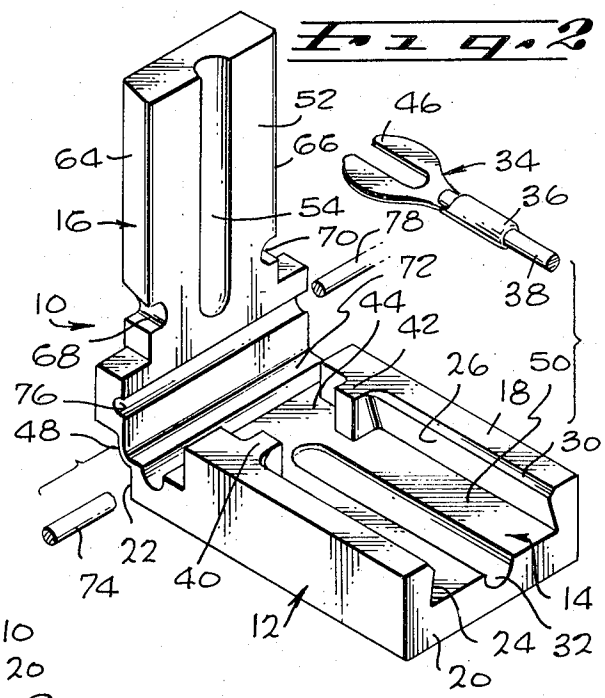


Fig. 3

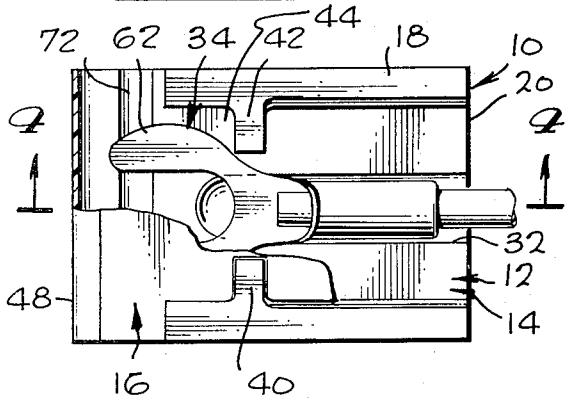
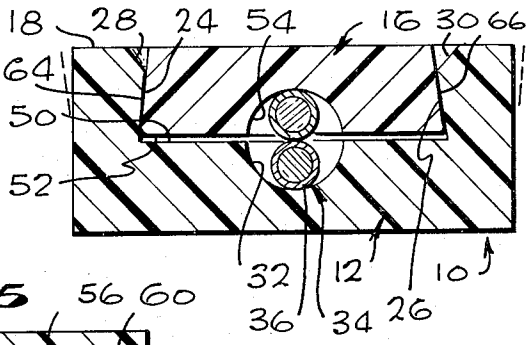


Fig. 5



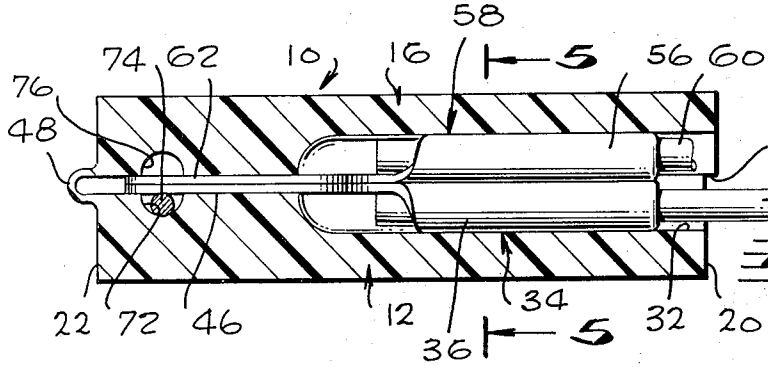
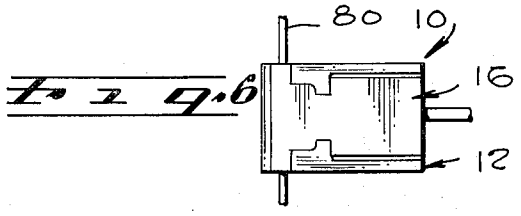


Fig. 4

Fig. 6



JOHN R. MASON
INVENTOR.

