Feb. 23, 1937. J. B. TERRILL, JR 2,071,713

TERMINAL CLIP AND DISTRIBUTING BLOCK

Filed May 25, 1932 2 Sheets-Sheet 1

FIG. 1

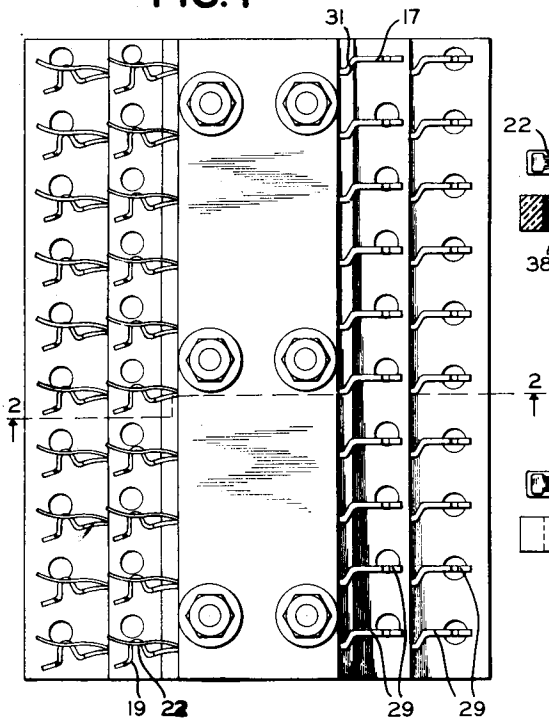


FIG. 2

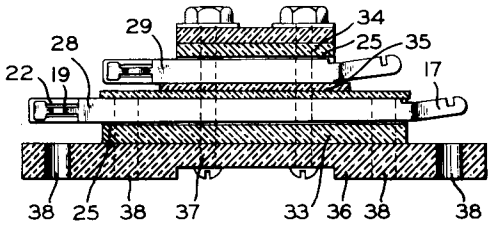


FIG. 3

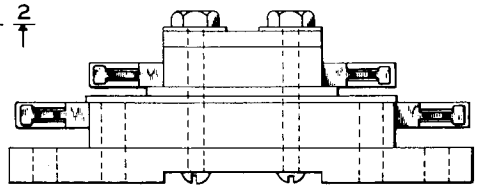


FIG. 4

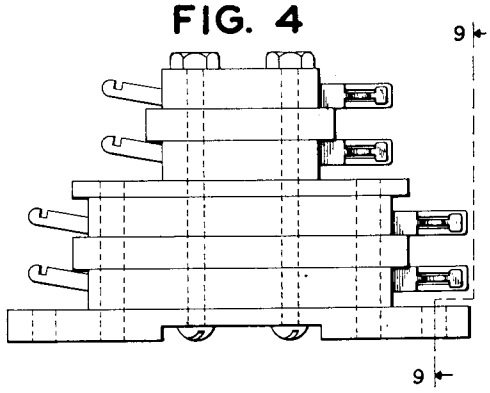


FIG. 8

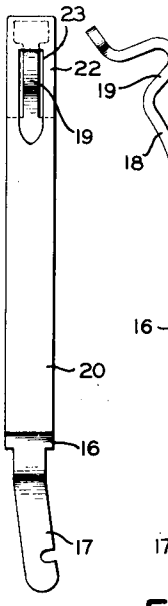


FIG. 6

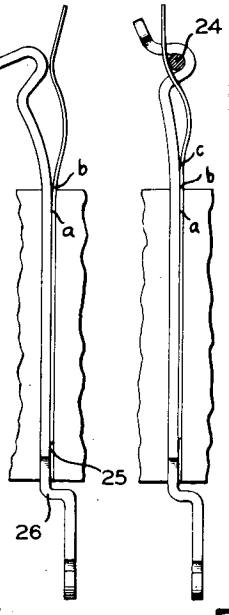
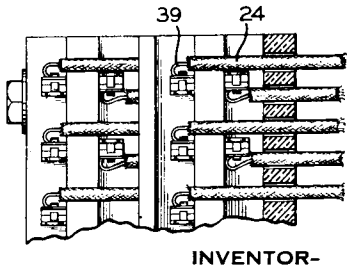


