April 16, 1940. J. S. MacLEAN 2,197,000

ELECTRICAL CONNECTOR

Filed Dec. 29, 1938

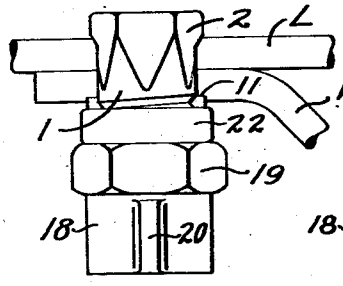

FIG. 1

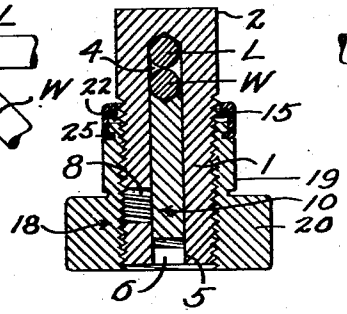

FIG. 2

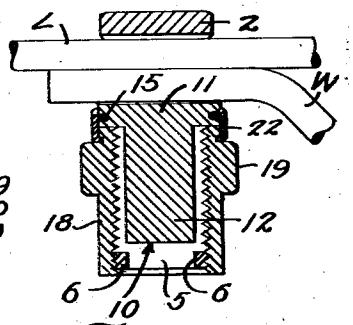

FIG. 3

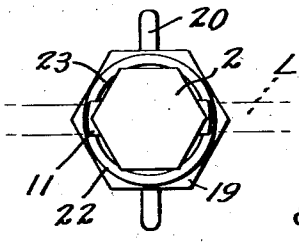

FIG. 4

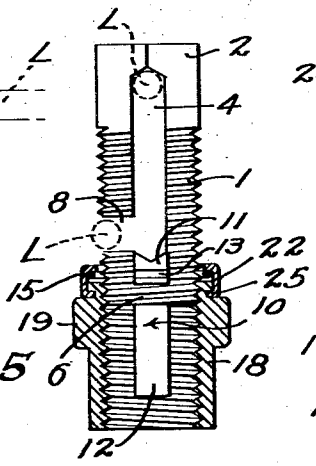

FIG. 5

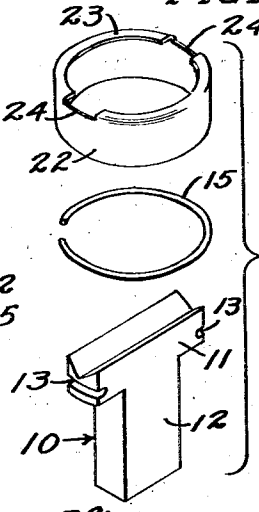

FIG. 6

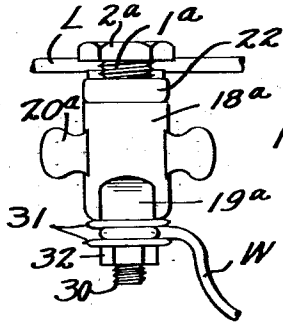

FIG. 7

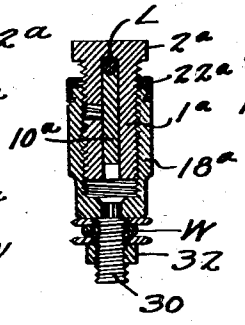

FIG. 8

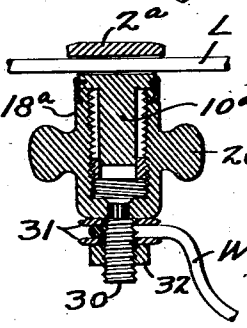

FIG. 9

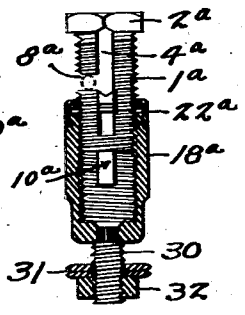

FIG. 10

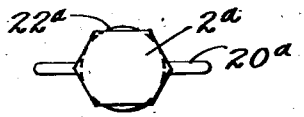

FIG. 11

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UNITED STATES PATENT OFFICE

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ELECTRICAL CONNECTOR

J. Showles MacLean, Toledo, Ohio

Application December 29, 1938, Serial No. 248,280

15 Claims. (Cl. 24—135)

This invention relates to improvements in wire connectors of the frictional or clamping type. Devices of this kind are used for joining tap or service wires to main lines of electrical power, light, telegraph and telephone systems, and for other similar purposes.