BY Allan M. Shapiro

ATTORNEY

ELECTRICAL TERMINAL CONNECTOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention is directed to an electrical terminal connector, which accepts two electric terminals and clamps them together to provide releasable electric joining and insulation covering thereof.

2. Description of the Prior Art

Electric wires are often terminated in terminals which can be connected by various different appropriate means for electrical continuity. One of the most usual types of connectors has a cylindrical collar which fits around the uninsulated portion of the wire, and is crimped thereon for mechanical security and electrical continuity. Integrally formed with this collar is a flat bifurcated member which is designed to embrace the shank of a terminal screw beneath the head thereof. Tightening of the screw thus clamps the fingers of the bifurcated member for mechanical security and electrical continuity, so that the wire is thus indirectly secured to the terminal screw. Particularly in the telephone industry, a large number of such wire connectors are employed for making connections at terminal strips in the central office, and at distribution points.

It is often necessary in the telephone arts, and in other electrical connection fields to connect two such connectors together. This has been accomplished in several ways in the past. Two such connectors can be applied under an otherwise unused terminal strip. This is undesirable because sometimes that terminal screw is required for more important interconnection purposes. Furthermore, sometimes such a junction must be insulated, and it is difficult to fully insulate the wire connectors and terminal screwhead. In another case of past practice, two such connectors are secured together by means of a throughbolt, around which the several bifurcated terminals are positioned in embrace thereof. A nut is tightened down to secure these connectors together, both mechanically and electrically. Of course, insulation of such a free-floating structure is difficult, but a plastic tube may be placed thereover, or tape may be wrapped thereabout. Both the making of such connection and the undoing thereof is a difficult handwork task because the screw and nut, as well as the two connectors must be held while the screw-driver is applied.

Another available connector for wires is the ordinary crimped sleeve. Two wires can be electrically and mechanically joined by stripping off the insulation, placing them in a malleable metal sleeve, and crimping the malleable sleeve thereover. In the present case of wires already having a connector thereon, a suitably large malleable sleeve will fit over the two connectors for crimping. On the other hand, the connectors can be cut off the wires, and the wires restripped. The newly stripped ends are then placed into such a malleable metal connector sleeve, whereupon crimping secures them in the usual manner. In either of these cases, the use of a crimped sleeve prevents reuse and, to undo the connection, the wires must be cut and new connectors crimped thereon.

SUMMARY OF THE INVENTION

In order to aid in the understanding of this invention, it can be stated in essentially summary form that it is directed to an electrical terminal connector. The connector has a base in which is located a receptacle of sufficient size to accept two terminals on the ends of different wires. The connector has a top which covers the receptacle in the base to secure the terminals together for mechanical and electrical connection thereof. At least the external surface of the base and top are insulated, and the terminals are positioned within the outer bounds of the connector so that the terminals are electrically protected.

Accordingly, it is an object of this invention to provide an electrical terminal connector by which two terminals on the ends of different wires can be engaged together for electrical connection therebetween. It is a further object to provide an electrical terminal connector of insulative character so that, upon the connection of two electrical connectors, they are insulated to make terminal contact. It is still another object to provide a connector of such nature that two electrical terminals can be placed therein and later released for reuse of both the connector and the terminals without damage thereto from such use.

It is still another object to provide an injection molded connector of thermoplastic synthetic polymer composition material of insulative and resilient character so that an entire connector can be integrally and economically formed. It is still another object to provide a connector which is easy to use and economic to manufacture and such that reliable electrical connection of terminals and insulation thereof from the outside is achieved.

