

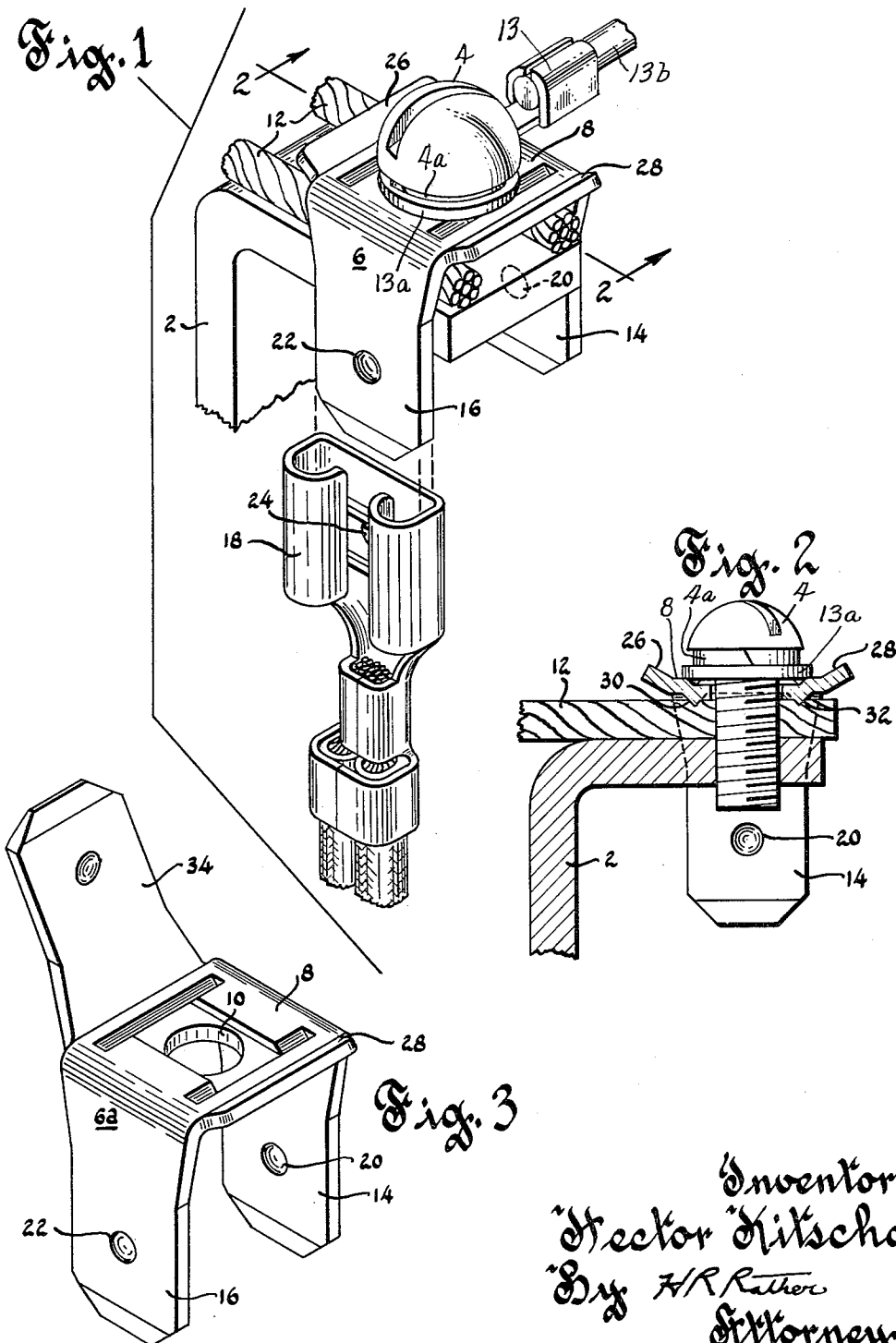
Aug. 21, 1962

H. KITSCHA
ELECTRICAL CONNECTORS

3,050,706

Filed Oct. 24, 1958

2 Sheets-Sheet 1



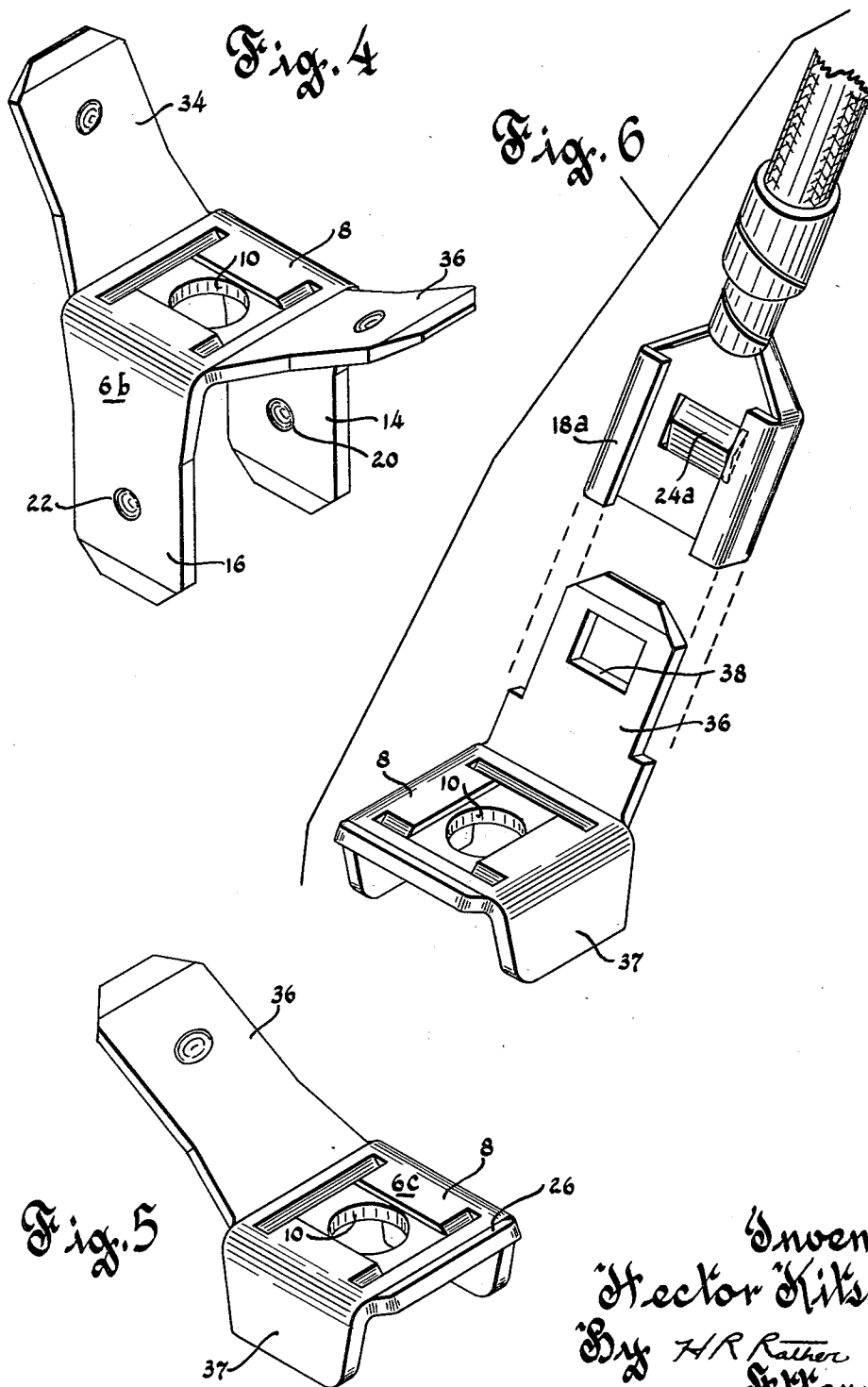
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ELECTRICAL CONNECTORS

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This invention relates to electrical connectors and more particularly to universal electrical connectors of the quick-detachable type.

While not limited thereto, the invention is especially applicable to connectors for providing electrical connections between external circuits and electrical apparatus such as control relays and the like.