A general object of my invention is the production of a self-contained or unitary connector that is especially convenient of use in that it may be applied to a line wire and manipulated to join a tap or service wire thereto, all by the use of one hand. This capability of one hand manipulation will be better appreciated when it is explained that frequently linemen, wearing heavy, cumbersome, multiple layer gloves and occupying precarious positions on poles or in similar places, have to hold on with one hand while they make connections, probably at arm's length, with the other hand.

Another object of the invention is to provide a relatively simple design and construction for connectors of the kind referred to that will facilitate assembly and otherwise expedite and cheapen manufacture.

Other objects are to provide a wire connector of the beforementioned character so constructed that, notwithstanding exposure to the elements, its working parts will be protected from deterioration or corrosion, insuring proper operation at any time in the removal or replacement of taps or service wires and permitting repeated use of the same connector; to provide a connector involving a threaded bolt-like body and a sleeve nut operating thereon that is of sufficient length to protect the threads of the body from end to end while the article is in stock or while being transported or handled, and that will shield the effective portion of the threads when the article is in use; to provide a connector of the character just described wherein said body is slotted longitudinally, and a jam plate, having permanent swivel connection with the nut, slides within the body when the nut is operated, said plate serving to prevent inward displacement or collapse of the sides of the body when the parts are placed under strain in the clamping of wires between the head of the jam plate and the opposed end wall of the slot; to provide separate means on the sleeve nut for turning it by hand and for turning it by means of a wrench or other tool; and, further—which is of paramount importance because it is responsible for the self-contained or unitary character of the connector, enabling it to be applied and manipulated with one hand—to provide a side opening for admitting a line wire to the longitudinal slot of the body. Also, this opening is spaced a sufficient distance from the end wall of the slot against which the wire is to be clamped to insure a very substantial thread engagement of the nut with the body between the plane of said end wall and said opening, thereby to effect a strong mechanical and efficient electrical connection, and one that is very firm and lasting.

Other objects and advantages will appear as I proceed to describe the invention in detail by reference to the accompanying drawing wherein Fig. 1 is a side elevation of one form of the invention, showing it as clamping a tap or service wire to a main line; Fig. 2 is a central vertical section through the connector shown in Fig. 1, the plane of section being at right angles to that of the former view; Fig. 3 is a similar section in a plane parallel to the plane of Fig. 1; Fig. 4 is a plan view of the connector; Fig. 5 is a detail of the connector showing the body in elevation and the nut in section and retracted to uncover the side opening of the body for application of the connector to a line wire; Fig. 6 shows, in perspective, the ferrule, retaining ring and jam plate in separated condition; Fig. 7 is a side elevation of a modified form of the invention; and Figs. 8, 9 and 10 are sectional details, and Fig. 11 a plan view of said modified form.

The invention as illustrated in Figs. 1 to 6 is intended especially for heavy duty work, as in connection with electrical power systems, wherefore it may be referred to as a "power" type of connector; while the form illustrated in Figs. 7 to 11 is intended for lighter work, as in connection with telephone systems, and accordingly may be referred to as the "telephone" type.

With reference to the so-called "power" type, 1 is a bolt-like body having a head 2 at one end and being threaded from a point adjacent said head to its opposite end. The head 2 is desirably formed to receive a wrench, the same being shown as hexagonal in plan, and a diametrical slot 4 extends longitudinally of the body from the region of the head to near its opposite end. A rectangular passageway 5 opens from said slot through the latter end of the body, leaving parts 6 to tie the sides of the body together at opposite ends of the passageway 5. An opening 8 formed in one side of the body near the end thereof remote from the head 2 provides access to the slot 4 for the line wire designated L.

