Aug. 4, 1942. H. R. ELLINWOOD 2,291,887

STRIP FOR FORMING CONDUIT SUPPORTS

Filed March 30, 1940

FIG. 1.

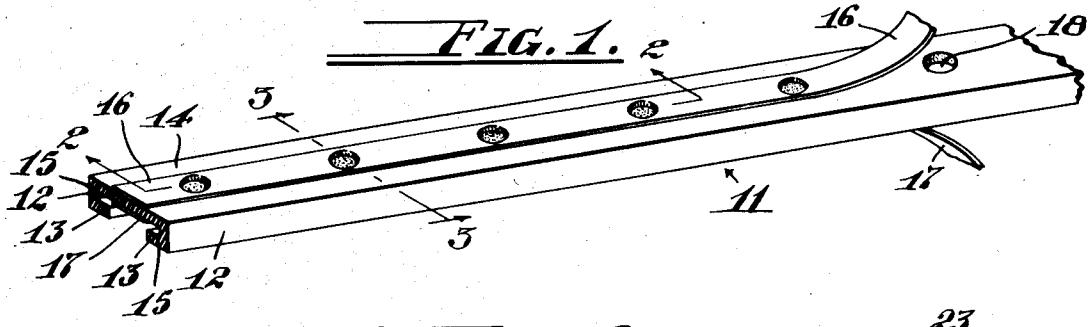


FIG. 2.

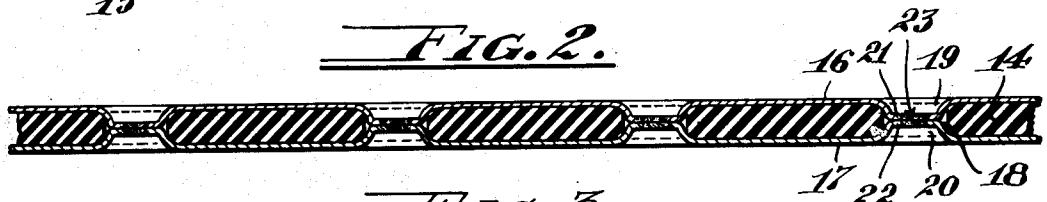


FIG. 3.

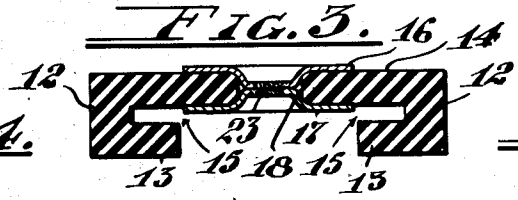


FIG. 4.

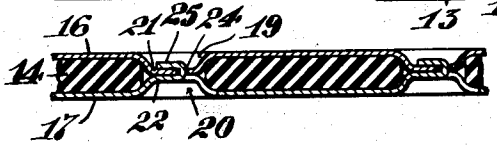


FIG. 6.

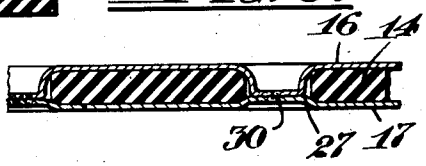


FIG. 5.

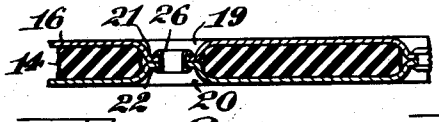


FIG. 7.

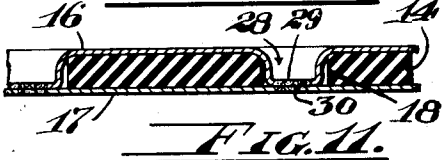


FIG. 8.

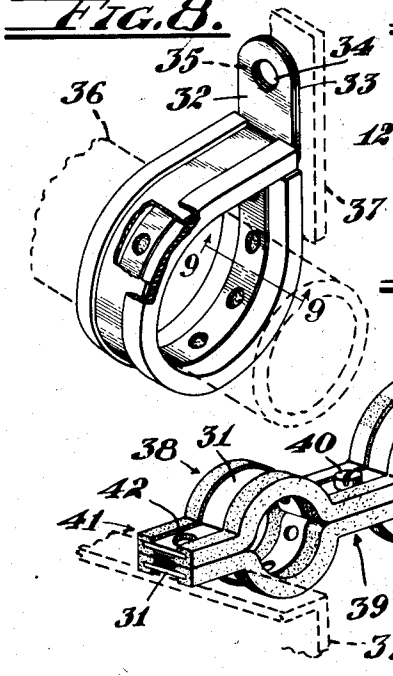


FIG. 9.

