Jan. 26, 1954

R. W. STROBEL

2,666,972

MOUNTING CLAMP

Filed Nov. 20, 1951

Fig. 1.

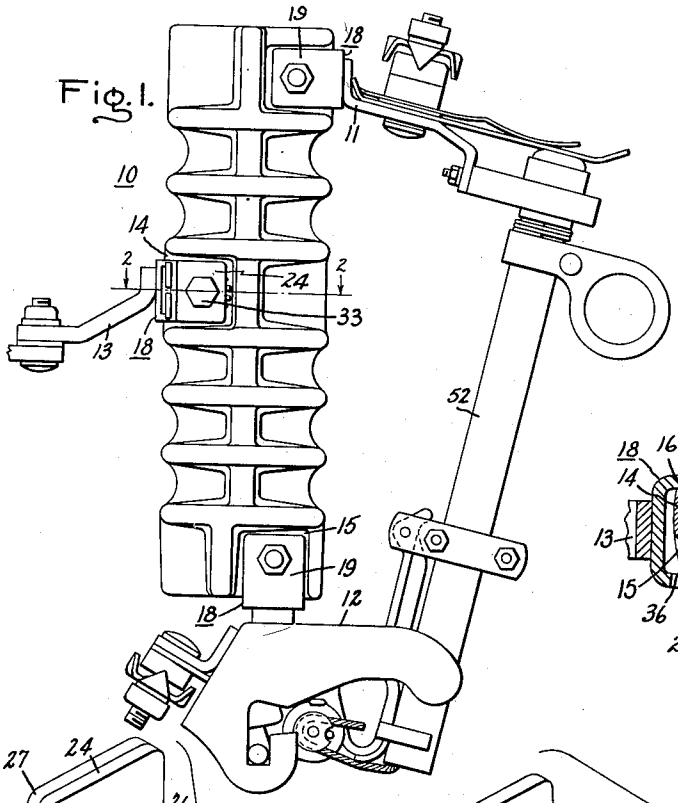
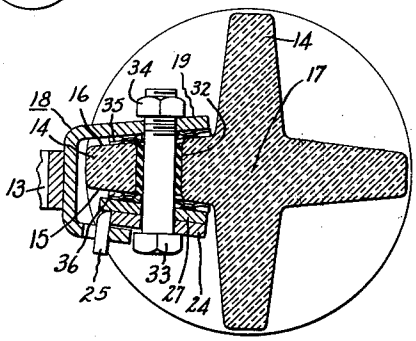


Fig. 2.



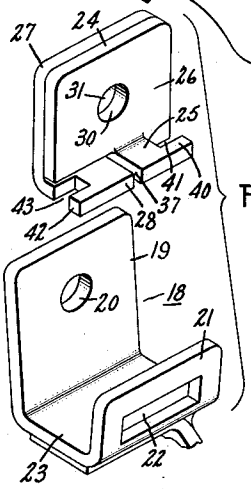


Fig. 3.

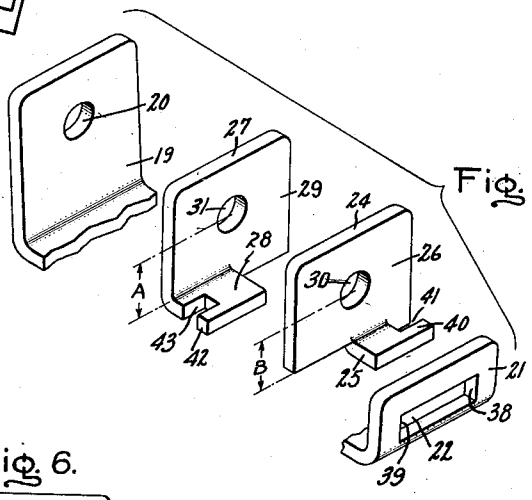


Fig. 4.

Fig. 5.

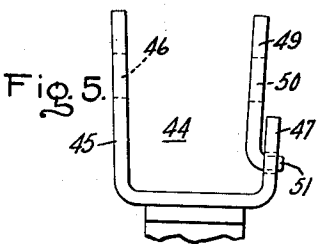
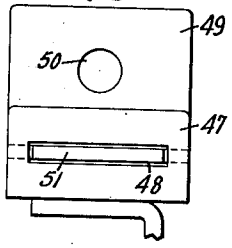


Fig. 6.



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UNITED STATES PATENT OFFICE

2,666,972

MOUNTING CLAMP

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Application November 20, 1951, Serial No. 257,369

9 Claims. (Cl. 24—243)

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This invention relates to mounting means for connecting electrical terminals, contacts and the like to a support therefor. More particularly, the invention is an improvement over the connecting or mounting clamp disclosed in the copending application of Sydney R. Smith, Jr., Serial No. 257,317, filed November 20, 1951, and assigned to the same assignee as the instant application.