A general object of the invention is to provide improved electrical connectors.

A more specific object of the invention is to provide electrical terminals with improved means for making a plurality of individual electrical connections thereto.

Another specific object of the invention is to provide electric terminals with improved means adapted for ready interengagement with a plurality of selectively different types of electrical connector members.

Another object of the invention is to provide improved electrical connector structures which are simple in construction, readily detachable and have universal application to reduce the number of parts which must be kept in stock.

Other objects and advantages of the invention will hereinafter appear.

While the invention hereinafter described is effectively adapted to fulfill the objects stated, it is to be understood that I do not intend to confine my invention to the particular preferred embodiments of electrical connectors disclosed, inasmuch as they are susceptible of various modifications without departing from the scope of the appended claims.

The invention will now be described in detail with reference to the accompanying drawings, wherein:

FIGURE 1 is an oblique view of an electrical connector constructed in accordance with the invention;

FIG. 2 is a cross-sectional view of the connector of FIG. 1;

FIGS. 3, 4 and 5 show modifications of the connector of FIG. 1; and

FIG. 6 shows a further modification which may alternatively be employed in the connectors of FIGS. 1, 3, 4 and 5.

Referring to FIGS. 1 and 2 the connector structure shown therein is provided with a terminal bracket 2 for supporting the connector. For exemplary purposes, it may be assumed that terminal bracket 2 is formed of electrically conducting material and is electrically connected to, or integrally formed with, a stationary contact of an electromagnetic relay. The end portion of bracket 2 may be bent at a right angle to its body portion and provided with a threaded aperture near its free end for receiving a clamping screw 4 or the like. A generally inverted U-shaped clamping member 6 straddles the free end of bracket 2. Member 6 is provided centrally of its yoke portion 8 with an aperture 10 in alignment with the threaded aperture in bracket 2. One or more solid or stranded conductors 12 may be inserted on either side of screw 4 between bracket 2 and clamping member 6. As shown in FIGS. 1 and 2, a connector lug 13 of the O-ring type may be assembled on screw 4 above clamping member 6. Screw 4 is freely accommodated in aperture 10 in the clamping member and, upon being turned into threaded engagement with bracket 2, clamps conductors 12 between member 6 and terminal bracket 2 into electrical engagement with the latter and clamps lug 13 be-

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tween the head of the screw and clamping member 6 into electrical connection with the latter, there being a locking washer 4a between the head of the screw and lug 13 if desired.

The depending portions of inverted U-shaped member 6 are formed to provide a pair of mating members or connector tongues 14 and 16 for interengagement with connector receptacles such as receptacle 18. To this end, the flat surfaces as well as the edges at the free ends of tongues 14 and 16 are beveled to facilitate insertion thereof into receptacles 18. Also the opposite flat surfaces of tongues 14 and 16 are provided with suitable depressions 20 and 22 in registration with one another for cooperation with a complementary projection 24 in receptacle 18. Thus, when receptacle 18 is forced onto tongue 16, projection 24 snaps into depression 20 or 22, depending on which way receptacle 18 is oriented, to lock the connector members to one another. Alternatively, holes extending through the tongues may be employed in place of depressions 20 and 22. The receptacle is provided with sufficient resiliency to permit ready removal thereof but to prevent separation from tongue 16 under shock conditions. For a more detailed description of receptacle 18, reference may be had to Robert J. Kinkaid and Kemper M. Hammell Patent No. 2,774,951 dated December 18, 1956.

The yoke portion of clamping member 6 is provided at its opposite edges with integrally-formed and upwardly-flared portions 26 and 28 to guide the ends of conductors 12 between clamping member 6 and bracket 2, thus to permit insertion of the conductors from either side, and to strengthen such yoke portion. The flared portions are particularly useful when stranded conductors are employed. The yoke portion 8 of clamping member 6 is also provided on its lower surface with preferably two longitudinal ridges 30 and 32 arranged parallel to one another and extending transversely of the axes of conductors 12. Each ridge is preferably V-shaped to provide a sharp extremity which "bites" into the conductors when screw 4 is turned in thereby to prevent the conductors from being pulled out. The area of the yoke portion adjacent aperture 10 may be recessed as shown in FIG. 2 to strengthen such yoke portion in conjunction with ridges 30 and 32 and diverging portions 26 and 28 and prevent spreading of tongues 14 and 16 when screw 4 is turned in.