FIG. 5

FIG. 7

FIG. 9



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TERMINAL CLIP AND DISTRIBUTING BLOCK

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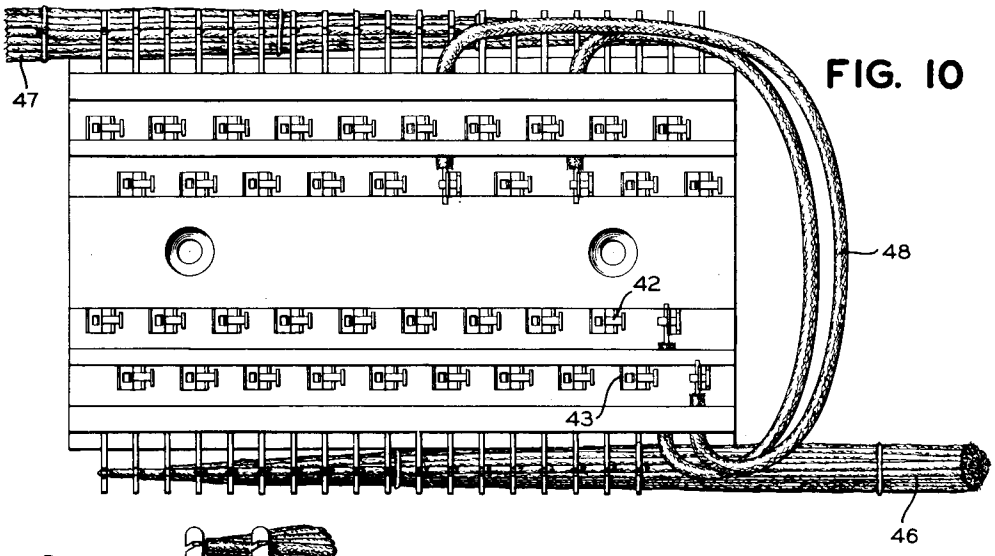


FIG. 10

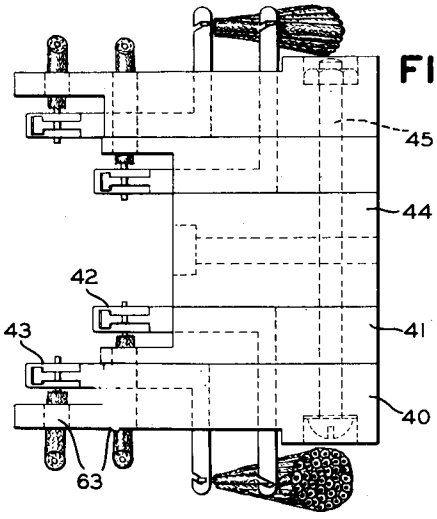


FIG. 11

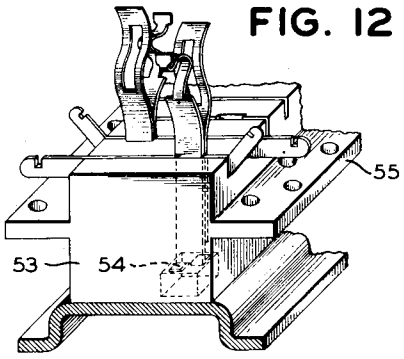


FIG. 12

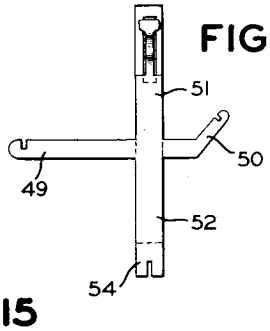
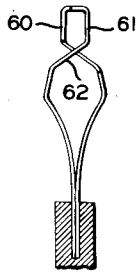


FIG. 13

FIG. 14



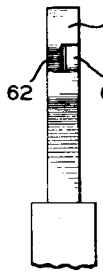


FIG. 15

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UNITED STATES PATENT OFFICE

2,071,713

TERMINAL CLIP AND DISTRIBUTING BLOCK

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Application May 25, 1932, Serial No. 613,535

8 Claims. (Cl. 173—324)

This invention relates to a terminal clip and a distributing block employing such clip. More particularly it relates to such apparatus for use in terminating cable conductors and making cross-connections on distributing frames and similar terminals.