The single one piece U-shaped clamp disclosed in the Smith application is suitable for those applications where the support to which the piece is applied has clamping surfaces substantially parallel to the inside opposite mating surfaces of the legs of the U-clamp and where the distance between the clamping surfaces of the support or the thickness thereof is only slightly less than the distance between the inside opposite mating surfaces of the clamp. However, in the case of insulating supports of porcelain material, the permissible manufacturing tolerances of necessity are quite liberal so that the manufactured spacing between the outstanding legs of metallic U-shaped clamps of one piece construction must be made relatively large to slide easily over all clamping surfaces of porcelains, both large and small. Consequently, when the clearance, before clamping, between legs of the one piece clamp and the support to which it was to be clamped happen to be excessive, only the free ends of the clamp legs were drawn in against the porcelain as the clamping nut was drawn up on the clamping bolt because the rigidity of the clamp where the legs are joined by a cross piece prevented the portion of the legs intermediate the cross piece and the free ends of the legs from being drawn in sufficiently. In other words, the clamping engagement between the porcelain and the clamp amounted to an undesirable line or edge engagement rather than a desirable surface engagement. Nevertheless, as pointed out in the above-mentioned copending application, the general idea of bolting hardware to a porcelain support in itself is a desirable feature provided the electrical creep or strike distance between hardware at different potential can be held at a suitable maximum value which, of course, was one of the features resulting from the distinctive configuration of the insulator disclosed and claimed in the Smith application. Consequently, it would be desirable to retain the bolting feature provided a clamp could be furnished which would overcome the disadvantages inherent in the rigid one-piece U-shaped clamp.

It is, therefore, an object of my invention to provide a connecting or mounting clamp which will adjust itself to the surfaces of the support to which it is applied or clamped.

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It is another object of my invention to provide a U-shaped clamp of either two-piece or three-piece construction which is self-aligning in that the elements of the clamp will separately adjust themselves to engage the contour of the support clamping surfaces.

It is a further object of my invention to provide clamps of either two piece or three piece construction which will clamp to all support clamping surfaces by distributing the clamping pressure over a plane irrespective of variations in thickness resulting from reasonable manufacturing variables of porcelain.

The invention will be better understood from the following description when taken in connection with the accompanying drawing and the scope of the invention will be pointed out in the appended claims. In the drawing, Fig. 1 is a side elevation of a fused disconnecting switch or cutout embodying mounting clamps of the invention and showing the switch in the circuit closed position; Fig. 2 is a section taken on the line 2—2 of Fig. 1; Fig. 3 illustrates an enlarged view of the elements of a three-piece clamp in perspective with two of the elements in assembled relationship; Fig. 4 is an exploded view of the three-piece clamp in perspective; Fig. 5 is an end elevation view of a two-piece clamp and Fig. 6 is a side elevation view of the clamp of Fig. 5.

In Fig. 1 the support insulator 10, the bracket 11 including the contacts and other elements mounted thereon, the hook-shaped bearing member 12 including the contacts and other elements also mounted thereon, the hanger arm 13 and the contact bridging means 52 are identical to those illustrated and fully described in the above-mentioned copending Smith application and, therefore, constitute no part of this invention. Insulator 10, however, does serve as a typical application to better emphasize the advantages of the clamps of the instant application since in clamping the bracket 11, the hanger arm 13 and the bearing member 12, the webs 14 extending axially or parallel to the longitudinal axis of the insulator 10 and to which the clamp is applied have clamping surfaces 15 and 16 which are not parallel but which converge outwardly from the core portion 17 of the insulator as better illustrated by Fig. 2.

Referring now to Figs. 1 to 4, inclusive, one of the pieces of the three-piece clamp of my invention comprises a member 18 having a portion 19 with an aperture such as the circular opening 20 transversely therethrough and a portion 21 with an elongated slot 22 transversely therethrough while the other two pieces comprise plate members 24 and 27 respectively having tongue portions

