Dec. 12, 1939. H. E. SIPE 2,183,109

SOLDERLESS CONNECTOR

Filed May 29, 1936

Fig. 1.

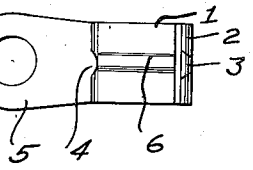
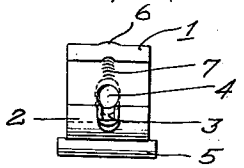


Fig. 4.



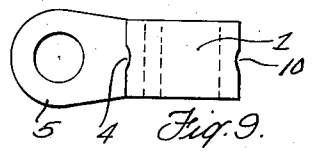


Fig. 9.

Fig. 2.

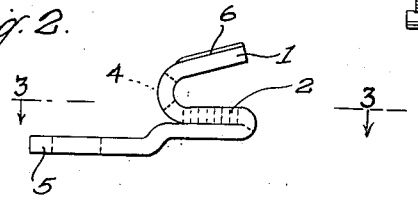


Fig. 10.

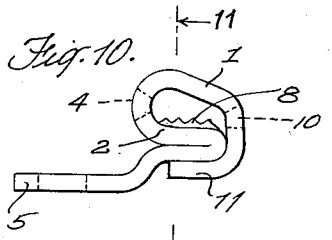


Fig. 3.

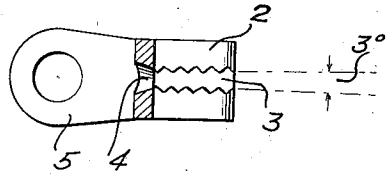


Fig. 11.

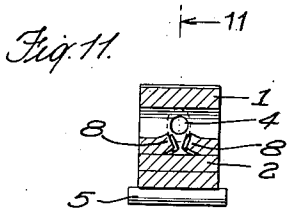


Fig. 5.

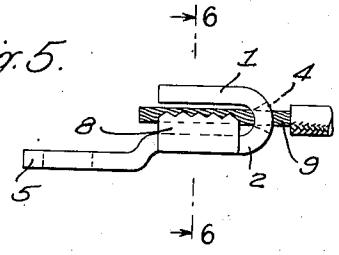


Fig. 6.

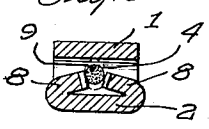


Fig. 12.

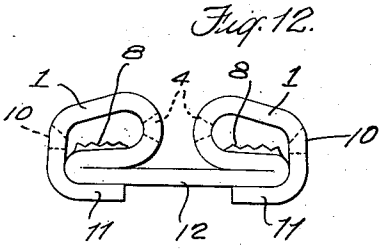


Fig. 7.

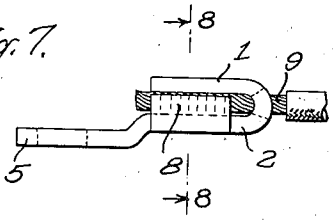


Fig. 8.

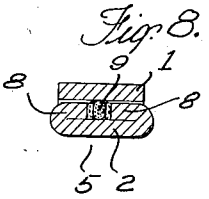
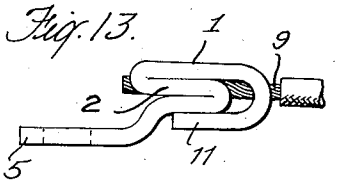


Fig. 13.



Harry E. Sipe

INVENTOR

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UNITED STATES PATENT OFFICE

2,183,109

SOLDERLESS CONNECTOR

Harry E. Sipe, New York, N. Y., assignor of one-half to Nathaniel L. Foster, Montclair, N. J.

Application May 29, 1936, Serial No. 82,384

19 Claims. (Cl. 173—269)

My invention relates to solderless connectors for use in connecting various fixtures to either stranded or solid wire electrical conductors or the like: and the object of the invention is to provide a perfect electrical connection without the use of screws or threaded parts or complicated and expensive parts.

A further object is to provide a connector blanked and formed from sheet in a single unit which is simple in construction and can be economically produced.

A further object is to provide a connector that can be applied without special tools.

A further object is to provide a connector which exerts a constant pressure against the engaged wire and insures permanent electrical conductivity.

Other objects and advantages will appear in the following specifications; reference being had to the accompanying drawing in which:

Fig. 1 is a top view of one form of the connector.

Fig. 2 is a side elevation of the form shown in Fig. 1.