Still other objects, features and attendant advantages of the present invention, together with various modifications, will become apparent to those skilled in the art from a reading of the following description of the preferred embodiments, constructed in accordance therewith, taken in conjunction with the accompanying drawings wherein like numerals designate like parts in the several figures.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the electrical terminal connector of this invention, showing it in the closed configuration wherein two spade terminals are positioned therein and connected together.

FIG. 2 is an enlarged view thereof, showing the connector in the open position, with an exploded showing of a spade terminal and a pair of through wires.

FIG. 3 is an enlarged top plan view of the connector shown in FIG. 1, with part of the top broken away to show the interior configuration and positioning.

FIG. 4 is a further enlarged section taken generally along line 4—4 of FIG. 3.

FIG. 5 is a section taken generally along line 5—5 of FIG. 4.

FIG. 6 is a top plan view of the connector of FIG. 1, on a reduced scale, and showing two of the connectors employed to electrically connect terminals with respect to a through wire.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The electrical terminal connector is generally indicated in the drawings by the reference numeral 10. The connector 10 is of unitary construction, and is made of insulative, resilient material. It is preferably injection-molded of termoplastic synthetic polymer composition material for economy of construction and, being of uni-

tary construction, there is no need to assemble together two discrete parts, which might become separated when not in use. Furthermore, the electric terminal connector relies upon resiliency, both with respect to moving from open to closed configuration, and also with respect to resiliently retaining it in closed configuration to maintain electrical contact force. Thus, the usual thermoplastic injection moldable synthetic polymer composition materials are suitable. Specific examples are nylon especially for its electrical and mechanical characteristics, and polyethylene and polypropylene copolymers for their resiliency.

Referring to the drawings in detail, connector **10** has a base portion **12** which has a receptacle **14** therein. Top portion **16** is preferably hingedly connected to the base portion **12** to provide the intergral character of the structure, for the reasons previously discussed. However, in some cases, they can be separate units if desired.

Receptacle **14** extends downward from top surface **18** on base **12.** It extends straight out the wire end **20** of the connector, as distinguished from the hinge end **22.** Inward sloping walls **24** and **26** form a dovetail-like configuration. Conventional dovetails have their mating parts, in this case, top portion **16,** inserted from the end. However, in the case of connector **10,** the mating portion is introduced into the dovetail to occupy the receptacle through the narrow portion of the dovetail adjacent top surface **18,** by way of resiliency of the parts. To aid in this insertion, the upper parts of the dovetail walls are beveled or chamfered, as at **28** and **30.**

Receptacle **14** has a groove **32** in its otherwise substantially flat bottom surface. This groove is sufficiently deep and sufficiently wide to accept the cylindrical collar, with its insulation, if any, on a wire terminal. A lower wire terminal **34,** with its cylindrical collar **36** malleably crimped on lower wire **38,** is shown in FIGS. **4** and **5.** These figures illustrate the depth of groove **32** to accommodate the shank of the lower wire terminal, and the wire on which it is secured.

The portion of receptacle **14** toward the hinged end narrows at stops **40** and **42.** These stops are shoulders which extend toward each other to provide a narrow zone intermediate the wire end **20** and hinge end **22** of base **12.** The receptacle **14** again widens in the direction toward the hinge end **22** from stops **40** and **42** and forms enclosure **44** into which the flat end portion of the wire connectors can be inserted, and from which they cannot be withdrawn in a direction toward wire end **20.** This is illustrated in FIG. **3,** where the bifurcated finger end portion **46** of lower wire terminal **34** is illustrated as being restrained in enclosure **44** by stops **40** and **42.** The bottom surface **50** forms the bottom plane of receptacle **14** which extends through between the stops to the hinge end, and serves as a supporting surface for the bifurcated finger end portion of the wire terminal, as is well seen in FIG. **4.**

Hinge **48** is preferably integrally formed as previously described, simply by forming a thin section of the resilient synthetic polymer composition material which forms the structure of the top and bottom portions of the connector **10.** Top portion **16** is of such thickness as to extend from the substantially planar bottom surface **50** of receptacle **14** through the top surface **18** of the base. When the top portion **16** is inserted into the receptacle in the base, this structure forms a substantially right rectangular solid, as is seen in FIGS. **1** and **5,** except for the projecting lip **51** which provides a finger catch for ease in manually opening the connector.