25 and 28 for extension through the slot 22 of member 18. Members 18, 24, and 27 may be of steel or any other material having proper strength characteristics. Actually, the member 18 illustrated is channel or U-shaped with portion 19 comprising one of the flanges or legs thereof while the portion 21 comprises the other and relatively short flange or leg thereof interconnected with leg 19 by a web portion 23. The distance between the opposite or the opposing surfaces of the legs is fixed so as to be substantially greater than the distance between the clamping surfaces of any support to which the clamp may be applied. Tongue portion 25 of plate member 24 extends transverse to a face 26 thereof, as better illustrated by Fig. 4, while tongue portion 28 which is longer than the tongue 25 also extends transverse to a face 29 of plate member 27. For a purpose which will become apparent hereinafter, each tongue portion has a thickness less than the width opening of the slot. Apertures 30 and 31, similar in size to the aperture 20 in U-shaped member 18 are respectively provided in plates 24 and 27 and so located therein that the vertical distance A between the center of the aperture 31 and the upper surface of tongue 28 is approximately equal to or slightly greater than the distance B between the center of aperture 30 and lower edge of plate 24, while the vertical distances between the upper surfaces of the tongues to the apertures are equal.

As more clearly illustrated by Fig. 2, hanger arm 13 is welded or otherwise fixedly connected to the U-shaped member 18 of the three-piece clamp, and bracket 11 and bearing member 12 are likewise respectively connected to this member of other three piece clamps.

In the course of mounting one of my clamps on a support, such as a web portion 14 of support insulator 10 having an aperture 32 transversely therethrough, plate 24 is first positioned within the U-shaped member adjacent the relatively short leg 21 thereof, as shown in Fig. 4, and is then moved so that the tongue portion 25 extends through the slot 22 as shown in Fig. 2 while the face 29 of plate 27 is placed in engagement with the face of plate 24 opposite the face 26 thereof with the relatively long tongue 28 extending under the lower edge of plate 24 and also through slot 22. Because of the equality in distance between the tongue portions and apertures in plates 24 and 27 as pointed out hereinbefore, and the difference in distance between the tongue portion and the aperture of plate 27 compared with the lower edge and aperture of plate 24, it will be observed that the apertures 30 and 31 may be aligned as better illustrated by the upper portion of Fig. 3 showing the assembled relationship of plates 24 and 27 removed from the U-shaped member in the interest of clarity. However, slot 22 is so located in relatively short leg 21 of channel member 18 that apertures 30 and 31, after insertion of tongues 25 and 28 through the slot, may also be aligned with aperture 20. Thereafter, the clamp, with the tongues 25 and 28 extending through slot 22, is moved or slipped over support web 14 so that leg 19 of channel member 18 will be adjacent one of the converging surfaces 16, for example, of the web and the plate 27 will be adjacent the opposite converging surface 15 thereof and the apertures 20, 30, 31 and 32 are all in alignment. The three elements of the clamp are next bolted together and to the web by means of a bolt 33 and a nut 34 threaded thereon. To serve as a cushion to protect the porcelain web 14 from mechanical shock transmitted through the metal clamps in service, so-called shakeproof or metal washers 35 and 36 having resilient or springing characteristics may first be interposed respectively between surface 16 and leg 19 and between surface 15 and plate 27 with the bolt 33 passing through the washers as illustrated in Fig. 2. Prior to final drawing up of nut 34 on bolt 33, means such as the end of a screw driver may be inserted in the space 37 (Fig. 3) between tongues 25 and 28 to force the edges thereof in engagement respectively with opposite edges 38 and 39 of slot 22.

From an inspection of Fig. 2, which illustrates the clamp with the nut tightly drawn up on the threads of the bolt so that the clamp is firmly clamped to the support, it will be observed that this clamp is self-aligning and that the elements thereof are parallel to or have adapted themselves to the surfaces 15 and 16 notwithstanding the fact that the surfaces are not parallel. Furthermore, it can be seen that the same clamp could be made to likewise firmly clamp a similar support having a slightly narrower or thicker web, such variation in thickness being within reasonable manufacturing tolerances expected for porcelain. Thus, the loads transmitted to and from the porcelain insulator are not concentrated through line engagements between the hardware and porcelain but are easily distributed over or through surface engagements. Furthermore, because of the engagement of elements 25 and 28 respectively with edges 38 and 39 of slot 22, it should also be observed that any force or load transmitted from the insulator through the clamp to the hanger arm 13 and tending to rotate the clamp about the bolt axis as a center, will not only be taken by member 18 but will also be taken up partially by one of the plates 24 or 27 depending upon the direction of rotation.

