Jan. 30, 1934. C. H. CHAPMAN 1,945,393

TERMINAL

Filed May 15, 1929

Fig. 1.

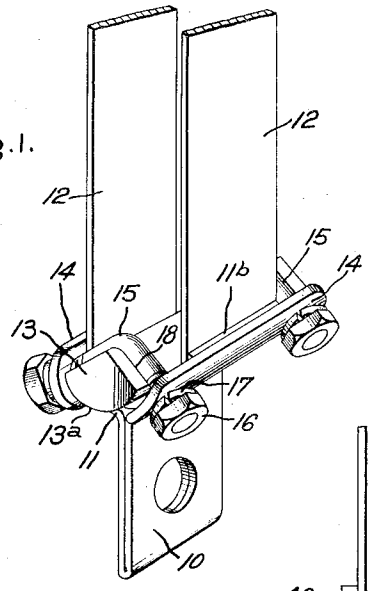


Fig. 2.

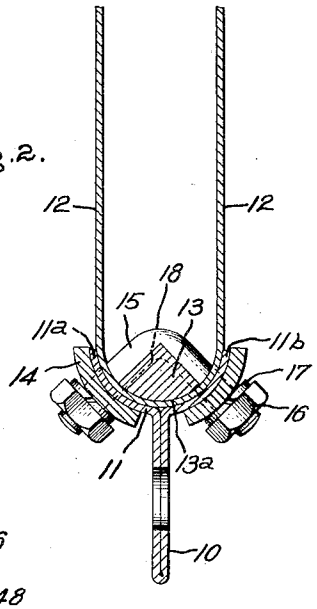


Fig. 6.

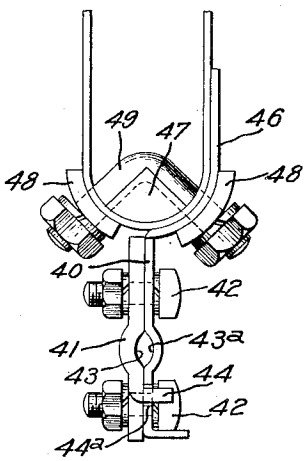


Fig. 3.

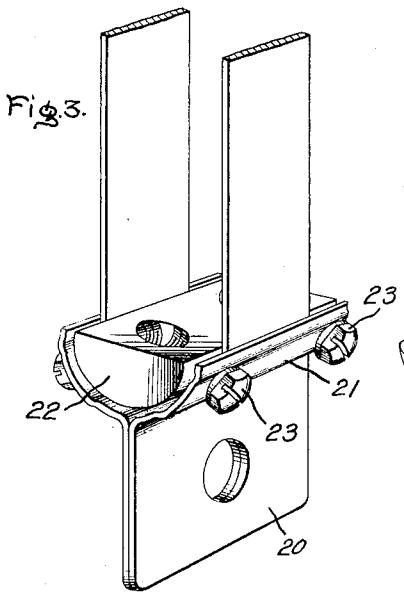


Fig. 4.

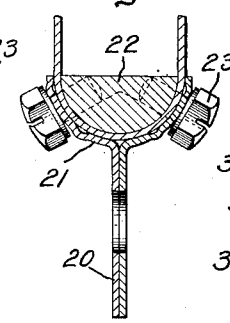


Fig. 5.

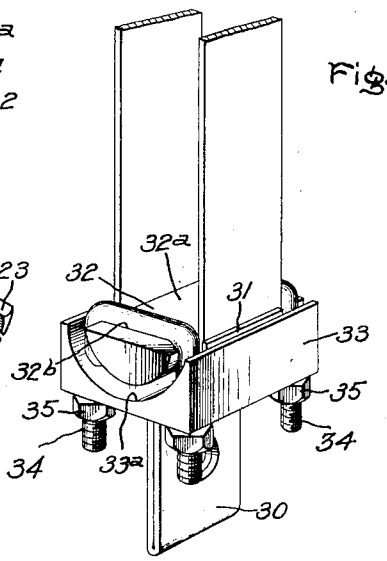
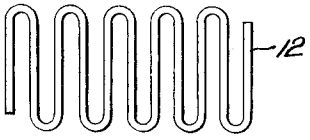


Fig. 7.



