May 29, 1945. H. L. ZIMMERMAN 2,377,061

STRAP STRUCTURE

Filed April 19, 1943

FIG. 1.

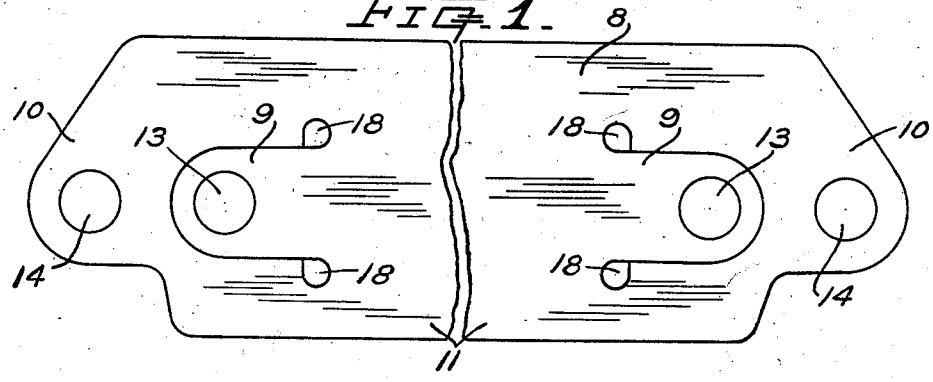


FIG. 2.

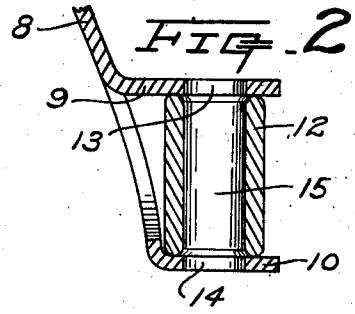
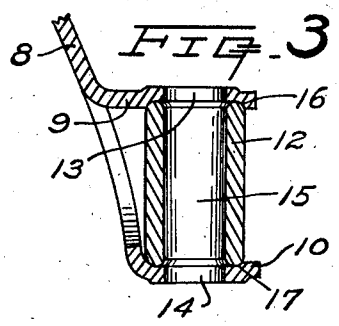


FIG. 3.



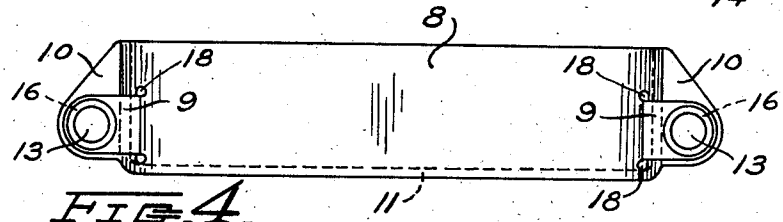


FIG. 4.

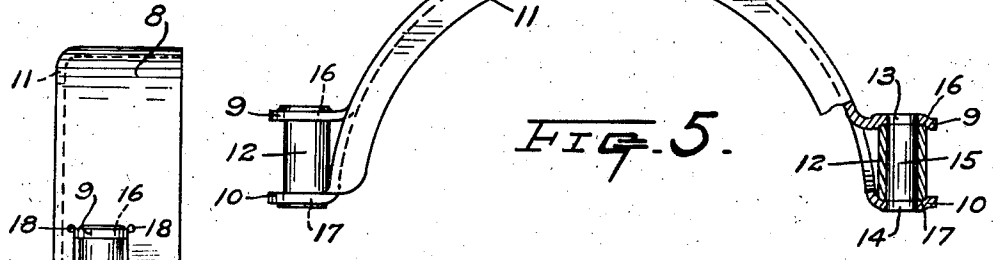


FIG. 5.

FIG. 6.

INVENTOR.
H. L. Zimmerman
BY Lieber & Lieber
ATTORNEYS.

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STRAP STRUCTURE

Herbert Leslie Zimmerman, Shorewood, Wis., assignor to The Fulton Company, West Allis, Wis., a corporation of Wisconsin

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6 Claims. (Cl. 248—74)

The present invention relates in general to improvements in the art of metal working, and relates more specifically to an improved strap structure and an improved mode of constructing the same.

Generally defined, an object of my invention is to provide an improved sheet metal strap assembly.

In the manufacture of airplanes as well as other industries, wherein various parts are assembled and held in place by means of semi-circular straps formed of light but strong sheet-metal such as aluminum or the like, it was heretofore customary to form these straps of curved sheet-metal bands having attaching or clamping bosses welded to the opposite extreme ends thereof. This prior method of constructing such straps was not only costly and tedious, but also resulted in the production of strap assemblies which were not of uniform and neat appearance, and which were frequently weakened by the welding operations. In many instances this weakening was not detected until after the straps were applied to the final assemblages, when they would break either while being clamped in position or after the assemblages were completed and placed in service. In the case of airplanes, this rupture of the straps may obviously result in serious accidents, so that the previous welding method of manufacturing these strap and boss assemblies has been extremely objectionable.

It is therefore a more specific object of the present invention to provide an improved mode of manufacturing clamping strap structures having attaching bosses at the ends thereof and which may be formed of light and strong sheet-metal such as aluminum, with the aid of punches and dies and without resorting to welding or other heating operations.

Another specific object of this invention is to provide an improved strap structure which is simple, strong and durable in construction, and which may be readily produced by quantity production methods whereby all straps are uniform and accurate in structure.