In a copending application of L. H. Rovere et al., Serial No. 438,481 filed March 24, 1930 and entitled Switchboard terminal block, for which Letters Patent No. 1,961,111 were granted May 29, 1934, there is shown a terminal block for use on the distributing frame of a telegraph switchboard, the elements of the block being so arranged as to permit of a multitude of connections being made between the switchboard and the distributing frame and also, by the use of a separate block, permitting connections to be made between the distributing frame and the incoming and outgoing conductors. The terminal block of the aforesaid application includes a plurality of rows of terminal strips, the rows extending longitudinally of the block and being superimposed one above the other in tiers. The terminal strips extend transversely of the block and each strip is provided with a soldering lug at each end thereof, the corresponding strips of each row being in alignment, one over the other, and each pair of rows being shorter than the preceding pair to produce a pyramided construction, thus separating the terminal lugs in such manner as to permit separate fanning openings to be provided for each lug. The terminal blocks may be arranged on the horizontal and vertical sides of the distributing frame in such manner that the switchboard and incoming line connections are made to the lugs on one side of their respective blocks and the cross-connections between horizonal and vertical sides of the frame, by which changes are ordinarily made in the permanent assignments of the lines, are secured to the lugs on the opposite side of the terminal blocks.

All conductors are soldered to their respective lugs and changes in assignment can only be made by removing the soldered connections and resoldering the conductors in a new location. While this block is exceptionally well suited for use where the wire assignments are relatively permanent, it is desirable in certain instances to provide quick detachable connections for the conductors terminating in such blocks. However the usual form of detachable clips are not suited for this purpose, since they do not permit of the necessary concentration of a large number of such clips in a restricted space and do not provide sufficient grip to insure a safe connection and to give the required electrical contact with the conductor necessary in telegraph circuits, where the signal currents are low and the receiving apparatus sensitive.

It is one of the objects of the present invention therefore to provide a quick detachable clip which is extremely strong, producing a firm grip on the conductor, and which is of small size whereby a large number of such clips may be confined in a restricted space and so arranged as to enable a multitude of connections to be made thereto.

Another object is to provide a detachable clip for current conductors which, while of small size permits a relatively large movement of the jaws so as to accommodate conductors of varying sizes.

Another object is to produce such a clip which is well adapted for switchboard terminal blocks and which requires substantially no more space than that occupied by the usual type of soldering lugs.

A further object is to provide a terminal block containing a multitude of terminal strips having spring jaws for detachably engaging the associated conductors, which may be quickly assembled and in which the terminal clips are firmly held in the insulating portions of a block.

Other objects and advantages of the invention will appear as the description proceeds.

In accordance with my invention I preferably construct the clip of two spring arms terminating in cooperating jaws, the spring arms being fulcrumed on each other with a relatively short leverage whereby a large gripping force may be obtained at the jaws with a safe bending moment at the point of fulcrum and in order to obtain the requisite movement of the jaws to accommodate conductors of various sizes and permit of their ready insertion into the jaws I so shaped the arms of the clip as to produce a constantly shifting fulcrum as the jaws are moved to a wire receiving position. The short leverage enables a strong grip to be produced with a given bending moment and the progressively shifting fulcrum enables a large jaw opening to be obtained without unduly straining the arms of the clip at any point, the strain being distributed over a substantial length of the resilient arms of the clip.

I prefer to construct one of the arms of a metal having a good contact conductivity with the conductor, such as phosphor-bronze and the other arm of a stiff resilient metal such as spring-

steel although it is to be understood that both arms may be composed of the same material and one may be rigid if desired whereby the entire strain is taken by the other arm. The clip may take different forms as will appear hereinafter and is appliable to a variety of uses, some of which are included herein.

One preferred use of the clip is the construction of a switchboard terminal block in which a large number of terminal strips must be confined in a restricted space. In accordance with one modification of the invention, the terminal strips of the blocks may terminate in a clip, the spring arms of which are so shaped as to hold the strips in place in their respective slots in the insulating portions of the block, due to their resiliency. The confining walls of the slot, at the same time, serve to hold the arms of the clip under an initial strain thereby assisting in the gradual accumulation of the gripping force thereof.

