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H. E. WEBB

2,395,926

LINE GROUNDING CLIP

Filed Oct. 30, 1941

FIG. 1.

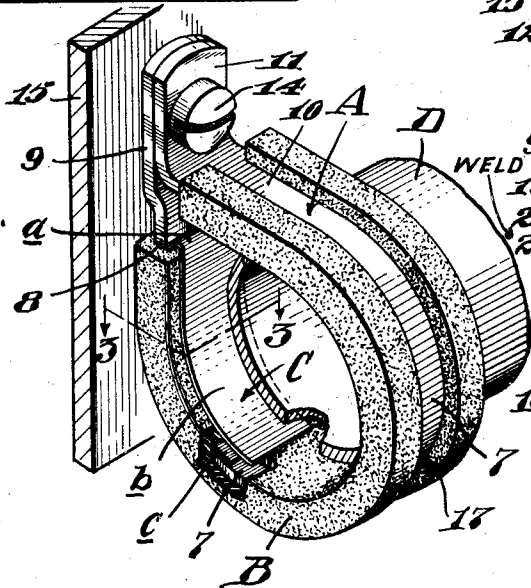


FIG. 2.

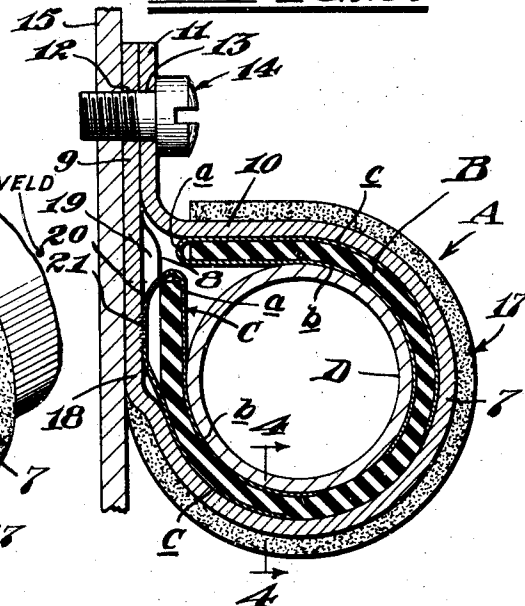


FIG. 3.

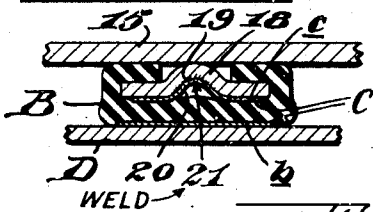


FIG. 4.

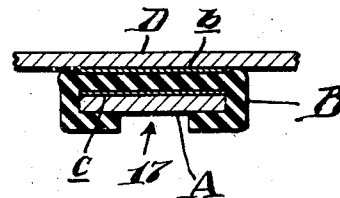
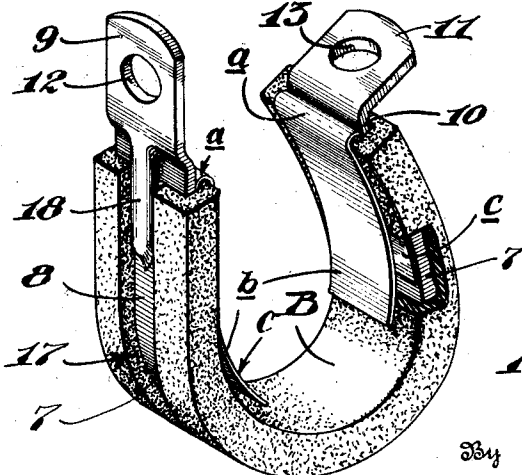


FIG. 5.



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UNITED STATES PATENT OFFICE

2,395,926

LINE GROUNDING CLIP

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4 Claims. (Cl. 174-40)

This invention relates to a support for metallic conduits of the character employed on aircraft and particularly pertains to improvements in the type of line supporting clip set forth in my copending application for United States Letters Patent Ser. No. 412,783 filed Sept. 29, 1941, which has matured to Patent No. 2,338,145 dated Jan. 7, 1944, and also of the type set forth in United States Letters Patent No. 2,215,283 issued to Paul W. Adler under date of September 17, 1940.

Conduit supports to which the invention pertains are characterized by the provision of a cushioned seat for a conduit carried by a metallic supporting strap together with a bonding or grounding strip of electrically conductive material interposed between the cushioned seat and a metallic conduit supported therein and electrically connected to the metallic strap which in turn is electrically connected to the metallic frame of the air craft so as to prevent the accumulation of static electricity in the line or conduit.

It is important in devices of this character to provide adequate electrical interconnection between the bonding strip and the supporting strap and the primary object of the present invention is to provide such a connection.

Another object is to provide a construction whereby the bonding strip may be positioned to extend on opposite sides of the cushioned seat so that a portion thereof will extend between said seat and the conduit thereon and another portion extend between said seat and the supporting strap without passing the bonding strip through the cushioned seat as heretofore commonly practiced and thus facilitating construction and assemblage of the support.