Thus, the top **16** has bottom surface **52,** which faces and adjoins bottom surface **50,** when the top is in the receptacle. Extending upward from surface **52** is groove **54,** which is of substantially the same characteristics as groove **32.** Groove **54** is of such size as to accept the cylindrical collar **56** of upper wire terminal **58,** which is crimped upon upper wire **60.** Upper wire terminal **58** has a bifurcated finger end portion **62** positionable in enclosure **44** similar to the portion **46** in wire terminal **34.**

The edge walls **64** and **66** of top **16,** where they respectively face dovetail walls **24** and **26** of the receptacle, are angularly disposed with respect to the substantially planar bottom surface **52,** and preferably on substantially the same angle as the dovetail walls. The dimensions are such that when the top is swung from its open position of FIG. **2,** toward its closed position of FIG. **1,** the outer corners between the edge walls and bottom surface on the top engage upon the bevels **28** and **30.** These bevels guide the top into the receptacle and also provide a spreading force for bottom portion **14.** This spreading force spreads apart the sides of the receptacle to permit the top to enter therein. FIG. **5** illustrated in dotted lines the resilient deflection of the base which permits this entry. Once the bottom corners of the top portion enter against the dovetail walls, the dovetail configuration draws the top portion downward to urge surfaces **50** and **52** toward each other. This force is the result of the attempted return of the base to its original shape, resulting from its resilient deflection.

Top portion **16** has channels **68** and **70** to respectively accommodate stops **40** and **42.** The preferred embodiment preferably includes transverse wire groove **72** which extends below the bottom surface **50** to slightly less than the full diameter of the uninsulated wire **74,** which can be laid therein, in one use of the connector **10.** Similarly, transverse wire groove **76** extends transversely across the undersurface **52** of top portion **16.** Its depth is such as to be slightly less than the diameter of uninsulated wire **78,** which can be laid therethrough in some uses of terminal **10.**

As is seen in FIG. **4,** wire terminals **34** and **58,** of the type for which connector **10** is useful, have a substantially planar surface wherein one side of the bifurcated fingers and one side of the cylinder lie substantially in the same plane. With the top portion raised, as seen in FIG. **2,** the lower wire terminal **34** is put in place. Its bifurcated finger end portion **46** is placed in enclosure **44** and laid on the surface **50.** As is known in these wire terminals, the finger end portion is substantially planar, and one side of the cylindrical collar **36** lies in this plane. Thus, when the lower wire terminal **34** is put in place, its cylinder **36** is laid in the groove **32.** Thus, nothing extends above the upper side of the bifurcated finger end. As is seen in FIG. **3,** the bifurcated finger ends are wider and engage behind the stops **40** and **42.** A slight tension on wire **38** holds the terminal **34** in position. Next, the upper wire terminal **58** is laid in place. In this case, the cylinder lies upward, so that the two terminals **34** and **58** lie in flat, planar, back-to-back electrical contact relationship.

Now, as the top portion **16** is swung downwardly about its resilient hinge **48**, the spreading of the dovetail walls **24** and **26** permits entry of the dovetail-shaped top. As soon as the top portion is sufficiently far closed to pass bevels **28** and **30**, the angularity of the dovetail walls urges the top portion downward. As is best seen in FIG. **4**, the finger end portions of both of the wire terminals lie between the top and base of the terminal connector **10**. Thus, resilient downward thrust of the top portion **16** by these resiliently deflected walls causes continued urging of the finger end portions together. This maintains electrical contact therebetween. When the top comes down toward the closed position, the cylindrical collar **56** is accepted in the upper groove **54**. However, there is sufficient clearance in these grooves to prevent the collars from reducing contact pressure. Thus, two wire terminals can be inserted into the electric terminal connector, and the terminal connector closed thereon to retain the wire terminals in the connector and in electric contact with each other. Furthermore, it must be noted that the entire electric terminal connector is made of insulative material and that both wire terminals are enclosed within the outer limits of the connector so that they are insulated with respect to the outside.