The invention will be more fully understood by reference to the accompanying drawings in which:

Figure 1 is a plain view of a distributing block embodying terminal strips constructed in accordance with the present invention;

Figure 2 is a vertical sectional view on the line 2—2 of Figure 1;

Figure 3 is an end elevation of a block similar to that shown in Figure 1 but employing terminal strips having both ends terminating in detachable clip members;

Figure 4 is an end elevation of a terminal block having four tiers of terminal strips;

Figure 5 is a side view of a terminal strip embodying the present invention;

Figure 6 is a similar view of the terminal strip in position in a slot of a distributing block;

Figure 7 is a further view of the terminal strip in position to engage a conductor;

Figure 8 is a front view of the terminal strip;

Figure 9 is a fragmentary side view partly in section substantially on the line 9—9 of Figure 4 showing the manner of connecting conductors to the terminal strips;

Figure 10 is an elevation of a modified form of terminal block;

Figure 11 is an end view of the block shown in Figure 10;

Figure 12 is a fragmentary perspective view of a further form of terminal block;

Figure 13 illustrates the form of the strip used in the block of Figure 12; and

Figures 14 and 15 are side and front views respectively of a different form of terminal clip

Referring first to Figures 5 to 8, a terminal strip suitable for a terminal block is shown, comprising a main body portion 16 composed preferably of phosphor-bronze and terminating at one end in a soldering lug 17 and having at the other end a curved resilient arm 18 terminating in a jaw member 19, forming one element of a clip embodying my invention. The other element of the clip is composed of a strip 20 of stiff resilient metal such as spring-steel welded or otherwise suitably secured to the body portion 16. The strip 20 has a curved spring arm 21 and terminates in jaw portion 22. The jaw 22 is slotted at 23 to receive the narrowed end of the jaw 19 in the usual manner, as is clearly shown in Figure 8.

The arms 18 and 21 of the clip, at the point (a) of divergence are curved outwardly in a slow arc whereby, as the jaws are pressed together, for instance from the position shown in Figure 5 to that shown in Figure 6, the arms fulcrum about the point (a) in an engagement which gradually shifts the fulcrum point outwardly towards the jaws to a point (b) (Figure 6) and as the jaws are further compressed as shown in Figure 7, the fulcrum is shifted to a point (c). This shifting of the fulcrum permits the stress to be gradually absorbed by the spring arms over the distance a—c, thereby permitting a relatively wide movement of the jaws which makes possible the easy insertion and secure gripping of conductors of various sizes without material distortion of the arms at any point. The jaws therefore may be made of an extremely stiff material without danger of distorting them beyond their elastic limit at any point. Due to the gradual shifting of the fulcrum point and consequent shortening of the leverage, the force applied at the jaws for a safe bending moment at the fulcrum point increases as the jaws are pressed together and due to the relatively short leverage this force assumes considerable magnitude enabling a strong gripping action of the jaws on the conductor 24 to be obtained.

The radius of curvature of the diverging portions of the strip may be so chosen, for each member, that the surfaces when brought together, by compression of the ends, will remain in continuous contact throughout the area over which the fulcrum has moved. This curvature varies with the nature and dimensions of the members and can be readily determined, with sufficient accuracy, by trial and error.

When the clip is employed in a terminal block of the type shown in the aforesaid application of L. H. Rovere, I prefer to mount the strip in a slot 25 (Figure 6), one end 17 of the terminal strip being offset to the side of the slot, as 26, and the two resilient arms 18 and 21 being compressed together in the opposite end of the slot whereby the strip is firmly retained in place. The compression of the arms 18 and 21 between the confining walls of the slot also applies an initial tension to the jaw members assisting in the gradual building up of a gripping force therein.

Referring now to Figures 1 and 2, I have shown a distributing block of the general form disclosed in the aforesaid application of L. H. Rovere and utilizing the terminal strip just described. This block comprises two rows of terminal strips 28 and 29, the strips extending through transverse slots 25 in the various insulating members and having one end 31 offset to the side of the slot and terminating in the soldering lug 17. The opposite end of the terminal strips terminate in the jaw members 19 and 22. The terminal block assembly comprises a wide insulating terminal strip retaining member 33 and a narrow insulating terminal strip retaining member 34, separated by an insulating spacer 35. The assembly is mounted upon an insulating base 36 by means of clamping bolts 37 and the base 36 is provided with individual fanning openings 38 for each end of each of the terminal strips.