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UNITED STATES PATENT OFFICE

1,945,393

TERMINAL

Charles H. Chapman, Scotia, N. Y., assignor to General Electric Company, a corporation of New York

Application May 15, 1929. Serial No. 363,267

7 Claims. (Cl. 173—324)

My invention relates to terminals, more particularly to electrical terminals for resistance conductors used for control purposes or the like, and has for its object the provision of an improved terminal which may be removably connected to various portions of the resistance conductor so as to provide for a ready resistance adjustment.

Although my invention is not limited thereto, it has particular application in connection with resistance units or the like wherein a sinuous ribbon-like resistance conductor is used. Certain kinds of service, wherein oftentimes it is desirable to use resistance units of this type, require a very close resistance adjustment. Thus, in crane hoist and like service, it is desirable at times to change the location of the terminal from one portion to another of the resistance unit so as to provide an accurate resistance control.

According to my invention I provide the external connection or lead portion of the terminal with securing means whereby it may be detachably connected to various portions of the resistance conductor length.

For a more complete understanding of my invention, reference should be had to the accompanying drawing in which Fig. 1 is a perspective of an electrical terminal embodying my invention, the terminal being illustrated as applied to a portion of a sinuous resistance conductor; Fig. 2 is a section of the electrical terminal shown in Fig. 1; Fig. 3 is a perspective of a modified form of my invention; Fig. 4 is a section of the terminal shown in Fig. 3; Fig. 5 is a perspective of another modified form of my invention; Fig. 6 is an elevation of still another modified form of my invention, and Fig. 7 is a diagrammatic view illustrating a sinuous resistance unit to which the terminal may be applied.

Referring to the drawing, I have shown my invention in one form as applied to a continuous, ribbon-like, strip resistance conductor (Fig. 7) having a regular sinuous form, the terminal being adapted particularly to be secured to the bent U-shaped portions of the convolutions forming the sinuous conductor. As shown, the terminal comprises an external connection or lead portion to which suitable leads may be connected, and securing means for detachably connecting the connection portion to the resistance conductor.

As shown (Figs. 1 and 2), the external connection or lead portion 10 is provided with a base 11 which comprises two flange-like members 11*a* and 11*b*. Preferably, the external connection portion 10 together with its base 11 will be stamped from a suitable sheet of electrically conducting material such as copper. The sheet strip will be of such length that its intermediate portion will form the connection member while its end portions will form the base portion, i. e., the flanges 11*a* and 11*b*. Thus, it will be observed that the strip will be folded upon itself along a line substantially at its longitudinal center, the folded portions of the strip serving to form the external connection portion 10, while the ends of the strip will be bent substantially at right angles to the lengths forming the connection portion so as to provide a base of suitable proportions. Preferably and as shown, the connection or lead member will be suitably apertured so that external connections may be effected conveniently. This lead member 10 is adapted particularly to receive a suitable punched tube lead terminal, it being understood that the tube terminal will be suitably bolted to the lead member.

The base portion 11 is shaped to conform with the surface of the resistance conductor to which the external connection member is to be secured. Thus, assuming that the connection member is to be mounted upon the outer surface of a U-shaped bend portion of the resistance conductor 12, the flanges 11*a*, 11*b* taken together will assume a substantially U-shape so that the base portion may be fitted to this outer surface. Obviously, if the terminal were to be fitted to the inner surface of the U-shaped bend or to the surface of a straight portion of the conductor length, the base portion 11 would be shaped accordingly. Preferably, the external connection member 10 and its base 11 will be of substantially the same width as the ribbon-like resistance conductor. Obviously, however, this is not necessarily true since these members may have any suitable relative dimensions (Figs. 3 and 5).