It will be apparent that the connector of FIG. 1 not only provides for the connection of the bare conductors 12 and receptacles 18 to terminal bracket 2 but also affords connection of a bifurcated lug or an O-ring lug 13 thereto, the latter having a washer-shaped member 13a having an aperture therein and normally attached to the end of a conductor 13b. While in prior connectors of the screw-clamped type the screw is rotatably attached to the clamping member to be non-removable therefrom, the invention contemplates a screw 4 which is removable from clamping member 6. Thus if an O-ring lug such as lug 13 is employed, the same may be assembled into clamping engagement between clamping member 6 and terminal bracket 2 or between the screw head and the clamping member. The latter position will accommodate any size of bifurcated or O-ring lug.

The modified clamping member 6a in FIG. 3 differs from that in FIG. 1 in that a third connector mating member or tongue 34 is provided. Tongue 34 is formed integrally with clamping member 6a and is, in effect, an extension of flared edge portion 26 of FIG. 1. Tongue 34 is similar to tongues 14 and 16 to receive the aforementioned connector receptacle and is arranged at an angle of less than 90 degrees with the yoke portion 8 to guide the ends of conductors which are insertable thereunder.

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The modified clamping member 6b in FIG. 4 differs from that in FIG. 3 in that a fourth connector mating member or tongue 36 is provided in place of flared edge portion 28 of FIG. 3. Tongue 36 is similar to tongue 34 thereby to accommodate the aforementioned connector receptacle.

The modified clamping member 6c in FIG. 5 differs from that in FIG. 4 in that tongues 14, 16 and 34 have been omitted, leaving short straddling portions 37 in place thereof, and upwardly-flared tongue 36 alone is provided. This modification finds application where space limitations preclude the use of the other three mating tongues.

The modification in FIG. 6 is similar to that in FIG. 5 except tongue 36 is provided with a different locking structure. To this end, tongue 36 is provided with a substantially square or rectangular depression or preferably an aperture 38 for cooperation with the modified projection 24a on receptacle 18a. Projection 24a is formed by providing a pair of parallel slots and pressing the connecting portion between the slots inwardly of the receptacle to form a V-shaped detent. Thus, when receptacle 18a is forced on tongue 36, projection 24a snaps into aperture 38 to disengageably lock the connector members together. For a more detailed description of receptacle 18a, reference may be had to Hugh W. Batcheller Patent No. 2,762,029, dated September 4, 1956.

Essential features of the invention reside in the provision of electrical terminal and connector structures adapted for making electrical connections with one or more of a plurality of different types of cooperating connector members. It will be apparent that clamping members 6, 6a and 6b shown in FIGS. 1, 3 and 4, respectively, each having a plurality of connector mating tongues, may be provided with mixed locking structures, as shown in FIGS. 5 and 6, among the several tongues. Thus, an electrical component such as a relay or the like provided with a connector in accordance with the invention affords the ultimate user a choice among the cooperating connector members that he can use to connect such component to an external control circuit. The exemplary embodiments of the invention shown and described contemplate electrical connections of the most commonly known types as well as interengagement with cooperating connector members widely available on the market. Therefore, the user is not restricted by the electrical device to a particular electrical connection whereby the number of different types of parts which must be kept in stock may be reduced. Additionally, the stocking of the relatively few different types of clamping members in accordance with the modifications of the invention provides accessibility for electrical connections under a variety of space limitation conditions. Moreover, in those applications where sufficient space is available, the invention affords a multiplicity of electrical connections and thus may be employed as a common terminal in addition to connection of the electrical device to an external circuit.