When a terminal block of this type is employed on a distributing frame, the connections from the switchboard are made permanently to the soldering lugs 17 of the blocks on the horizontal side of the frame and the incoming lines are connected permanently to the soldering lugs of corresponding blocks on the vertical side of the frame. Cross-connections between the horizontal and vertical side of the frame can then

be made between the clips, thus permitting these cross-connections to be changed readily so as to associate each switchboard section with any desired ones of the incoming and outgoing lines.

Figure 3 shows a block differing from that shown in Figures 1 and 2 only in the use of clips on each end of the terminal strip. This block is of use where all of the connections to the block are of a temporary or semi-permanent nature.

The block shown in Figure 4 is for use where a greater number of conductors must be terminated in a restricted space, substantially twice the same terminal facilities being provided in the same space with this form as with the previous forms.

The manner of attaching the cabled conductors to the clips is shown in Figure 9. The end of each conductor **24** is bared and bent in the form of a hook as shown at **39**. The hook end is then inserted through the fanning openings **38** and while the jaws are pressed together, as with a pair of pliers. The hooked end is pulled downwardly between the jaw members and the jaws released. When so connected the conductors are firmly held in their associated clips and it is practically impossible to remove them by a pull exerted thereon from the exterior of the block. As is evident in Figure 9 a large number of such conductors may be terminated in a restricted space without danger of accidentally contacting between the individual conductors or between a conductor and unassociated terminal clip.

In Figure 10 I have shown a form of distributing block which provides the facilities of both the horizontal and vertical sides of the distributing frame. This block is particularly adaptable for city distribution service, as for instance, in the case of cable conductors entering an office building for distribution to a plurality of offices throughout the building. The lower half of the block may be considered as equivalent to the incoming or vertical side of the distributing frame and the upper half thereof as the equivalent of the horizontal side. As shown each half of the block comprises two insulating terminal carrying strips **40** and **41** stepped at their left sides, as shown in Figure 11, and having slots for the reception of a number of L shaped terminal strips, the vertical arms of which terminate in soldering lugs and the horizontal arms in detachable clips. The two rows **42** and **43** of terminal strips are staggered longitudinally of the block and provided with individual fanning openings **63**. The upper and lower halves of the block are spaced by an insulating section **44** and are secured together by clamping bolts **45**.

In the use of this block the cable **46**, entering the building, may be fanned to the lower row of soldering lugs and the cable **47**, composed of conductors extending to various offices throughout the building, may be fanned to the upper set of soldering lugs. These connections are permanent. Cross connections between the incoming conductors **46** and the conductors **47**, are made by patching loops **48** extending from the lower clips **42**, **43** to the upper clips, preferably around the end of the block, as shown in Figure 10. By means of these patching loops any incoming conductor may be connected to any of the office conductors **47** and the assignments changed quickly when required. Due to the fact that the patching loops extend around the sides of the block, the face thereof is left unobstructed, thereby rendering all of the clips available for changing assignments and for inspection. The clips are all contained within the recessed portion formed by the stepped sections of insulation and, therefore, they are protected from accidental contact and, if desired, a cover may be provided for the open end of the block. It is to be understood, however, that the block as normally used is enclosed in a metallic casing in the usual manner.

In Figure 12 a still further form of distributing block is shown which provides facilities for both permanent and detachable connections. In this form the terminal strips are shaped as shown in Figure 13, the horizontal arms terminating in soldering lugs and the upper vertical arm in a detachable clip. The lower vertical arm is received in a slot in the insulating body **53** and the tabs **54** formed on the lower end thereof are bent in opposite directions to lock the strip securely in the insulating body. The insulating body is provided with outwardly extending flanges **55**, having fanning openings through which the conductors may pass to adjacent the soldering lugs.