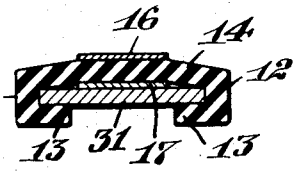


FIG. 11.

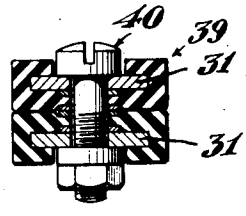
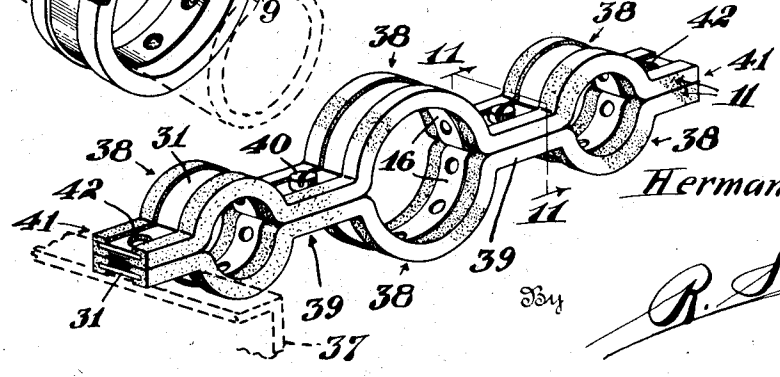


FIG. 10.



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Attorney

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UNITED STATES PATENT OFFICE

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STRIP FOR FORMING CONDUIT SUPPORTS

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Application March 30, 1940, Serial No. 326,994

6 Claims. (Cl. 174—40)

This invention relates to the construction of supports or conduits of the character set forth in the United States Letters Patent of Paul W. Adler, Number 2,227,528 issued January 7, 1941, for "Conduit support," and Number 2,215,283, issued September 17, 1940, for "Line supporting clip," and which conduit supports are especially applicable for use in the construction of air craft as a means for resiliently supporting metallic conduits employed in conducting fluids, such as the oil and fuel lines, air lines, and electrical current conductors, and where it is desirable to effect electrical grounding of the conduits in a fashion to prevent the accumulation of static in electricity in the conduits.

A primary object of the present invention is to provide an improved construction in a resilient and electrically conductive strip for forming conduit supports, whereby a flexible strip, formed of resilient cushioning material such as rubber, rubber composition, or synthetic rubber composition such as "Neoprene" or the like, may be fitted on opposite sides thereof with electrically conductive strips and in a fashion whereby the electrically conductive strips are electrically connected together at close intervals along the length of the flexible and resilient strip imposed therebetween, whereby adequate electrical grounding of one or more metallic conduits carried in a support formed of the strip will be effected.

Another object is to provide a mode of constructing a combined cushioning and electrically conductive ribbon such as to facilitate production thereof and also in a fashion to facilitate conversion of the ribbon into conduit supporting devices.

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 of a length of the formed strip;

Fig. 2 is a detail in longitudinal section taken on the line 2—2 of Fig. 1;

Fig. 3 is a view in cross section taken on the line 3—3 of Fig. 1;

Figs. 4, 5, 6 and 7 are details in longitudinal section depicting modified forms of means employed in uniting a pair of electrically conductive strips through a resilient strip interposed therebetween;

Fig. 8 is a perspective view depicting the manner of mounting the strip to form a conduit supporting clip;

Fig. 9 is a detail in cross section taken on the line 9—9 of Fig. 8;

Fig. 10 is a perspective view depicting the manner of assembling the strip in forming a bar-like support for a plurality of parallel conduits;

Fig. 11 is a detail in cross section taken on the line 11—11 of Fig. 10.

Referring to the drawing more specifically 11 indicates generally a ribbon or length of flexible resilient material such as rubber, rubber composition, synthetic rubber, and compositions thereof, such as "Neoprene" or the like.

As here shown the ribbon 11 is formed on its longitudinal margins with parallel flanges 12 which flanges are formed on their outer margins with inturned flanges 13 the inner margins of which are spaced apart and the inner faces of which are spaced from the adjacent face of the main wall portion 14 of the ribbon to provide the ribbon with opposed inwardly opening marginal channels 15 as particularly shown in Fig. 3.