Electric terminal connector **10** can be easily released by placing a thin instrument into the slot between the base and top of the wire end **20**. The top is simply snapped out of the receptacle to release the wire terminals therein. The wire terminals and the connector **10** are completely reusable.

In another use of this same electric terminal connector **10**, a single long, uninsulated wire **80** can be placed through the lower transverse wire groove **72**. This uninsulated wire **80** can extend out of both sides of the electrical terminal connector **10**, as shown in FIG. **6**. A plurality of electric terminal connectors are engaged upon the wire **80**, and each of the electric terminal connectors has one or more wire terminals engaged therein. Of course, each of the wire terminals, such as the wire terminals **34** and **58**, has its own wire extending therefrom. Thus, a plurality of wires can easily be connected to the single wire **80**, which can be a ground wire or other voltage to which the plurality of wires must commonly be connected. As before, the connection is releasable and reusable.

Another use of the same terminal connector occurs when uninsulated wire, or at least the stripped end of an insulated wire, is inserted into the lower transverse wire groove **72**, as wire **74** (see FIG. **2**). This wire may be the long wire on which a plurality of such electrical terminal connectors are engaged, or may be just a short stripped end. Again, one or two wire terminals are engaged between the top and the base to be clamped together and onto the wire **74**. Next, another wire **78** is engaged in the upper transverse wire groove **76**, and the top is closed. Of course, the portion of wire **78** in the groove is uninsulated so that electrical contact is made with the wire terminals in the connector. Thus, four wires can be connected together in an electrical terminal connector **10**. For reuse, the wire terminal is simply snapped open and new wires and wire terminals connected a different way, and the terminal connector **10** reused.

The above description has been directed to the manner in which the connector **10** can be employed to connect two terminals together or one or two terminals to one or two transverse wires. There is still another use for the connector, and that is an employment as an insulator device for a wire end terminal. When insulation of a single wire terminal secured on the end of a wire is required, the wire terminal can be placed inside one of the connectors **10**, which is thereupon closed to fully enclose the terminal for providing it with an insulative covering. The finger end portion is engaged in enclosure **44** behind the stops and, with the top holding the wire terminal in place, an insulative device is provided. Of course, the insulating device can be removed. Upon removal, the wire terminal can be employed, because the use of the connector **10** is nondestructive. Furthermore, the connector **10** can also be reused.

While particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from this invention in its broader aspects and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

What is claimed is:

1. An electrical terminal device comprising:

a base formed at least partly of insulating material, a receptacle within said base, a stop on said base and extending into said receptacle; said base

said base including a bottom surface and first and second dovetail walls intersecting with said bottom surface to define said receptacle, said dovetail walls being non-parallel to each other and being closer together at the top of saidbase than at the bottom surface of said receptacle;

said base being made of resilient material so that the material behind said dovetail walls resiliently deflects to permit entry of said top into said receptacle between said dovetail walls, said receptacle and said stop being configured so that an electrical terminal can be inserted into said receptacle and positioned against said stop; and

a top, said top being movable from a position away from said receptacle to an engaged position at least partway into said receptacle said top being positioned adjacent said stop when said top is in its engaged position to cooperate with said base so that the space for the electrical terminal connector is configured to retain an electrical terminal.

2. The device of claim **1** comprising:

first and second stops, said first and second stops each extending inward from one of said dovetail walls and extending substantially from said top of said base to said bottom surface of said receptacle, said stops being positioned intermediate the ends of said device.

3. The device of claim **2** comprising:

said base having a wire end, from which end the wire connected to a wire terminal extends when a wire terminal is positioned within said receptacle and engaged by said stops; and

a groove in said bottom surface of said receptacle, said groove being positioned and being of such size as to accept the cylindrical collar on a wire terminal positioned within said receptacle against said stops, said groove extending to said wire end of said base.