It will be observed by reason of this construction that the external connection member 10 may be fitted to any one of the U-shaped end portions of the convolutions which form the sinuous resistance unit. I provide suitable means for detachably securing the base 11 to these end portions of the resistance conductor. As shown (Figs. 1 and 2), the securing means comprises a securing member 13 to which the base 11 is clamped. The securing member 13 is provided with an arc shaped surface 13*a* so that this member may be fitted upon the surface of the U-shaped bend opposite to the surface to which the external connection member will be fitted. Thus, the securing member 13 will be shaped to conform with the inner surface of each U-shaped

bend portion of the convolutions. Preferably, the securing member will be formed from cadmium plated steel.

Each flange is provided with a clamping member 14 which is shaped in conformity therewith. It will be understood that these clamping members taken together will serve to secure the base 11 to the securing member 13. To this end, the securing and clamping members will have such lengths that in the assembled terminal, their end portions will project beyond the two opposite edges, respectively, of the ribbon resistance conductor and the terminal base portion and these projecting portions in the assembled terminal will be detachably secured to each other. Preferably, these members will be provided with screw fastening means so that the terminal may readily be applied to or removed from the various U-shaped portions of the resistance conductor.

As shown, a pair of bolts 15, formed from a suitable material such as cadmium plated steel, are provided for this purpose, each bolt being provided to secure the projecting ends of the members at one side of the resistance conductor. Preferably, the clamping bolts 15 are bent at right angles while the securing member 13 is provided with an upper bearing surface for the bolts shaped in conformity therewith. Thus, the member 13 is shaped in the form of a sector, the angle of which is substantially a right angle so as to conform with the right angle bolts. Each clamping member 14 is suitably apertured at each end to receive the threaded end portions of the clamping bolts 15 upon which nuts 16 are provided so as to detachably secure the base member 11. Spring locking washers 17 may be interposed between the clamping members and their securing nuts 16.

Preferably, the upper bearing surface of the securing member 13 will be provided with a recess 18 at each end shaped in conformity with the bearing surface of the bolts 15 so that the bolts in the assembled terminal will rest within these recesses. These recesses serve both to facilitate the assembly of the terminal and to effect a more rigid construction.

The foregoing construction lends itself very readily to large scale production by reason of the fact that the bend in the angle bolts 15 is practically a right angle, and since this bend is at the middle of the bolt the threads on the ends of the bolts will not be injured by the bending operation. Moreover, if it is desirable to cut the threads on the clamping bolts after the bend has been formed, this can be done readily. Moreover, the securing member 13 may be formed readily by comparatively simple milling operations.

In the form of my invention shown in Figs. 3 and 4, I dispense with the clamping members 13, shown in Fig. 1, the external connection or lead member being connected directly with the securing member. To this end, both the connection member 20 and its base portion 21 are of such lengths that in the assembled terminal, their opposite ends will be projected beyond the two opposite edges, respectively, of the ribbon-like resistance conductor. The member 22, which is provided to secure the base portion 21, likewise is of such length that its opposite ends will be projected beyond the opposite edges, respectively, of the ribbon-like resistance conductor. The flanges of the base portion 21 will be secured directly to the securing member 22 rather than through the medium of clamping members, as shown in Fig. 1. As shown, suitable stud bolts 23 are provided for this purpose, the projecting ends of the flanges being suitably apertured to receive these bolts and the projecting portions of the securing member being suitably tapped so that the bolts will be received by the securing member in threaded engagement therewith. It will be understood that the connection or lead member 20 together with its base 21 will be formed from a suitable sheet conducting material substantially in the manner described in connection with the lead member 10 and its base 11, shown in Figs. 1 and 2.