In normal use one set of conductors may be permanently attached to the soldering lugs **49** and the other ones extended to the detachable clips. After the circuits have been completely tested and the assignments determined to be permanent, the second set of conductors may be removed from the clips and permanently soldered to the lugs **50**. This provides an extremely handy arrangement for making the initial assignment and permitting them to be shifted until their permanent location has been established.

It will be appreciated that in all the terminal blocks described the use of the detachable clips is possible only because of the specific construction thereof, whereby a strong gripping action is obtained with a clip of small dimension.

In Figures 14 and 15 a somewhat slightly different clip is shown, in which the jaw members **60** and **61** have a biting engagement with the conductor, the two arms being cut away and crossing over each other at **62** in the manner of a pair of tongs. The arms are curved outwardly, however, adjacent their point of divergence so as to provide a shifting fulcrum, thereby permitting a relatively large opening to be obtained with short lever arms composed of relatively stiff material.

It is obvious that the clip may take a variety of other shapes without departing from the essential features thereof and may be applied to a large variety of uses. Therefore, I do not desire to be limited to the particular form of clip or to the distributing block employing the same, shown herein, but contemplate all modifications and changes therein within the terms of the appended claims.

What I claim is:

1. A terminal clip for an electric conductor comprising a pair of cooperating conductor gripping jaw supporting members, one of which is composed of a metal of good contact conductivity and the other of which is composed of a stiff resilient material of a different nature, said jaw supporting members being fulcrumed on each other and curved outwardly relative to each other over a substantial portion of their length so as to produce a shifting fulcrum as the members are pressed together to open said jaws.

2. A terminal clip for an electric conductor

comprising a pair of supporting members, fulcrumed on each other, cooperating conductor gripping jaws carried by said members, at least one of said members being convexed with relation to the other over a substantial portion of their length so as to produce a shifting fulcrum as the members are pressed to conductor receiving position and means for applying a constant compressive force to said members along a convex portion thereof to produce an initial tension in the jaws.

3. A terminal clip for an electric conductor comprising a pair of supporting members, fulcrumed on each other, cooperating conductor gripping jaws carried by said members, at least one of said members being convexed with relation to the other over a substantial portion of their length so as to produce a shifting fulcrum as the members are pressed to conductor receiving position, a support for said members comprising confining wall portions engaging a convex portion of said members to hold them under an initial compression.

4. A terminal clip for an electric conductor comprising a pair of oppositely disposed jaw carrying strips, a support for said strips comprising an insulating body having an elongated slot therein, said strips having flexible diverging portions, said diverging portions being partially compressed together and a substantial part of said diverging portions being contained within said slot, whereby the strips are held in an initial compression by the walls of said slot and exert an outward force thereagainst.

5. A terminal block comprising an insulating support having a plurality of parallel transverse slots therein, a terminal strip contained in each of said slots, said strips comprising a central body portion with outwardly projecting terminals, at least one of said terminals comprising a pair of diverging resilient members partly compressed within the slot, whereby the strips are held under an initial compression by the walls of said slot and exert an outward force thereagainst, said resilient member having cooperating wire gripping portions externally of the slot.

6. A terminal block comprising an insulating support, a group of L-shaped terminal strips extending therethrough, said strips having conductor engaging terminals projecting outwardly through two adjacent sides of the support and a second group of L-shaped terminal strips also extending through said support and having conductor engaging terminals projecting outwardly through adjacent sides of the support, at least one of said latter sides being a different side from either of said first mentioned sides.

7. A terminal block comprising a support having a group of terminal strips extending therethrough and terminating at one end in soldering lugs and in the opposite ends in wire gripping jaws, and a second group of corresponding terminal strips extending through said support and being spaced from the first set, individual cabled conductors extending to the soldering lugs of each group of terminal strips and looped conductors extending between the wire gripping jaws of one group and those of the other group said looped conductors being disposed to a side of the block different from that adjacent which the gripping jaws are arranged whereby said looped conductors do not interfere with free access to said gripping jaws.

8. A terminal block comprising an insulating support having a recessed side, a group of terminal strips extending through said support, having one end terminating in wire engaging clips contained within said recess and the other ends extending outwardly from an adjacent side of the support, a second group of terminal strips extending through said support and also having one end terminating in wire engaging clips contained within said recess and the opposite ends projecting outwardly from the opposite adjacent side.

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