Fig. 3 is a top view of the form shown in Figs. 1 and 2 in partial section along the line 3—3 of Fig. 2 to show the contour of the channel 3.

Fig. 4 is an end view of the form shown in Figs. 1, 2 and 3.

Fig. 5 is a side elevation of a modification.

Fig. 6 is a cross sectional view along the line 6—6 of Fig. 5.

Fig. 7 is a side elevation of the form shown in Fig. 5 after the connector has been clamped to the wire.

Fig. 8 is a cross sectional view of Fig. 7 along the line 8—8.

Fig. 9 is a top view of another modification.

Fig. 10 is a side elevation of the form shown in Fig. 9.

Fig. 11 is a cross sectional view of Fig. 10 along the line 11—11.

Fig. 12 is a side elevation of a variation employing the same form of connector as that shown in Figs. 9, 10 and 11.

Fig. 13 is a side elevation of the form shown in Figs. 9, 10 and 11 after the connector has been clamped to a wire.

Figs. 1, 2, 3, and 4 show a form of the connector adapted to engage either solid or stranded wire which is blanked from strip or sheet metal. The connector shown consists of a single member in a generally S-shape formation, providing a first leg 5, a second leg 2, and a third leg 1. The holes and slot 3 are punched and ridged—surface 7 is formed before folding into form shown. Since the channel is formed by punching it out, the channel walls, transversely of the length of the channel, are straight and parallel to each other, as seen in Figs. 3 and 4. The connector is shown in this as part of a terminal lug 5. The first leg 5 has provision for attaching the connector to a terminal or the like. Such means may take the form of a simple hole as shown. For convenience this leg may, if desired, be upwardly offset as best seen in Fig. 2. In Fig. 1 is shown the top portion 1 with a bead raised at 6 in the forming of a longitudinal row of transverse ridges on its under face and the entrance of hole at 4 through the top piece, 1. The entrance to channel 3 in 2 is also shown. The hole 4 is formed at the bend between the second and third legs, and while located a little higher than the channel 3 is in general alignment therewith. In Fig. 2, similarly numbered, hole 4 and channel 3 are indicated by dotted lines. Fig. 3 shows more clearly that the channel 3 is formed in, and longitudinally of, the second leg 2 of the S-shaped strip member.

In Fig. 3 the contour of hole 4 is shown and the taper of the channel, tapering to a greater width at the end farther from the hole 4, with its side walls provided with serrations transverse to the longitudinal axis of the channel. Fig. 4 is a rear view of the connector looking into the open end of the channel 3 and showing the ridges formed on the under surface of the top 1. The hole 4 is punched in diameter adapted to permit the passage of a given size of wire after the distortion of the walls of the hole by bending to point shown in Fig. 2, and the tapered channel 3 in 2 is of a width adapted to properly engage the wire. The width of the channel is less than twice the thickness of the metal, preferably being of about the same width as the thickness of the metal, as best seen by comparing Fig. 2 and Fig. 3 of the drawing. Thus the channel is of a depth greater than one-half of its width, whereby the sides of the channel can grip the diametrically opposed sides of the wire without its tending to be pushed out. As indicated in Fig. 2 by dotted lines and shown in Fig. 4 the channel 3 is long enough to pass partly around the bend. Also very little material is left between the hole 4 and the adjacent channel end as indicated by dotted lines in Fig. 2.

In use the wire is passed over the open top of the channel 3 and through the hole 4 in which position it is forced into the channel by pressing the top 1 which extends over the channel longi-

tudinally thereof, down against 2 with a pair of pliers or other means, thus closing down the bend, at right angles to the channel, between the second and third legs. In this movement the hole is further contracted and the sharp rim of the hole firmly engages the wire. The small amount of metal between the hole 4 and the channel 3 is compressed and displaced and the wire forced completely into the channel. As is apparent in the drawing, the first leg 5 forms the bed of the channel 3. The projections at the entrance of the channel 3 are spaced to firmly engage the wire without abrasion and the remaining projections are successively closer together in a direction toward the hole 4 and are spaced to make successively deeper abrasions in the wire as it is forced into the channel, thus insuring a perfect contact of the abraded surfaces of the wire and the projections which are also abraded by the passage of the wire into the channel. The top portion 1 is formed with a series of sharp ridges as indicated in Fig. 4 at 7 for the purpose of forming further contact with the wire when pressed against it.