10 is a T-shaped jam plate. It is of a thickness throughout enough less than the width of the slot 4 to insure free movement therein, and

its head 11 is of a length somewhat greater than the diameter of the body 1. A part of the jam plate that may be referred to as the tongue, and which part is designated 12, is of a cross sectional size and shape to have a sliding fit within the passageway 5 in the end of the body 1. The jam plate is arranged within the slot 4 with its head 11 in opposed relation to the end of the slot against which the wire is adapted to be clamped, and the opposed wire engaging faces of said end and head are desirably V-shaped so as to exert a better hold upon the wires and center them within the slot if they are of a diameter less than the width of the slot. The ends of the head 11 have transverse grooves 13 for the reception of a retaining ring 15 of spring wire.

A sleeve nut 18 operates on the threaded portion of the body 1. It has a wrench receiving portion 19 near one end, and oppositely extending wings 20 near its other end to facilitate turning of the nut by hand. The ends of the head 11 of the jam plate 10, where they extend beyond the sides of the body 1, bear upon the inner end of the nut.

Encircling said end of the nut is a ferrule 22, desirably of sheet metal, the same having an inturned flange 23 at one end that is engaged over the retaining ring 15 and is cut away at diametrically opposite points, as indicated at 24, for the passage of the ends of the head 11. The other end of the ferrule is peened inwardly, as shown at 25, so as to occupy a circumferential groove in the nut thereby to provide a swivel connection between the nut and the jam plate. As a consequence of this connection, which may properly be termed a "swivel connection," the nut may be turned freely to feed it along the body 1 and simultaneously move the jam plate longitudinally of the slot 4. As the nut 18 is retracted, the tongue 12 of the jam plate is projected through the passageway 5, movement in this direction being limited by engagement of the ends of the head 11 with the parts 6 of the body, the elements being shown in this position in Fig. 5. So conditioned, the connector may be applied to a line wire L and the nut turned to feed the jam plate toward the wire engaging end of the slot 4. If a single tap or service wire W is to be joined to the line L, the nut may be threaded along the body 1 until the head 11 of the jam plate is spaced a little more than the diameter of the wire from the line L, after which the wire W may be inserted through the slot 4 above the head of the jam plate and the nut 18 further turned to clamp said wire to the line. If it is necessary to screw the parts up more firmly than is possible by hand, a wrench or other tool may be applied to the portion 19 and the nut further turned to bind the parts firmly together. While I have shown only two wires joined by the connector, obviously any number may be clamped together, within the capacity of the slot 4 above the side opening 8, allowance being made for a substantial thread engagement between the nut and body above said opening.

The so-called "telephone" type of connector, illustrated in Figs. 7 to 11, is made up, essentially, of the same elements as, or ones equivalent to, those constituting the "power" type, for which reason, and for easy reference, the corresponding parts of the two forms are designated by the same reference numerals augmented, in the case of the "telephone" type, by the exponent *a*.

In both forms, the nuts 18, 18^a, with the ferrules 22, 22^a, are sufficiently long to enclose the entire threaded portions of the bodies 1, 1^a so as to thoroughly protect the threads when the devices are in stock or while being shipped or handled, and so as to enclose and protect from the elements the threaded portions of the bodies when the devices are in use. This protection prevents the engaged threads of the bodies and nuts from becoming corroded or damaged while the connectors are in service thereby to insure ready unscrewing of the nuts in case the tap or service wires are to be removed or replaced; and in event the joint is abandoned, the connectors may be salvaged for subsequent use.

In the "telephone" type connector, the nut 18^a is provided with wings 20^a and a wrench receiving portion 19^a, the latter being provided by flattened areas near the end of the nut remote from the ferrule 22^a. In the form under discussion, the last mentioned end of the nut is closed, and secured to such end, desirably axially of the nut, is a threaded stud or binding post 30. This stud or post might be an integral part of the nut except for the desirability of making it of a different kind of metal. The body 1^a and nut 18^a are preferably composed of a zinc alloy because of the fact that this portion of the device is intended for mechanical and electrical connection with a line wire L' that is zinc plated or galvanized, while the tap or service wire W' is of copper, and to avoid undesirable electrolytic action with resultant corrosion in this region, the binding post or stud 30 is preferably made of bronze, brass or the like, as are also the washers 31 and nut 32 that are applied to the stud or post.