Arranged on the opposite faces of the wall portion 14 of the ribbon 11 is a pair of electrically conductive pliable metallic strips 16 and 17, which strips extend longitudinally of the ribbon 11 and are co-extensive therewith. The strips 16 and 17 are preferably flat and formed of a width that is preferably slightly less than the width of the space extending between the inner margins of the flanges 13, particularly as to the strip 17 so that the latter may be readily positioned against the inner side of the wall 14.

An important feature of the invention resides in effecting electrical connection between the strips 16 and 17 through the wall portion 14 of the ribbon 11 at closely spaced intervals throughout the length of the latter, and to which end the wall 14 is formed with openings 18 at suitably spaced intervals throughout the length thereof, and which openings are preferably circular in outline and disposed in alignment midway between the side margins of the ribbon.

I have evolved several satisfactory ways of effecting electrical interconnection between the strips 16 and 17 through the openings 18, one of which is shown in Figs. 1, 2 and 3 of the drawing and consists in forming each of the metallic strips 16 and 17 with protrusions 19 and 20 respectively which project from one side of the strip at such spaced intervals throughout the length thereof that such protrusions will register with the openings 18 formed in the ribbon wall 14 and project into such openings with the pro-

trusions 19 and 20 extending equi-distant into the openings and with the end walls 21 and 22 thereof abutting each other mid-way of the thickness of the wall 14. The abutting end walls 21 and 22 of the protrusions are then securely and electrically connected together by spot-welds 23. By this construction the strips 16 and 17 are complementary. The protrusions are preferably formed by indenting the strips as by a stamping operation.

In the construction shown in Fig. 4 the end walls 21 of the protrusions 19 are formed with openings 24, and struck from the walls of the protrusions 20 are tongues 25 which are passed through the openings 24 and bent to overlie the walls 21 to effect interlocking engagement between the strips 16 and 17 in the openings 18.

In the construction shown in Fig. 5 the end walls 21 and 22 of the protrusions 19 and 20 are united by rivets 26 which are passed through the walls 21 and 22 and are beaded over the outer faces thereof.

While the interconnection of the strips 16 and 17 is shown as effected mid-way of the thickness of the ribbon wall 14 as shown in Figs. 1 to 5 inclusive, such interconnection may be effected at a point spaced slightly inward from one side of the wall 14 as indicated at 27 in Fig. 6, in which arrangement the protrusions 19 or 20 are formed of greater depth than the companion protrusions 19 or 20.

In some instances it may be desirable to form protrusions on only one of the strips as indicated in Fig. 7, wherein the strip 16 is shown as formed with protrusions 28 of sufficient depth that the end wall 29 thereof will extend through the opening 18 in the ribbon wall 14 to meet the ribbon 17. The strips 16 and 17 in the constructions shown in Figs. 6 and 7 are united as by spot-welds 30 or in any other suitable fashion to afford an electrically conductive interconnection between the strips through the resilient ribbon.

In the application of the invention a suitable length of the ribbon 11 equipped with the electrically conductive strips 16 and 17 is employed in formation of a conduit supporting clip as shown in Fig. 8 by positioning a predetermined length of the ribbon 11 astride a strip 31 of supporting metal as shown in Fig. 9; the strip 31 being engaged in the channel 15 and overlapped by the inturned flanges 13 of the ribbon and with the electrically conductive strip 17 seating on the strip 31 and held in intimate contact therewith under the tension then imparted to the resilient ribbon. The strip 31 is then bent into a loop with the strip 31 outermost so as to dispose the electrically conductive strip 16 interiorly of the loop; the supporting strip 31 being formed so that the end portions 32 and 33 thereof will protrude from the end of the ribbon 11, which end portions are arranged to overlie each other and are formed with an opening 34 for the reception of a bolt or screw 35 whereby the loop on being wrapped around a conduit 36 may be fastened to a suitable metallic supporting member 37 by the bolt or screw.

By this construction the conduit 36 will be supported in a substantial fashion by a metallic support comprising the supporting member 37 and supporting strip 31 each of which are formed of metal but with a cushioning body of resilient material interposed between the conduit and the metallic supporting structure.