In the form of my invention shown in Fig. 5, the external connection member 30 will be connected with its securing member by means of a clamping member in a manner somewhat similar to the method described in Figs. 1 and 2. As shown, the connection member 30 and its base 31 will be identical in construction with the member 10 and its base 11 of Figs. 1 and 2. However, the flanges, which comprise the base portion 31, will be detachably connected with the securing member 32 by means of a unitary clamping member 33, rather than by means of a pair of clamping members as shown in Figs. 1 and 2. It will be understood that this member will be provided with a longitudinal aperture (not shown) for receiving the member 30 so that in the assembled terminal, this member will be projected through the aperture. Thus, the inner surface 33*a* of the clamping member may be brought into firm contact with the base 31. As shown, the inner surface 33*a* is shaped in conformity with the U-shaped base portion 31 which, of course, is shaped in conformity with the outer surface of the U-shaped bend portion. The clamping member 33 in the assembled terminal is detachably secured to the securing member 32 by means of a pair of bolts 34 each of which is bent so as to assume a substantially U-shape. As shown, the securing member 32 will be provided with a substantially flat upper bearing surface 32*a* for receiving the middle straight bearing portions of the U-shaped bolts. The threaded legs of the bolts are projected downwardly through suitable apertures provided in the clamping member 33 upon which nuts 35 are threaded. By reason of this construction, the external connection member may be readily secured to or removed from the resistance conductor. Preferably, the securing member 32 will be provided with recesses 32*b* in its upper bearing surface 32*a* for receiving the middle portions of the bolts whereby the assembly of the terminal is facilitated and the sturdiness of construction is enhanced.

In the form of my invention shown in Fig. 6, the lead or connection member will be detachably connected to the resistance conductor in a manner very similar to the method disclosed in Figs. 1 and 2. However, the lead member in this case is of a construction particularly adapting the terminal for connection with the bared end of a lead. As shown, this lead member 40 is provided with a clamping member 41 which is detachably connected to the lead member by means of a pair of bolts 42. The clamping member is provided with recess 43 which in the assembled terminal aligns itself with a cooperating recess 43*a* formed in the lead portion. It will be understood that these recesses in the assembled terminal provide a passageway in which the lead will be received so that it may be clamped in proper position with respect to the terminal and resistance unit. Preferably and as shown, the

clamping member 41 is provided with a projecting arm 44 which in the assembled terminal will be received by a slot 44a provided in the lead member 40. This construction serves to secure the lead ends substantially within the confines of the passageway.

In this modification, the lead member is provided with only one flange 46 which is shaped in conformity with the surface of the resistance conductor to which it is to be attached. Thus, this flange will be shaped so that it may be fitted, as shown in Fig. 6, to the one half of the outer surface of the U-shaped convolution end.

The securing member 47, the clamping members 48 and the securing bolts 49 are similar in construction to the securing member 13, the clamping members 14 and the securing bolts 15, respectively, of Figs. 1 and 2. Moreover, these members will be assembled in substantially the same manner as those shown in Figs. 1 and 2.

However, the clamping member 48, shown at the left of the U-shaped convolution as viewed in Fig. 6, will bear directly against and in contact with the outer surface of the resistance conductor. Otherwise the assembly is identical with that shown in Figs. 1 and 2.

It is to be noted that by reason of the construction of each of the aforedescribed terminals, the connection or lead members may readily be welded to the resistance conductor. This is an important feature of my invention. Thus, when adjustments in the position of the terminal are not required, the terminal lead portion may be welded or otherwise permanently secured to the resistance conductor.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. A terminal for an electrical conductor having a bend therein comprising an external connection member having a base portion shaped to conform with one surface of said bend portion whereby it can be fitted thereto, a member having one surface shaped to conform with the opposite surface of said bend whereby it can be fitted thereto, said second member having a length substantially greater than the width of said conductor so that when it is fitted to said bend it extends across the width of said conductor with its ends projecting beyond the edges of said conductor, a clamping member fitted over said base portion so that its edges project beyond said base portion and means for detachably connecting the projecting end portions of said second member and said clamping member.

