ELECTRICAL CONNECTOR WITH WIRE-GRIPPING MEANS

John E. Beaudion, Granada Hills, Calif., assignor, by
direct and mesne assignments, to Electro-Clamp Cor-
poration, Beverly Hills, Calif., a corporation of
California

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7 Claims

ABSTRACT OF THE DISCLOSURE

An electrical connector embodying a pair of wire-
clamping jaws formed in respective levers hinged to-
together at one end and having tails at their opposite ends,
adapted to be separated to open the jaws to receive a
conductor wire, and to be brought together and secured
to a support and to thereby clamp the wire between the
jaws.

This invention relates to electrical connectors of the
general type disclosed in U.S. Patent No. 3,118,720 issued
Jan. 21, 1964 in the name of Richard J. Schuck and Rob-
ert E. Lawlor and U.S. Patent No. 3,138,422, issued June
23, 1964, in the name of Robert E. Lawlor, wherein a pair of
jaw members having respective tails provided with reg-
istrable apertures to receive a fastener bolt or screw,
are connected for relative rotating movement about an
axis transverse to the jaws, such as to effect clamping ac-
tion of the jaws against a conductor inserted between the
jaws, such clamping action being developed by bringing
the tails together and fastening them to a support.

The general object of the present invention is to provide
improvements in this general type of connector. Specific
objects are:

1. To facilitate the insertion of the end of a con-
ductor between the jaws of the connector.
2. To reduce the tendency of the jaws to cut through
the conductor in being clamped thereon.
3. To provide such a connector in which a spring-
clamping action is developed which maintains constant
spring loading on the jaws so as to avoid any possibility
of looseness between the jaws and the conductor.
4. To provide such a connector which can be fabri-
cated quite inexpensively as, for example, from extruded
sections.
5. To provide such a connector having means for ad-
justing it to conductor wires or cables of varying diam-
eters.

Other objects will become apparent in the ensuing spec-
fication and appended drawings.

FIG. 1 is a side view of a connector embodying the
invention, with its jaws in open position;

FIG. 2 is a longitudinal sectional view of the connec-
tor with its jaws closed upon a conductor wire;

FIG. 3 is an end view of the same, closed but with the
conductor omitted;

FIG. 4 is a plan view of the underneath jaw thereof;

FIG. 5 is a side view of a modified form of the invention;

FIG. 6 is a longitudinal sectional view of another modi-
ﬁed form of the invention with the jaws closed on a con-
ductor and attached to a support;

FIG. 7 is an end view of the same with the jaws closed
but the conductor omitted;

FIG. 8 is a side view of the same with the jaws open;

FIG. 9 is a longitudinal sectional view of another form
of the invention closed on a conductor and secured to a
support;

FIG. 10 is a side elevational view of the same with the
jaws open and the top jaw partially broken away and
shown in section; and

FIG. 11 is an end view of the same with the jaws open
and partially broken away and shown in section.

Referring now to the drawings in detail and in particu-
lar to FIG. 1, I have shown therein, as an example of one
form in which the invention may be embodied, an elec-
trical connector comprising an under section A and a
top section B hinged together at one end and provided
with a clamping or of a cable C (FIG. 2) between their respective jaws when
attached to a support D by a fastener bolt or screw E.

Under section A comprises a jaw portion 10 of yoke or
channel form including a flat web 11 and respective legs
12 and 13 extending downwardly from respective sides
thereof; and a tail lever 14 extending in a plane parallel
to that of web 11 but offset downwardly therefrom by
the leg 13 to which it is joined. Formed integrally in the
upper face of web 11 are parallel, transversely extend-
ing teeth 15. In the tail 14, near one end of the section
A, is a bolt hole 16. Projecting from the leg 12 at the
other end of the section A is a hinge pin 17 which is of
less width than the leg 12 and in centered relation thereto
(FIG. 3).

The section B comprises a yoke-shaped jaw portion 18
consisting of a flat web 19 and a pair of legs 20 and 21
extending therefrom in diverging relation such as to
embrace the legs 12 and 13 of jaw 10 when the jaws are
closed. Web 20 is bifurcated (FIG. 3), defining a slot
22 the lower portion of which receives the leg 17 and up-
per portion of which is defined by a semi-circular lip for
clamping engagement with the conductor C. The leg 21
is provided with an aperture 23 adapted to receive the end
of the conductor C. Projecting from the lower end of
leg 21 is an integral tail lever 24 having a bolt hole 25
adapted to register with the bolt hole 16.

A hinge pin 26 is extended through registering trans-
verse bores in the ends of the furcations of leg 20 and
in the leg 17 so as to provide a hinged fulcrum connec-
tion between the legs 12 and 20 of the respective con-
ector sections A and B. When the sections A and B are
spread as in FIG. 1 to open the jaws 10, 18, a conductor
wire can be readily inserted through the slot 22 and the
aperture 23 so as to be held in opposed relation to the
key 15 of the lower jaw 18; and by bringing the tail lever
24 down against the tail lever 14 the jaws will close so
as to clamp the conductor C between the jaws 18, 10
causing the teeth 15 to become embedded in the lower
side of the conductor C as indicated in FIG. 2. The clos-
ing of the jaws is effected by placing the lower tail lever
14 against a support D, inserting a fastener screw or bolt
E through the registering apertures 16, 25, and using the
screw or bolt E to draw the tail lever 24 down against the
tail lever 14.