A feature of my improved connector that distinguishes it from all prior connectors of the same class with which I am familiar is the constant or permanent thread engagement between the nut and body. This is very important, especially in view of the unfavorable conditions under which the device frequently has to be used, as hereinbefore pointed out, because it entirely avoids the tedious task or difficulty of having to properly engage the nut with the threads of the body, and entirely eliminates any possibility of crossing the threads and damaging the connector by attempting to forcibly screw the parts together by means of a tool under such circumstances.

Having thus described my invention, what I claim is:

1. An electrical connector comprising a threaded body having a substantially diametrical, longitudinal slot, one end of the slot constituting a wire engaging seat, the body having a side opening spaced a substantial distance from said seat and intermediate the termina's of its threaded portion, a jam plate reciprocable in the slot, and a nut permanently engaged with and operable on the threaded portion of the body, said jam plate having a swivel connection with the nut.

2. An electrical connector comprising a threaded body having a substantially diametrical, longitudinal slot, one end of the slot constituting a wire engaging seat, the body having a side opening spaced a substantial distance from said seat and intermediate the terminals of its threaded portion, a jam plate reciprocable in the slot and having a head in opposed relation to the aforesaid seat, a nut permanently engaged with and operable on the threaded portion of the body, and a swivel connection between the nut and the head of the jam plate.

3. An electrical connector comprising a threaded body having a substantially diametri-

cal, longitudinal slot, one end of the slot constituting a wire engaging seat, the body having a side opening spaced a substantial distance from said seat and intermediate the terminals of its threaded portion, a jam plate reciprocable in the slot and having a head in opposed relation to said seat, the ends of the head protruding beyond the opposite sides of the body, a nut permanently engaged with and operable on the body, and means connecting the nut to the ends of the head while permitting rotation of the nut with respect to the jam plate and body.

4. An electrical connector comprising a threaded body having a substantially diametrical, longitudinal slot, one end of the slot constituting a wire engaging seat, the body having a side opening spaced a substantial distance from said seat, a jam plate reciprocable in the slot and having a head in opposed relation to the seat, the ends of the head protruding beyond the opposite sides of the body, a nut operable on the body against one end of which the aforesaid ends of the head bear, a ferrule surrounding the body and having a swivel connection with the nut, and means forming an interlocking connection between the head of the jam plate and ferrule.

5. An electrical connector comprising a threaded body having a substantially diametrical, longitudinal slot, one end of the slot constituting a wire engaging seat, the body having a side opening spaced a substantial distance from said seat, a jam plate reciprocable in the slot, the same comprising a head that extends through said slot and beyond the opposite sides of the body and a tongue projecting from the head intermediate the ends thereof, the end of the body opposite said seat having a passageway for the accommodation of said tongue, the ends of the head having transverse grooves, a retaining ring surrounding the body and engaged within said grooves, a nut operable on the body and against one end of which the ends of said head bear, and a ferrule rotatably connected to said end of the nut and having an end flange engaged over said retaining ring, the flange having diametrically opposed notches for the accommodation of the ends of the head.

6. An electrical connector comprising a threaded body having a substantially diametrical, longitudinal slot, one end of the slot constituting a wire engaging seat, the body having a side opening spaced a substantial distance from said seat, a jam plate reciprocable in the slot, and a sleeve nut operable on the threaded body and being of a length approximately equal to the length of the threaded portion of the body, and a swivel connection between the nut and jam plate.

7. An electrical connector comprising a bolt-like body having a head at one end and threaded throughout the remainder of its length, said body having a substantially diametrical, longitudinal slot, one end of which constitutes a wire engaging seat, the body being provided with a side opening spaced a substantial distance from said seat, a jam plate reciprocable in the slot and including a head whose ends project from the slot on opposite sides of the body, a sleeve nut operable on the threaded portion of the body and against one end of which the ends of the jam plate head bear, a ferrule surrounding the body and swiveled to said end of the nut, and means operatively connecting the jam plate to the nut through the intervention of said ferrule, the aggregate length of the sleeve nut and ferrule being approximately that of the threaded portion of the body.

8. An electrical connector comprising a threaded body having a substantially diametrical, longitudinal slot, one end of the slot constituting a wire engaging seat, the body having a side opening spaced a substantial distance from said seat, a jam plate reciprocable in the slot, a sleeve nut operable on the threaded body, a swivel connection between the nut and jam plate, the nut including a tool receiving portion and a portion shaped to facilitate turning of the nut by hand.