The above recited advantageous results will be realized regardless of the configuration of tongues 25 and 28 in plates 24 and 27. However, tongue 25 is provided with an ear portion 40 extending transverse to the direction of projection of the tongue from the face 26 of the plate so as to define a notch or slot 41 in the outer edge of the tongue while tongue 28 is also provided with an ear portion 42 defining a notch 43 therein. In addition, the width opening of elongated slot 22 is not only provided larger than the thickness of each tongue but is provided so as to be equal to or slightly in excess of the sum of the thicknesses of both tongues 25 and 28. Upon assembly, the tongue 25 is first inserted through the slot 22 and moved laterally and upwardly so that notch 41 therein engages edge 38 of the slot and the upper surface of the tongue engages the upper longitudinal edge of the slot. Then tongue 28 is inserted under tongue 25 and through the slot 22 after which it is moved laterally so that notch 43 therein engages edge 39 of the slot. Thereafter, the upper surface of tongue 28 may be moved upwardly into engagement with the upper edge of slot 22 or, tongue 25 may be lowered, to align the apertures 30 and 31. Thus, the three elements of the clamp are thereby placed in interlocking engagement with each other which prevents the tendency of the slot 22 moving out of engagement with the tongues upon the imposition of some bending forces on the hardware such as a force on the hanger arm 13, for example, parallel to the bolt axis.

As part of my invention, I have also illustrated in Figs. 5 and 6 a two-piece clamp comprising a channel or U-shaped member 44 hav-

ing a leg or flange portion 45 with an aperture 46 transversely therethrough and a relatively short leg or flange 47 having an elongated slot 48 transversely therethrough. The other piece of the clamp comprises a plate member 49 having an aperture 50 transversely therethrough and a tongue portion 51 projecting or extending transverse to a face thereof and engageable with the slot 48. As illustrated, the position of slot 48 and the free clearance provided by the excess dimensions of the slot over those of the tongue permits alignment of apertures 46 and 50. Like the clamp of the three piece embodiment, it will be apparent to those skilled in the art without further elaboration that the elements of this clamp will also adjust themselves to the surfaces of the support to which it is applied.

While I have shown and described particular embodiments of my invention, it will be observed that changes and modifications can be made without departing from the invention in its broader aspects and I, therefore, aim in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of my invention.

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

1. A three piece clamp comprising a channel-shaped member having a leg with an aperture transversely therethrough and a relatively short leg with an elongated slot therethrough, a plate member having an aperture transversely therethrough aligned with said aperture in said channel-shaped member and a tongue portion projecting transverse to a face of said plate member extending through said slot and in engagement with an edge thereof, a second plate member having an aperture therethrough aligned with the apertures in said channel and said first-mentioned plate member and having a tongue portion projecting transverse to a face of said plate extending through said slot and in engagement with the opposite edge thereof, and bolt means extending through said apertures.

2. A three piece clamp comprising a U-shaped member having a leg with an aperture transversely therethrough and a relatively short leg with an elongated slot transversely therethrough, a plate member positioned between said apertured leg of said U-shaped member and the slotted leg thereof, a second plate member positioned between said apertured leg of said U-shaped member and said first-mentioned plate member, said plate members respectively having apertures transversely therethrough in alignment with said aperture in said apertured leg of said U-shaped member and tongue portions extending respectively transverse to faces of said plate members through said slot and respectively in engagement with opposite edges thereof to limit the rotation about the common axis through said apertures of said plates and said U-shaped member with respect to each other, said tongues respectively having ear portions extending therefrom transverse to the direction of extension thereof through said slot and defining notches for interlocking engagement respectively with said opposite edges of said slot to limit movement in a direction parallel to said common axis of said plates and said U-shaped member with respect to each other, and fastening means extending through said apertures.

3. Clamp means for mounting an element on a support having a portion defining a pair of

clamping surfaces projecting therefrom and an aperture extending between said surfaces transversely through said portion comprising, a channel-shaped member having a leg with an aperture therethrough disposed adjacent one of said clamping surfaces of said support with the aperture therein in alignment with the aperture in said leg and a relatively short leg with an elongated slot therethrough, a plate member having an aperture transversely therethrough disposed between said relatively short leg of said channel-shaped member and the other of said clamping surfaces of said support with the aperture in said plate in alignment with the apertures in said support and said channel-shaped member, said plate member having a tongue portion projecting transverse to a face thereof extending through said slot and in engagement with an edge thereof, a second plate member disposed intermediate said other clamping surface of said support and said first-mentioned plate member, said second-mentioned plate member having an aperture therein in alignment with the apertures in said support, said channel-shaped member and said first-mentioned plate and having a transversely projecting tongue portion extending through said slot and in engagement with the opposite edge thereof, a bolt having threads adjacent an end thereof extending through the apertures in said support, said plate members and said channel-shaped member, and a nut in threaded engagement with said threads to maintain said mounting means on said support, said element being fixedly connected to the portion of said channel-shaped member interconnecting said legs.