Since the cushioning element is inherently insulative against electrical current, it is necessary to provide adequate electrical connection between the metallic conduit 36 and its metallic support through the cushioning element in order to obviate accumulation of static electricity in the conduit 36. The arrangement of the electrically conductive strips 16 and 17 herein set forth serve to afford adequate electrical conductivity between the conduit 36 and the metallic supporting members through the vibration insulating or cushioning body afforded by the resilient ribbon or strip 11; the electrically conductive strip 16 seating on and substantially encompassing the conduit 36, the electrically conductive strip 17 seating on the supporting strip 31 throughout the length of the cushioning element, and the electrical connections between the strips 16 and 17 through the openings 13 of the cushioning element, serving to afford adequate electrical connection between the conduit 36 and metallic support and to assure against accumulation of static electricity in the conduit.

The invention is also applicable for use in affording a support of the bar type as illustrated in Figs. 10 and 11, by employing a pair of the ribbons 11 with their associated electrically conductive strips 16 and 17 and the supporting strips 31 and arranging such pair of ribbons face to face with the channel sides thereof outermost, and bending a length of the ribbon in opposed arcuate or loop sections 38 to form conduit encircling or engaging loops. Any suitable number of such loops 38 may be formed in a single conduit supporting unit, three of such loops being shown in the structure depicted in Fig. 10. Where a plurality of such loops are provided in a single unit, adjacent loops are spaced apart by a web 39 of suitable length composed of overlying straight portions of the ribbon 11. The webs 39 thus formed are interconnected by bolts 40 as shown in Fig. 11 and the unit is fastened to a metallic supporting member by forming end webs 41 on the unit fitted with holes 42 through which bolts or screws are passed and engaged with a supporting member. The interconnected electrically conductive strips 16 and 17 serve in cooperation with the supporting strip 31 to effect electrical connection between the conduit or conduits carried by the unit and the metallic supports to which the latter is applied, in the fashion above described relative to the structure shown in Fig. 8. In this instance a series of metallic conduits may be collectively supported in a single unit and electrically interconnected and collectively grounded through the supporting unit.

The invention contemplates forming the resilient ribbon with associated electrically conductive strips 16 and 17 of indeterminate or predetermined length and which may be marketed as an article of manufacture to be later cut into short lengths and applied to the metallic supporting strip 31 in effecting production of finished conduit supports. However, it is obvious that the resilient strip 11 with the electrically conductive strips 16 and 17 applied thereto may be initially formed and equipped with the supporting strip 31 preparatory to fabricating the assembly into a conduit support.

While I have shown and described specific embodiments of my invention I do not limit myself to the exact details of construction set forth, and the invention embraces such changes, modifications and equivalents of the parts and their formation and arrangement as come within the purview of the appended claims.

I claim:

1. A strip for forming conduit supports comprising a ribbon of resilient cushioning and electrically insulating material, a bare electrically conductive strip extending longitudinally of said ribbon on each of opposed sides thereof, and means electrically interconnecting said strips at spaced intervals along the lengths thereof.

2. A strip for forming conduit supports comprising a ribbon of resilient cushioning and electrically insulating material, a bare electrically conductive strip extending longitudinally of said ribbon on each of opposed sides thereof, and means electrically interconnecting said strips through said ribbon at spaced intervals throughout the length of said strips.

3. A strip for forming conduit supports comprising a resilient ribbon of electrically insulating material, a pair of bare electrically conductive metallic strips arranged on each of the opposed sides of said ribbon and extending longitudinally thereof coextensive therewith, and electrical interconnections between said strips at intervals along the lengths thereof.

4. In a conduit support forming strip, a length of flexible ribbon formed of resilient cushioning and electrically insulating material having openings at spaced intervals throughout the length thereof, a bare metallic electrically conductive strip on each of the opposed sides of said ribbon extending longitudinally thereof, and means electrically interconnecting said strips through the openings in said ribbon.

5. A strip for forming conduit supports comprising a ribbon of resilient and electrically insulating material formed with openings therethrough at spaced intervals throughout the length thereof, a bare electrically conductive strip on each of the opposed sides of said ribbon and extending longitudinally thereof, means electrically interconnecting said strips through said openings; said ribbon being formed with opposed inwardly opening channels on a side thereof, and a metallic supporting strip engaged in said channels and extending longitudinally of said ribbon in contact with at least one of said electrically conductive strips.

6. A strip for forming conduit supports comprising a ribbon of resilient and electrically insulating material formed with openings therethrough at spaced intervals throughout the length thereof, a bare electrically conductive strip on each of the opposed sides of said ribbon and extending longitudinally thereof, protuberances on at least one of said strips projecting into the openings in said ribbon, and means engaging said protuberances and electrically connecting said strips.

HERMAN RAY ELLINWOOD.