The hinge pin 26 is spaced away from the jaws 10, 18
sufficiently so that the jaws can spring apart slightly
under the compression developed in the conductor C
by the deformation thereof, and the connector sections A,
B are of sufficient resilience to permit a small amount of
flexing yielding action. Thus a spring load is imposed
upon the conductor C when the jaws are fully closed as
in FIG. 2, which will maintain constant pressure of the
jaws against the conductor C and thus retain an excel-
lent electrical connection. At the same time the rounded
surfaces of the teeth 15, while effective to indent the con-
ductor C, will not cut into the conductor and thus will
not weaken its strength factor in sustaining any tension
loads that are imposed on the conductor when connected
to the support D.

The connector sections A, B can be fabricated rela-
tively inexpensively from extruded sections of suitable
metal such as aluminum or brass, and by shearing off sec-
itions of satisfactory width of the extruded material. The connector sections can then be finished by machining operations in which corners of the section A are milled away to leave the lug 17, and in which the apertures 16, 25 and 23 are bored and the slot 21 milled out from the leg 20.

FIG. 5 illustrates a modified form of the invention wherein the section A1 has a jaw 110 provided in the end thereof with a transverse hinge socket 112 in the form of a substantially semi-cylindrical channel of somewhat more than 180 degrees circumferential extent; and wherein the upper jaw 118 of section B1 has, on the end of its leg 120, an integrated flange terminating in a cylindrical, transversely extending hinge knuckle 126 which is rotatably caged in the socket 112 to provide a fulcrum connection between sections A1, B1. Legs 120 and 121 of jaw 118 are provided with aligned apertures 122 and 123 to receive a conductor, the teeth 15 of jaw 110 projecting into the cylindrical space jointly defined by apertures 122 and 123 so as to become embedded in the conductor when the jaws are closed as in FIG. 5. The sections A1 and B1 of FIG. 5 can be fabricated by slicing off selected widths from extruded sections and by then boring the bolt holes 25 and 16 in the series 24 and 14 and the apertures 122 and 123 in jaw 118. The parts are assembled simply by sliding the hinge knuckle 126 into the socket 112 by relative transverse movement of sections A1, B1, and are held together by taking a portion of socket 112 into a slot 127 cut in the bottom of hinge knuckle 126.

FIGS. 6-8 disclose another modified form of the invention wherein the sections A2, B2 can be fabricated by slicing off pieces of selected widths from extruded sections and then milling fastener screw slots 215 in the respective tail levers 224, 214 and drilling a single pair of apertures 222, 223 in the jaw 218. This connector further differs from those previously described in that the jaws 210, 218 are of dihedral angular V form, the apex of the jaw 210 providing a single tooth 215 for indenting the conductor C on one side, thus clamping the opposite side against the edges of apertures 222, 223. The fulcrum connection between the connector sections is similar to that of FIG. 5, a cylindrical knuckle 217 being formed transversely on the end of section A2 and being socketed in a cylindrical channel socket 226 on the end of section B2. Sections A2, B2 are held together by slitting a portion of socket 226 into a slot 227 in knuckle 217.

FIGS. 9, 10 and 11 disclose a further modified form of the invention wherein means is provided for adjusting the connector to conductors of varying diameters up to three conductors in one clamp. The section A3 comprises a tail lever 314, a jaw 310 of dihedral angular form including a leg 312 from which an integral fulcrum lug 317 projects, the lug 317 having in its opposite sides, respective fulcrum recesses 30 of E-shape (FIG. 9) including a plurality of vertically-spaced pairs of laterally-opposed pivot recesses 31 communicating with a connecting passage 32. Connector section B3 comprises a tail lever 324 and a jaw 318 of dihedral angular form including a bifurcated lug 329 having pivot pins 326 secured in the ends of its furcations and projecting into the E-recesses 30. The pins 326 can be shifted from any pair of the pivot recesses 31 into the connecting passage 32 and thence to another pair of the recesses 31 so as to adjust the opposed spacing between the jaws 310, 318. FIG. 9 illustrates the position of maximum separation of the jaws 310, 318 for positioning the pins 326 in the uppermost pair of pivot recesses 31 as indicated in FIG. 10.

Two additional positions of adjustment are provided for by positioning the pins 326 in either the pair or intermediate recesses 31 or the pair of lower recesses 37, providing for successive closer spacing of the jaws to receive conductors of successively smaller diameter or three separate conductors of small diameter. A plurality of shims 33 are employed for adjusting the spacing of the tails 314, 324 to the spacing of the jaws 310, 318, so that in all positions of adjustment the connector can be clamped to the conductor and attached to a support D with a parallel relation existing between the sections A3, B3.

The jaw 318 is provided with a plurality of parallel, longitudinally extending teeth 34 bridging between the aperture 322, 323 which receive the conductor C, and adapted to be embedded in the conductor in longitudinally extending depressions therein (FIG. 9) at right angles to the transverse depression formed by the tooth 315 of jaw 310.