4. Clamp means for mounting an element on a support having a web portion projecting therefrom and defining a pair of clamping surfaces with an aperture extending transversely through said web portion comprising, a channel-shaped member having a leg with an aperture therethrough disposed adjacent one of said clamping surfaces of said web with the aperture therein in alignment with the aperture in said leg and a relatively short leg with an elongated slot therethrough, a plate member having an aperture transversely therethrough disposed between said relatively short leg of said channel-shaped member and the other of said clamping surfaces of said web with the aperture in said plate in alignment with the aperture in said web and said channel-shaped member, said plate member having a tongue portion projecting transverse to a face thereof extending through said slot and in engagement with an edge thereof, a second plate member having an aperture transversely therethrough disposed between said other clamping surface of said web and said first-mentioned plate member and having a face in engagement therewith, said aperture in said second plate being in alignment with the apertures in said web, said channel-shaped member and said first mentioned plate, said second mentioned plate member having a tongue portion projecting transversely to said face in engagement with said first-mentioned plate extending through said slot and in engagement with the opposite edge thereof, a washer of resilient material with the aperture therein in alignment with the aperture in said web interposed between and in engagement with said web and the leg of said channel-shaped member having the aperture therein, a second washer of resilient material with the aperture web therein in alignment with

said web interposed between and in engagement with said other clamping surface of said web and said second plate member, a bolt having threads adjacent an end thereof extending through the apertures in said washers, web, channel-shaped member, and said plate members, and a nut in threaded engagement with said threads to maintain said mounting means on said web, said element being fixedly connected to the portion of said channel-shaped member interconnecting said legs.

5. A three piece clamp comprising a U-shaped member having one leg slotted and shorter than the other leg, a plate between said legs having a tongue projecting into the slot of said one leg, another plate between said other leg and said first mentioned plate having a tongue projecting into the slot of said one leg, said tongues each engaging an edge of said slot and lying in substantially the same plane, and means for fastening said other leg and said second mentioned plate in flat bearing engagement with a flat surfaced mounting member.

6. In a three piece clamp as in claim 5, wherein the portions of said tongues engaging the edges of said slot each have an ear formed thereon, said ears engaging the outer surface of said one leg.

7. A clamp comprising a U-shaped member having two legs interconnected by a base portion, one of said legs being shorter than the other of said legs, said shorter leg having a slot therein extending generally parallel to said base portion, a first plate positioned between said legs, said first plate having a tongue extending therefrom into said slot and abutting an end edge of said slot, a second plate positioned between said first plate and other leg, said second plate having a tongue extending therefrom into said slot and engageable with an opposite end edge of said slot, said first and second plates superposed with respect to each other, and said tongues lying in substantially the same plane, said tongues when lying in said same plane having a combined width not greater than the length of said slot, said tongues when superposed with respect to each other having a combined thickness not greater than the width of said slot, the portions of said tongues engaging said end edges of said slot having ears formed thereon, said ears extending opposite to each other beyond said end edges of said slot and engaging the outer surface of said one leg, and fastening means extending through aligned apertures in said plates and other leg.

8. A clamp comprising a member having a leg portion, a first plate positioned opposite to said leg portion and spaced therefrom, another portion of said member having an elongated slot therethrough, said first plate having a tongue extending therefrom into said slot and abutting an end edge thereof, a second plate positioned between said leg portion and said first plate and spaced from said leg portion, said second plate having a tongue extending therefrom into said slot and abutting an opposite end edge of said slot, said plates superposed with respect to each other and said tongues lying in substantially the same plane, said tongues when lying in said same plane having a combined width not greater than the length of said slot, said tongues when superposed with respect to each other having a combined thickness not greater than the width of said slot, the portions of said tongues abutting said end edges of said slot having ears formed thereon, said ears extending opposite to each other beyond said end edges of said slot, and means for fastening said clamp about a web shaped support portion whereby said leg portion and said second plate will engage opposite sides of said web shaped support portion.

9. A clamp comprising a member having a leg portion, a first plate positioned opposite to said leg portion and spaced therefrom, another portion of said member having an elongated slot therein, said first plate having a tongue extending therefrom and abutting an end edge of said slot, a second plate positioned opposite to said leg portion and spaced therefrom, said second plate having a tongue extending therefrom into said slot and abutting an opposite end edge of said slot, said tongues lying in substantially the same plane and having a combined width not greater than the length of said slot, said tongues when superposed with respect to each other having a combined thickness not greater than the width of said slot, the portions of said tongues abutting said end edges of said slot having ears formed thereon, said ears extending opposite to each other and beyond said end edges, and means for fastening said clamp about another member whereby said another member is disposed between said leg portion and plates.

RUDOLPH W. STROBEL.

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