Figs. 5 and 6 show a variation in which the channel is formed by a pair of wings 8—8 which have been blanked on opposite sides of the connector and folded over to nearly meet, forming a channel between their end faces. The juxtaposed ends of these two wings are tilted up at a slight angle, as shown in Fig. 6. In this form the body member 2 forms the bed of the channel. A third wing 1 is also bent over this channel, the line of bend being at right angles to the channel, and this third wing extending longitudinally over the channel, as shown in Fig. 5. A hole 4 is formed through the bend of the third wing 1, in general alignment with the channel. In Fig. 5 a wire 9 is shown passed through the hole and extending over the channel. In this case the hole is a size that will firmly hold the wire without abrasion when distorted by clamping.

Fig. 6 shows the relative position of wire 9 and the channel between the sides 8 before the top 1 is clamped down. Fig. 7 shows the connector clamped to the wire after the top 1 is pressed against the wire forcing it between the serrated channel sides. The wings 8 are thus forced downward and the channel sides toward one another clamping the wire between them to a position where the channel sides are parallel and the wire firmly clamped in place as further shown in the cross sectional Fig. 8. This clamping action is assured by the channel in this form also having a depth of more than half its width. In this form also the end faces of the wings which form the channel sides are provided with serrations transverse of the channel length. In this form the wire does not slide across the projections as in the type shown in Fig. 1 but the projections are firmly pressed against the wire from opposite sides without friction. This form is particularly adapted to fine stranded wire which is liable to damage from abrasion when forced into the fixed channel type. In engagement the normally round section of stranded wire is forced into oval contour by the side pressure of the wings and against the bottom of channel and top piece 1 as shown in Fig. 8. The channel in this form need not necessarily be tapered though the taper does have the advantage of compensating for variation in wire diameter and insures greater strength of engagement without weakening the wire section at the point adjoining its entrance into the channel where the walls are spaced to prevent too great a pressure against the wire.

While the smaller sizes of the foregoing forms may be engaged with ordinary pliers, larger sizes for larger wire will require the use of a hand vice with screw pressure.

Figs. 9 and 10 show a variation particularly adapted to small stranded wire, though also suitable for use with solid wire. This form is generally similar to the form of Figs. 1–4 except for the addition of a tail piece and the provision of a second hole. As clearly seen in the drawing, this form is made of a strip member bent to form a first leg 5 extending to the right, bent up and back to the left forming a second leg 2, then bent up and to the right forming a third leg 1, and then bent down and back to the left under a portion of the first leg, forming a tail piece 11. A channel is provided in the second leg 2, longitudinal thereof, and the first leg 5 forms the bed for this channel. Holes 4 and 10 are provided in the two bends at the ends of third leg 1, slightly above but in general alignment with the channel. In this design the wire end is threaded through the two holes 4 and 10 and is thus held in proper alignment with the channel between the sides 8 and 8 as shown in Fig. 11. The channel sides are provided as in the other forms with serrations transverse to the channel length, and the channel sides 8 and 8 are bent slightly upward as shown in Fig. 11 thus widening the upper part of the channel to receive the wire. As the top portion 1 is clamped against the wire, the wire is pushed against the teeth and as the pressure continues the teeth are forced downwards and toward one another from opposite sides into the sides of the wire until their faces are parallel and the wire is held firmly between the bottom of the channel and the top 1. The tail piece 11 extending under the channel clamps firmly against the bottom of the fixture and holds the parts in clamped position as shown in Fig. 13 in which a wire 9 is shown engaged.

The holes 4 and 10 also contract against the wire in clamping, the hole 10 being slightly larger than hole 4, the former being adapted to firmly engage the wire without abrasion and the latter adapted to press tightly around the wire. This form has the advantage of properly directing the wire into engagement and by the addition of the tail piece 11 may be made of thinner metal than the other forms.

Fig. 12 shows a connection adapted to splice two wires and having clamping devices on the opposite ends of the strip 12 of the type shown in Figs. 9 and 10. The length of the strip 12 may be varied to meet different requirements such as sealed coil terminals in which one end would clamp the conductor inside the assembly and the other protrude to form a terminal attachment.

Plating or coating the connectors with tin, solder, or like material prevents corrosion of the engaging parts and also such a surface is more easily abraded and prevents too great abrasion of the engaged wires. Also with such plating the wire may be soldered to the connector by heating after engagement. While specific forms are shown to illustrate this invention it is to be understood that the clamping devices may be a part of a great variety of fixtures of different angles and contours and adapted to the many and varied use of wire assembly. Also the clamping device may include more than one channel adapted to engage two or more wires in the same fixture.

Also two wires may be joined by twisting together or otherwise and then engaged in connector of this type of proper size.