9. An electrical connector comprising a body threaded from near one end throughout the remainder of its length, said body having a substantially diametrical, longitudinal slot, one end of which constitutes a wire engaging seat, the body being provided with a side opening spaced a substantial distance from said seat, a jam plate reciprocable in the slot, a sleeve nut operable on said body and closed at its outer end, and a swivel connection between the inner end of the nut and the jam plate, the nut incorporating means for attaching an electrical conductor thereto.

10. An electrical connector comprising a body threaded from near one end throughout the remainder of its length, said body having a substantially diametrical, longitudinal slot, one end of which constitutes a wire engaging seat, the body being provided with a side opening spaced a substantial distance from said seat, a jam plate reciprocable in the slot, a sleeve nut operable on said body and closed at its outer end, a swivel connection between the inner end of the nut and the jam plate, and means for attaching an electrical conductor to the nut, said means being of a different kind of metal from that of the remainder of the connector.

11. An electrical connector comprising a bolt-like body having a head at one end and threaded throughout the remainder of its length, said body having a substantially diametrical, longitudinal slot, one end of which constitutes a wire engaging seat, the body being provided with a side opening spaced a substantial distance from said seat, a jam plate reciprocable in the slot, a sleeve nut operable on said body and closed at its outer end, and a swivel connection between the inner end of the nut and the jam plate, the nut incorporating means for attaching an electrical conductor thereto.

12. An electrical connector comprising a bolt-like body having a head at one end and threaded throughout the remainder of its length, said body having a substantially diametrical, longitudinal slot, one end of which constitutes a wire engaging seat, the body being provided with a side opening spaced a substantial distance from said seat, a jam plate reciprocable in the slot, a sleeve nut operable on said body and closed at its outer end, a swivel connection between the inner end of the nut and the jam plate, a binding post extending axially from the closed end of the nut, and means for securing an electrical conductor to the post.

13. An electrical connector comprising a bolt-like body having a head at one end and threaded throughout the remainder of its length, said body having a substantially diametrical, longitudinal slot, one end of which constitutes a wire engaging seat, the body being provided with a side opening spaced a substantial distance from said seat, a jam plate reciprocable in the slot, a sleeve nut operable on said body and closed at its outer end, a swivel connection between the inner end of the nut and the jam plate, a binding post of a different kind of metal from that of the nut

secured to the closed end of the nut and extending axially therefrom, and means for attaching an electrical conductor to the binding post.

14. An electrical connector comprising a bolt-like body having a head at one end and being threaded throughout the remainder of its length, the body having a substantially diametrical, longitudinal slot, one end of which constitutes a wire engaging seat, the body having a side opening spaced a substantial distance from said seat and being provided with a passageway through its end remote from the head, a jam plate including a head that extends transversely through the slot and beyond the opposite sides of the body and a tongue extending from the head intermediate its ends and being adapted to project through the passageway in the end of the body, a sleeve nut operable on the body and closed at its outer end and having a circumferential groove adjacent its inner end, a ferrule surrounding the inner end of the nut and interlocking with said groove whereby the ferrule is swiveled to the nut, operative connections between the ferrule and the head of the jam plate whereby the ends of said head are held contiguous to the end of the nut, means for attaching a conductor to the nut, the nut having means intermediate its ends to facilitate manual turning of the nut.

15. An electrical connector comprising a bolt-like body having a head at one end and a thread throughout the remainder of its length, the body having a substantially diametrical, longitudinal slot, one end of which constitutes a wire-engaging seat, the body having a side opening spaced a substantial distance from said seat and having also a passageway through its end remote from the head, a jam plate including a head that extends transversely through the slot and beyond the opposite sides of the body and a tongue extending from the head intermediate its ends arranged to project through the passageway in the end of the body, a sleeve nut operable on the body and having a circumferential groove adjacent its end nearest the head of the body, a ferrule surrounding said end of the nut and interlocking with said groove whereby the ferrule is swiveled to the nut, operative connections between the ferrule and the head of the jam plate whereby the ends of said head are held contiguous to the end of the nut, the nut having means intermediate its ends to facilitate manual turning of the nut.

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