2. A terminal for a ribbon-like sinuous electrical conductor having a number of equally spaced convolutions comprising a lead member having a base portion of substantially the same shape as the bent end-portions of said convolutions whereby it may be fitted to any one of said end-portions on one side thereof with a substantial portion of its area in engagement with said side, a member cooperating with said base portion and shaped to conform with the other side of said bent end-portion whereby it may be fitted thereto with a substantial portion of its area in engagement therewith and means for detachably securing said base to its cooperating member.

3. A terminal for a length of electrical conductor comprising a lead member provided with a flange at one end thereof adapted to be fitted to the surface of one side of said electrical conductor and means for detachably clamping said flange to said electrical conductor comprising a securing member adapted to be fitted to the surface of the opposite side of said electrical conductor, a clamping member for said flange and means for detachably securing said clamping member to said securing member whereby the flange and the electrical conductor will be sandwiched between said clamping member and said securing member.

4. A terminal for a ribbon-like electrical conductor having a substantially U-shaped bend portion comprising an external connection member provided with a flange at one end thereof, said flange being shaped to conform with the surface of one half of the outer surface of the U-shaped bend portion whereby it may be fitted thereto and means for detachably clamping said flange to said bend portion comprising a securing member provided with an arcuate surface whereby the member may be fitted to the inner surface of the U-shaped bend portion, a clamping member for said flange shaped in conformity therewith so that it may be fitted thereto, a second clamping member shaped to conform with a portion of the area of the other half of the outer surface of the U-shaped bend portion so that it may be fitted thereto, said securing member and said clamping members being projected beyond the edges of said electrical conductor and said flange, and means for detachably securing the projecting ends of said clamping members and said securing member.

5. A terminal for an electrical conductor adapted to be attached to one side of said conductor comprising a terminal lead connection member provided with a base portion fitted to said one side, a cooperating member fitted to the opposite side of said conductor, said cooperating member being of such length that when fitted to said side its end portions project from the two edges of said conductor, and said cooperating member being provided with recesses in its outer face within its said projecting ends, a clamping member for said base having its end portions projecting beyond said base and said conductor when fitted to said base, and means for detachably connecting said clamping member with said cooperating member comprising bolt-like members fitted in said recesses so as to embrace said cooperating member, and means for mechanically connecting said bolt-like members to the projecting ends of said clamping member.

6. A terminal for a ribbon-like electrical conductor comprising a base member provided with a lead connection portion fitted to one side of said conductor, a cooperating securing member fitted to the opposite side of said conductor with its end portions projecting beyond the edges of said conductor, said projecting end portions being provided with recesses in the side opposite to the surface in engagement with said conductor, a clamping plate for said base having its end portions projecting beyond said base and said conductor when fitted to said base, said end portions being provided with apertures, and bolt-like members adapted to rest in said recesses and be passed through said apertures for securing the projecting ends of said clamping and securing members.

7. A terminal for a ribbon-like electrical conductor having a regular sinuous form comprising a terminal member provided with a base at one end thereof, said base being shaped to conform with the surface of one-half of the outer surface of a bend portion of said conductor whereby it may be fitted thereto, a securing member provided with an arcuate surface whereby said mem-

ber can be fitted to the inner surface of said bend portion, a pair of clamping members, one shaped in conformity with said base whereby it can be fitted thereto and the other being shaped to be fitted to the other side of said bend portion, said securing and clamping members being proportioned to project beyond the edges of said conductor, the projecting end portions of said securing member being provided with recesses in the surface opposite said arcuate surface and the projecting end portions of said clamping members being provided with apertures, and bolt-like members adapted to be received in said recesses and passed through said apertures for detachably securing said clamping and securing members.

CHARLES H. CHAPMAN.