With the foregoing objects in view, together with such other objects and advantages as may subsequently appear, the invention is carried into effect as illustrated by way of example in the accompanying drawing, in which:

Fig. 1 is a perspective view in vertical section of the clip showing it as applied and with portions broken away;

Fig. 2 is a view in vertical section of the clip showing it as applied;

Fig. 3 is a view in cross section taken on the line 3-3 of Fig. 1 as seen in the direction indicated by the arrows;

Fig. 4 is a detail in cross section taken on the line 4-4 of Fig. 2;

Fig. 5 is a perspective view of the clip with portions broken away showing it as detached.

Referring to the drawing more specifically A indicates generally a metallic conduit supporting strap here shown as in the form of a loop and as having an intermediate arcuate portion 7 merging at one end in a straight tangentially extending end portion 8 terminating in an outwardly off-set ear 9 while the other end of the arcuate portion 7 merges into a tangentially extending straight portion 10 ending in an angularly disposed ear 11 adapted to overlie and seat on the off-set ear 9.

The ears 9 and 11 are formed with apertures 12 and 13 respectively adapted to be positioned in register with each other when the ear 11 is seated on the ear 9 and which apertures are designed to receive a bolt 14 by which the strap may be secured to a metallic frame member 15 with the off-set ear 9 seating on the latter.

Extending over the inner face of the arcuate portion 7 of the strap and projecting along the tangential straight portions 8 and 9 is a cushioning seat B formed of a suitable resilient material such as "neoprene," rubber, or the like, and which cushioned seat may be affixed to and carried by the strap A in any suitable manner. As here shown the cushioned seat is formed of a strip of material of channelled cross section and having a T-slot 17 extending throughout the length thereof in which the strap A is positioned with the open side of the T-slot 17 extending along the outer periphery of the strap A. The cushioned seat thus extends over substantially the entire inner surface of the looped portion of the strap and also around the edges thereof.

The tangential end portion 8 of the strap is formed with a longitudinally extending reinforcing rib 18 projecting in continuation of the connected portion of the ear 9 intermediate the edges of the strap, the outer face of which rib is adapted to seat on the frame member 15 as shown in Fig. 2 and the inner face of which rib is contoured to provide a longitudinally extending recess 19 on the inner face of the tangential end portion 8 of the strap and which recess 19 underlies a substantial length of the contiguous end portion of the cushioned seat B.

A thin flat strip C of electrically conductive metal is arranged with a portion thereof overlying the inner periphery of the cushioned seat B to effect electrical contact with a metallic conduit D imposed on the seat, and having another portion in electrically conductive contact with the strap A so as to act as an electrical ground-

ing or bonding connection between the conduit D and the frame member 15 through the clip.

Generally considered the features of construction and arrangement above recited are old in the art and broadly are not my invention; the essence of my present invention residing in the provision of a highly advantageous way of constructing and mounting the electrically conductive or bonding strip C. In carrying out the invention the thin strip C which is pliable is bent upon itself intermediate its ends providing a bend *a* and portions *b* and *c* leading therefrom, thus forming a forked structure which is positioned astride either or both ends of the cushioned seat with the termination of the seat proximate the bend *a* and so that one portion *b* will overlie the inner periphery of the seat, while the portion *c* will extend between the seat and its encompassing strap A.

By this arrangement an electrically conductive surface is provided on the opposed faces of the cushioned seat leading over an end thereof and without passing through the seat as in constructions heretofore employed, thus obviating formation of holes in the cushioned seat and threading of the conductor there through as now commonly practiced.

The strip C is formed of a width less than that of the cushioned seat and is centered relative to the latter so that its side margins will be inset relative to the side margins of the seat whereby when the strap A is tightly clamped around a conduit D the strip will be impressed into the faces of the cushioned seat with its edges abutted by portions of the seat thus confining portions of the strip and thereby securely holding it against displacement.

Each terminus of the cushioned seat may and preferably are thus equipped with an electrically conductive or bonding strip. In applying the bonding strip to the end portion of the cushioned seat overlying the end portion 8 of the strap an outward extrusion 20 is formed on the outer portion of the strip contiguous the bend *a* which is arranged to protrude into the recess 19 on the strap and is formed to conform to the wall of the latter so as to provide an interlock between the strip and strap such as to hold the bent end portion of the strip protruding from the portion embedded from lateral shifting.

In order to effect positive electrical connection between the strip and the strap a spot weld 21 is applied in a fashion to fasten the strip to the strap. This weld 21 is preferably applied to the extrusion 20 to anchor the latter in the recess 19. By reason of the interengagement of the wall of the extrusion 20 with that of the recess 19 serving to hold the strip against lateral displacement, the weld 21 will be protected against rupture as might occasion on lateral stress being applied to the bonding strip and which stress occurs when threading the clip on the conduit or threading the conduit through the clip in applying the latter.