Between the teeth 34 are defined grooves in which three small conductors can be positioned in side-by-side, parallel relation while being clamped across the transverse tooth 315.

It may be noted that in each form of the invention, the hinge connections between the connector sections at one end lies substantially in a common plane with the tail lever of one of the sections and that the jaws are offset upwardly from this plane so that the conductor can extend into the jaw above the hinge connections.

I claim:

1. An electrical connector comprising a pair of connector sections each including a tail lever at one end and a hinge element at the opposite end and disposed substantially in a common plane with the tail lever, and a jaw disposed between the tail lever and the hinge element, said hinge elements being coupled to provide a fulcrum hinge about which said jaws can be swung in opening and closing movements, said jaws projecting upwardly above said tail levers and hinge elements, the jaw of the upper connector section being of yoke form including a pair of legs spaced lengthwise of the connector and having in said legs respective apertures through which the conductor can be extended and engaged between said jaws upon bringing said tail levers together, said tail levers having means for attaching them to a support; the jaw of the lower connector section having a transverse tooth adapted to be embedded in the under side of said conductor and to clamp the latter upwardly against the portion of the jaw of the upper section at the upper extremities of the apertures therein; the legs of the upper connector section being arranged in dihedral-angular relation, converging upwardly from the tail lever and the hinge element respectively of said upper section and positioned to embrace the jaw of the lower section when the jaws are closed; and the lower jaw having in its apex a plurality of longitudinally-spaced, transversely extending teeth projecting toward the upper jaw, the latter having a flat web bridging between its said legs and in opposed relation to said teeth.

2. A connector as defined in claim 1, wherein said hinge elements comprise a lug projecting longitudinally from the lower jaw and having a transverse bore, the adjacent leg of said upper jaw comprising a pair of furcations embracing said lug and having bores aligned with said lug bore, and a hinge pin extending through said bores and connecting said lug to said furcations.

3. A connector as defined in claim 1, wherein said jaws are both of dihedral-angular V form, the lower jaw being embraced between the legs of the upper jaw when the jaws are closed, and wherein said lower jaw has at its apex a single transverse tooth adapted to be embedded in the underside of said conductor and to clamp the latter upwardly against the portion of the jaw of the upper section at the upper extremities of the apertures therein.

4. A connector as defined in claim 1, wherein the lower jaw is of dihedral-angular V form having a single transverse tooth at its apex, and wherein said upper jaw has an apex portion provided on its underside with a plurality of laterally-spaced teeth extending longitudinally between the apertures of its legs and intersecting the upper sides of said apertures.

5. An electrical connector comprising a pair of con-
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4 connector sections each including a tail lever at one end and a hinge element at the opposite end and disposed substantially in a common plane with the tail lever, and a jaw disposed between the tail lever and the hinge element, said hinge elements being coupled to provide a fulcrum hinge about which said jaws can be swung in opening and closing movements, said jaws projecting upwardly above said tail levers and hinge elements, the jaw of the upper connector section being of yoke form including a pair of legs spaced lengthwise of the connector and having in said legs respective apertures through which the conductor can be extended and engaged between said jaws upon bringing said tail levers together, said tail levers having means for attaching them to a support; the legs of the upper connector section being arranged in dihedral-angular relation, converging upwardly from the tail lever and the hinge element respectively of said upper section and positioned to embrace the jaw of the lower section when the jaws are closed, the lower jaw having in its apex a plurality of longitudinally-spaced, transversely extending teeth projecting toward the upper jaw, the latter having a flat web bridging between its said legs and in opposed relation to said teeth and parallel to the plane thereof, and said hinge elements consisting of a transverse integral semi-cylindrical channel of more than 180° circumference of the end of the lower jaw, and a cylindrical knuckle on the outer leg of the upper jaw, secured in said channel, the upper jaw having a reentrant arm integrally joining said knuckle to said outer leg.

6. An electrical connector comprising a pair of connector sections each including a tail lever at one end and a hinge element at the opposite end and disposed substantially in a common plane with the tail lever, and a jaw disposed between the tail lever and the hinge element, said hinge elements being coupled to provide a fulcrum hinge about which said jaws can be swung in opening and closing movements, said jaws projecting upwardly above said tail levers and hinge elements, the jaw of the upper connector section being of yoke form including a pair of legs spaced lengthwise of the connector and having in said legs respective apertures through which the conductor can be extended and engaged between said jaws upon bringing said tail levers together, said tail levers having means for attaching them to a support; said hinge elements comprising a lug projecting from the lower jaw at the end of the lower connector section, said lug having, in respective sides thereof, E slots providing a plurality of vertically-spaced pairs of opposed hinge sockets and vertical passages connecting the sockets of each E-slot, the outer leg of the upper jaw comprising laterally-spaced furcations embracing said lug, and opposed, aligned hinge pins secured in said furcations, extending into said E-slots, and selectively engageable in said pairs of sockets to provide hinge connections between said sections at selected spacings between the sections.

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MARVIN A. CHAMPION, Primary Examiner.
PERRY TEITELBAUM, Assistant Examiner.
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