I claim:

1. In an electrical connector:

- (a) a terminal bracket provided with a threaded aperture therethrough,
- (b) a clamping member having an aperture in registration with said threaded aperture,
- (c) a clamping screw extending through said aperture in said clamping member and into threaded engagement with said terminal bracket to clamp at least one bare conductor between said clamping member and said terminal bracket and into electrical connection with the latter,
- (d) said clamping member having integral straddling leg portions on two opposite sides thereof and depending therefrom on each side of said terminal bracket for straddling said terminal bracket and ex-

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tending therebeyond and forming electrical connector tongues for mating interengagement with respective cooperating electrical receptacles, said leg portions serving the dual function of preventing such bare conductor from sliding out from under said clamping member when said screw is tightened and of affording electrical connection of such electrical receptacles thereto,

(e) and each of the other two sides of said clamping member diverging from said terminal bracket to serve the dual function of guiding and thereby facilitating insertion of such bare conductor between said clamping member and said terminal bracket and of strengthening said clamping member.

2. In an electrical connector:

- (a) a terminal bracket provided with a threaded aperture therethrough,
- (b) a clamping member having an aperture in registration with said threaded aperture;
- (c) a clamping screw extending through said aperture in said clamping member and into threaded engagement in said threaded aperture in said terminal bracket to afford clamping at least one bare conductor between said clamping member and said terminal bracket and into electrical connection therewith, said screw affording clamping at least one connector lug between the head thereof and said clamping member and into electrical connection with the latter,
- (d) said clamping member comprising a pair of integral straddling leg portions depending from opposite sides thereof for straddling said terminal bracket and extending therebeyond to form electrical connector tongues for receipt in complementary electrical receptacles, said connector tongues serving the dual purpose of preventing a bare conductor from sliding out from under said clamping member when said screw is tightened and of affording electrical connections thereto,
- (e) and a third connector tongue integral with and extending from another side of said clamping member at an angle of less than ninety degrees relative to said terminal bracket and serving the dual function of guiding and thereby facilitating insertion of such bare conductor between said clamping member and said terminal bracket and of affording electrical connection of a complementary electrical receptacle thereto.

3. In an electrical connector:

- (a) a terminal bracket provided with a threaded aperture therethrough,
- (b) a clamping member having an aperture in registration with said threaded aperture,
- (c) a clamping screw extending through said aperture in said clamping member and into threaded engagement in said threaded aperture in said terminal bracket to afford clamping at least one bare conductor between said clamping member and said terminal bracket and into electrical connection therewith, said screw affording clamping at least one connector lug between the head thereof and said clamping member and into electrical connection with the latter,
- (d) said clamping member comprising integral straddling portions on two opposite sides thereof for straddling said terminal bracket to prevent such bare conductor from sliding out from under said clamping member when said screw is tightened,
- (e) and a connector tongue integral with and extending from another side of said clamping member between said straddling portions at an angle of less than ninety degrees relative to said terminal bracket and serving the dual function of guiding and thereby facilitating insertion of such bare conductor between said clamping member and said terminal

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bracket and of affording mechanical and electrical connection of a complementary electrical receptacle thereto.

4. In an electrical connector:

- (a) a terminal bracket provided with a threaded aperture therethrough, 5
- (b) a clamping member having an aperture in registration with said threaded aperture
- (c) a clamping screw extending through said aperture in said clamping member and into threaded engagement in said threaded aperture in said terminal bracket to afford clamping at least one bare conductor between said clamping member and said terminal bracket and into electrical connection therewith, said screw affording clamping at least one connector lug between the head thereof and said clamping member and into electrical connection with the latter, 10
- (d) said clamping member comprising a pair of integral straddling portions depending from opposite sides thereof for straddling said terminal bracket and at least one of said straddling portions having integral therewith a connector tongue extending beyond said terminal bracket, said straddling portions and said connector tongue serving the dual purpose of preventing such bare conductor from sliding out from under said clamping member when said screw is 15

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tightened and of affording electrical connection thereto of a complementary electrical connector receptacle, (e) and each of the other two sides of said clamping member diverging from said terminal bracket at an angle of less than ninety degrees to serve the dual function of guiding and thereby facilitating insertion of such bare conductor between said clamping member and said terminal bracket and of strengthening said clamping member.

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