In applying the bonding strip C to the ends of the cushioned seat it may be put in place by initially positioning a length of the strip along one side of the cushioned seat before applying the latter to the strap and when bending the strip around the ends of the seat and extending the then free end portion along the other face of the cushioned seat; one of the lengths of the strip leading from the bend thereof being positioned in the channel 17 to extend along the bottom thereof.

In assembling the clip the strap A is initially formed straight with the ear 9 off-set and ear 11 bent outwardly; the strap being subsequently bent into its looped or U-shaped form as shown in Fig. 5 after application of the cushioned seat and the bonding strips thereto. Where the bonding strip is to be welded to the strap, which may not necessarily be required, the strip in a substantially straight form is laid on the inner face of the strap with the end portion of the strip designed to be interposed between the cushioned seat and the strap overlying the latter lengthwise thereof with the other end portion extending outwardly from the end of the strap. The strip may then be readily affixed to the strap by one or more spot welds 21 at any suitable points along the overlying portion of the strip. Where the strip is formed with the extrusion 20 and is to be welded to the strap the end portion of the strip carrying the extrusion is first positioned on the inner face of the strap with the extrusion seated in the recess 19 and with the then outer end of the strip extending outwardly along the outer end portion 8 of the strap. The spot weld 21 may then be readily applied to the extrusion 20. The cushioned seat B is then positioned on the strap, it being initially disposed on the latter by inserting the strap in its straight formation sideways into the T-slot 17 in the cushioned seat. The outer end portion of the bonding strip C is then bent inwardly to extend over the inner surfaces of the cushioned seat lengthwise thereof. The assembly is then bent around a mandrel to impart a substantially U-shaped formation thereto as shown in Fig. 5.

In applying the clip to support a conduit a desired number of the clips are initially threaded onto a conduit D with the clips in their open position as shown in Fig. 5, the clip assemblies being thus slid longitudinally along the conduit such as to effect a slight abrading action on the surfaces of the bonding strips presented to the conduit thereby effecting polishing of such surfaces and the removal of at least a major portion of surface oxidation from the strips so as to insure good electrical contact between the strips and the conduit when clamped on the latter and which contact is essential to the proper grounding of a static current.

On the clip being disposed at the desired position along the length of the conduit D the ears 9 and 11 of the clip are brought toward each other with the openings 12 and 13 therein aligned whereupon the bolt 14 is passed through the openings and engaged with the frame member 15; tightening of the bolt drawing the strap and the cushioned seat tightly against the conduit and in a fashion to compress the cushioned seat and to impress the terminations of the portions *a* and *b* of the bonding strip into the cushioned seat as before described thus securely binding the bonding strip in place.

It will be apparent from the foregoing that by the construction set forth I have provided an effective grounding connection between the conduit and the supporting strap around the cushioned seat interposed between the strap and conduit without the necessity of passing the bonding strip through the cushioned seat and in a fashion whereby the bonding strip will be securely held in place.

While I have shown and described a specific embodiment of the invention, I do not limit myself to the exact details of construction and arrangement shown, but may employ such

changes and modifications of the parts and their arrangements as occasion may require coming within the meaning and scope of the appended claims.

I claim:

1. In a line grounding clip embodying a metallic supporting strap and a cushioned seat carried by said strap and extending along the inner periphery thereof; an electrically conductive strip bent intermediate its ends and positioned astride an end of said cushioned seat with one of its end portions extending between said seat and said strap and with its other end portion overlying the outer face of said seat for interposition between said seat and a conduit imposed on the latter to effect electrical connection between said conduit and said strap around the terminus of said cushioned seat, said strap being formed with a longitudinally extending recess on its inner periphery, and an extrusion on said strip projecting into said recess to hold the strip against lateral shifting relative to said strap.

2. In a line grounding clip embodying a metallic supporting strap and a cushioned seat carried by said strap and extending along the inner periphery thereof; an electrically conductive strip bent intermediate its ends and positioned astride an end of said cushioned seat with one of its end portions extending between said seat and said strap and with its other end portion overlying the outer face of said seat for interposition between said seat and a conduit imposed on the

latter to effect electrical connection between said conduit and said strap around the terminus of said cushioned seat, said strap being formed with a longitudinally extending recess on its inner periphery, an extrusion on said strip projecting into said recess, and means effecting a positive connection between the extrusion of said strip and the walls of said recess.

3. In a line grounding clip, a metallic conduit supporting strap having a longitudinally extending recess on its inner periphery, an electrically conductive strip bent intermediate its ends, an extrusion on said strip adjacent the bend thereof extending into said recess, and a cushion seat extending along the inner periphery of said strap having an end portion extending between the end portions of said electrically conductive strip and terminating adjacent the bend in the latter, there being a positive connection between said extrusion and the wall of said recess.

4. In a line grounding clip, a metallic line supporting strap, a cushioned seat lining said strap, an electrically conductive strip having a portion overlying said cushioned seat and disposed to contact a conduit seated on said seat and having another portion overlying an end of said cushion seat and extending between the latter and said strap, whereby said portions of said strip will be pressed into said cushion on clamping said strap around a conduit.

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