4. The device of claim **3** wherein:

said receptacle is open to said wire end of said base; and

said dovetail walls and said bottom surface of said receptacle intersect with said wire end of said base.

5. An electrical terminal device comprising:

a base formed at least partly of insulating material, a receptacle within said base, said base having a top surface;

said receptacle having a bottom surface, a stop on said base extending into said receptacle, said receptacle and said stop being configured so that an electrical terminal can be inserted into said receptacle and positioned against said stop; and

a top, said top being movable from a position away from said receptacle to an engaged position at least partway into said receptacle, said top having a channel therein to engage around said stop so that said top extends into said receptacle around said stop, said receptacle having dovetail walls and said top having corresponding edge walls

said dovetail walls being closer adjacent each other toward said top surface and farther away from each other toward said bottom surface, said dovetail walls being supported by resilient base structure so that said top is resiliently retained in said receptacle with said edge walls lying adjacent said dovetail walls so that the space for the electrical terminal connector is configured to retain an electrical terminal.

6. An electrical terminal device comprising:

a base formed at least partly of insulating material, a receptacle within said base, a stop on said base and extending into said receptacle, said receptacle and said stop being configured so that an electrical terminal can be inserted into said receptacle in position against said stop;

said base including a bottom surface and first and second dovetail walls intersecting with said bottom surface to define said receptacle, said dovetail walls being non-parallel to each other and being closer together at the top of said base than at the bottom surface of said receptacle;

said base being made of resilient material so that the material behind said dovetail walls resiliently deflects to permit entry of said top into said receptacle between said dovetail walls;

a top, said top being movable from a position away from said receptacle to an engaged position at least partway into said receptacle, said top being positioned adjacent said stop when said top is in its engaged position to cooperate with said base so that the space for the electrical terminal connectors is configured to retain an electrical connector, said top being integrally formed with said base; and

said entire electrical terminal device being molded of thermoplastic synthetic polymer composition material, said top being joined to said base by a thin web which forms a hinge so that said top can be pivoted on said hinge from an open position away from said receptacle to its engaged position where it is at least partway into said receptacle.

7. The device of claim **6** comprising:

first and second stops, said first and second stops each extending inward from one of said dovetail walls and extending substantially from said top of said base to said bottom surface of said receptacle, said stops being positioned intermediate the ends of said device.

8. The device of claim **7** comprising:

said base having a wire end, from which end the wire connected to a wire terminal extends when a wire terminal is positioned within said receptacle and engaged by said stops; and

a groove in said bottom surface of said receptacle, said groove being positioned and being of such size as to accept the cylindrical collar on a wire terminal positioned within said receptacle against said stops, said groove extending to said wire end of said base.

9. The device of claim **8** wherein:

said receptacle is open to said wire end of said base; and

said dovetail walls and said bottom surface of said receptacle intersect with said wire end of said base.

10. An electrical terminal device comprising:

a base formed at least partly of insulating material, a receptacle within said base

said base having a top surface;

said receptacle having a bottom surface, a stop on said base and extending into said receptacle, said receptacle and said stop being configured so that an electrical terminal can be inserted into said receptacle and positioned against said stop; and

a top, said top being integrally formed with said base, said top being movable from a position away from said receptacle to an engaged position at least partway into said receptacle, said top having a channel therein to engage around said stop so that said top extends into said receptacle around said stop, said entire electrical terminal device being molded of thermoplastic synthetic polymer composition material, said top being joined to said base by a thin web which forms a hinge, said receptacle having dovetail walls, and said top having corresponding edge walls, said dovetail walls being closer adjacent each other toward said top surface and farther away from each other toward said bottom surface, said dovetail walls being supported by resilient base structure so that said top is resiliently retained in said receptacle with said edge walls lying adjacent said dovetail walls and said channel embracing said stop.

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