In all the designs of this connector the channel walls are slightly pressed apart by the wedging of the wire forced between them and therefore exert a continuous pressure against the wire, due to the elasticity and resilience of the metal of the channel. This feature insures permanent contact and conductivity between the wire and the connector. It is to be understood that the embodiments here presented are for illustration only and that the invention is of the scope defined by my claims.

I claim:

1. An electric connector comprising a single member having an open-top wire receiving channel formed therein, whereby a wire may be freely placed over said channel, outside of same, for forcing the wire laterally from outside the channel down into the channel, the side walls of said channel, transversely of its length, being straight, the depth of said channel being greater than one half of its width, and said member having also a different portion thereof bent over adjacent the open face of said channel to force and retain a wire in clamped relation within said channel, the said bent over portion extending lengthwise of said channel, and the line of its bend being transverse to the longitudinal axis of said channel.

2. A one-piece solderless electric connector consisting of a strip of metal in a generally S-shape formation having a channel slot in the second leg longitudinal thereof and extending therethrough, the depth of said channel being greater than half its width, the first leg being bent back under the open bottom of the channel and serving as a bottom therefor, and the third leg overlying the said channel for forcing and clamping a wire therein.

3. Device of claim 2 in which the side walls of said channel are provided with serrations perpendicular to the general plane of said second leg.

4. Device of claim 2 in which the channel extends part way around the bend between the first and second legs.

5. Device of claim 2 in which a hole is formed through the bend between the second and third legs, in general alignment with the channel slot.

6. Device of claim 2 in which a hole is formed through the bend between the second and third legs, in general alignment with the channel slot, and the channel slot tapers to a greater width at the end away from the said hole.

7. An electric connector comprising a member having three wings, two of said wings extending out at opposite sides and bent back over to nearly meet, leaving a channel between their end faces, and a third wing bent back over top of said channel.

8. Device of claim 7 in which the line of bend of the third wing is disposed at right angles to the lines of bend of the first two wings and the third wing extends longitudinally over the length of the channel.

9. Device of claim 7 in which the juxtaposed ends of the first two wings are tilted up at a slight angle whereby to wedge the wire therebetween when a wire is placed in the channel and the third wing is pressed downwardly toward the first two wings.

10. Device of claim 7 in which the juxtaposed end faces of the first two wings are provided with serrations transverse to the longitudinal axis of the channel.

11. Device of claim 7 in which the juxtaposed end faces of the first two wings are provided with serrations transverse to the longitudinal axis of the channel and the juxtaposed ends of the first two wings are tilted up at a slight angle, whereby to wedge and bite into the wire when a wire is placed in the channel and the third wing is pressed downwardly toward the first two wings.

12. Device of claim 7 in which the line of bend of the third wing is disposed at right angles to the lines of bend of the first two wings and the third wing extends longitudinally over the length of the channel and a hole is formed through the bend of the third wing in general alignment with the said channel.

13. An electric connector comprising a strip member having a first leg extending to the right, bent up and back to the left forming a second leg, then bent up and back to the right forming a third leg, and then bent down and back to the left under a portion of the first leg, and a wire-receiving channel formed in the second leg.

14. Device of claim 13 in which the said channel is formed longitudinally of the second leg and a hole is formed through a bend at an end of the third leg.

15. Device of claim 13 in which the said channel is formed longitudinally of the second leg and a hole is formed through the bend at each end of the third leg.

16. In an electric connector, a member having a wire-receiving channel formed completely therethrough, leaving the side walls cut apart by said channel, whereby they can be sprung apart bodily, the opposed faces of said channel being tilted upwardly at a slight angle, and a portion of said member extending over the top of said channel whereby when a wire is placed in said channel and the member portion which extends over the channel is pressed downwardly the wire will be wedged and clamped in the channel.

17. In an electric connector a bed member and a pair of channel side members joined to the bed member and located immediately thereabove slanting slightly upwardly from the bed member as they extend toward each other whereby to form a toggle clamp to grip a wire under directly opposed side compression when a wire is placed in the channel between the side members and the wire and side members are forced down flat against the bed member.

18. Device of claim 17 in which the channel sides are provided with serrations transverse to the longitudinal axis of the channel and perpendicular to the bed member.

19. An electric wire connector of bendable conductive material comprising an elongated base member, a second member overlying the base member and integral therewith, said second member having a wire receiving channel formed therein, the base member forming the bottom of the channel, and a third member extending from the second member starting in line therewith and in line with the channel, said third member being bendable transversely of its extension and of the channel for forcing and retaining a wire in clamped relation within the channel.

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