These and other specific objects and advantages of the present invention will be apparent from the following detailed description.

A clear conception of the several features involved in my present improved mode of strap production, and of the specific construction of the improved strap structures, may be had by referring to the drawing accompanying and forming a part of this specification wherein like references characters designate the same or similar parts in the various views.

Fig. 1 is a fragmentary plan view of one of the blanks utilized in my improved mode of strap production, showing the sheet-metal blank punched preparatory to distortion thereof into semi-circular strap formation;

Fig. 2 is an enlarged central section through one end of a strap assembly, showing one of the boss forming tubes in place preparatory to final attachment thereof to the strap end;

Fig. 3 is a sectional view similar to that of Fig. 2, showing the boss forming tube finally clamped between the integral flanges at the end of the strap;

Fig. 4 is a top view of a completed strap assembly;

Fig. 5 is a side elevation of a completed strap assembly showing one end thereof in section; and

Fig. 6 is an end view of one of the completed strap structures.

While the invention has been shown and described herein as being especially applicable to the production of semi-circular sheet-metal strap structures formed of metal such as aluminum, and especially applicable to the airplane industry, it is not my desire or intent to thereby unnecessarily restrict the scope or utility of the improvement which may obviously be more generally applied to the production of straps for other purposes.

Referring to the drawing, the improved sheet-metal strap structure shown in Figs. 4, 5 and 6, is preferably formed of light metal having high tensile strength, such as aluminum, and comprises in general a semi-circular band 8 having integral laterally spaced outwardly directed flanges 9, 10 at its opposite ends and also being provided with an integral side flange 11; and a spacing tube 12 interposed between each set of the end flanges 9, 10. The flanges 9, 10 are provided with alined circular holes 13, 14 respectively, with which the central opening 15 of the adjacent tubes 12 are also accurately alined, and the opposite ends of each tube 12 are snugly confined within recesses 16, 17 formed in the respective flanges 9, 10.

Each of the strap bands 8 together with its flanges 9, 10, 11 is preferably formed of a single flat sheet of metal by substantially the following method. The blanks are formed with the aid of punches and dies, as shown in detail in Fig. 1, with the band 8 and flanges 9, 10, 11 disposed in a common plane and having the circular holes 13, 14 punched through their respective end

flanges 9, 10; and in order to prevent tearing of the metal a small hole 18 may be pierced at each of the opposite sides of each flange 9. The successive blanks may thereafter be distorted to properly curve each band 8, to dispose the side flange 11 approximately perpendicular to the band portion, and to position the plane end flanges 9, 10 outwardly and spaced apart so as to snugly receive the bushings or tubes 12 therebetween as illustrated in Fig. 2. When the blanks have been thus distorted and the spacing tubes 12 have been temporarily assembled between the sets of end flanges 9, 10, the flange and tube assemblies may be subjected to a punch which is adapted to press the opposite ends of each tube 12 into the adjacent flanges 9, 10 so as to further distort these flanges and to form the retaining recesses 16, 17, thereby snugly confining each bushing or tube 12 between the corresponding strap flanges 9, 10 with its central opening 15 in accurate alinement with the flange holes 13, 14, and completing the successive bosses.

The successive strap structures when thus completed may be used for diverse purposes, by applying clamping bolts or studs and nuts, to the boss assemblies at the opposite ends thereof. When such clamping elements are applied to the boss structures of the improved straps, the flanges 9, 10 are obviously firmly clamped against the opposite ends of the intervening spacing sleeves or tubes 12, and the bosses are subjected to compression so that the tubes will remain confined within their retaining recesses 16, 17. The band 8 which is re-enforced by the side flange 11, may be placed under considerable tension without tearing or rupturing by virtue of the provision of the holes 18 at the inner ends of the flanges 9 which have been struck out of the body of the blank, and also due to the fact that the flanges 9, 10 are formed integral with the band ends and no heating operation such as welding or soldering, is utilized in producing the strap assemblages.

From the foregoing detailed description it will be apparent that my present invention provides an improved mode of producing attaching straps having clamping bosses at the opposite ends thereof, from relatively thin sheet material, with the aid of punches and dies and without utilizing heat. The successive strap structures can be quickly and accurately produced so that absolute accuracy and uniformity result, and although the straps appear quite frail and light, they are adapted to effectively resist considerable pressure without breaking or becoming undesirably distorted. The improved attaching straps may also be constructed with the aid of relatively simple machinery and the end bosses thereof are extremely strong and are properly positioned for reception of the attaching elements. The invention has proven highly successful in actual commercial use, especially as applied to the manufacture of airplane parts, and it has been found that the straps manufactured in accordance with this improvement may also be produced at minimum cost and at maximum speed.

It should be understood that it is not desired to limit this invention to the exact details of construction or to the precise steps of the method, herein shown and described, for various modifications within the scope of the claims may occur to persons skilled in the art.

I claim:

1. An article of manufacture, comprising, a sheet-metal strap having integral outwardly directed approximately parallel sets of flanges at its opposite ends, the flanges of each set having alined holes therein, and a tubular spacer snugly confined between each set of said end flanges concentric with said alined holes.

2. An article of manufacture, comprising, a longitudinally curved sheet-metal strap having integral outwardly directed approximately parallel sets of flanges at its opposite ends, each flange being provided with a central hole and an annular recess formed concentric with the hole and recess of the other flange of the same set, and a tubular spacing sleeve snugly confined in the flange recesses of each set centrally of the adjacent holes.

3. An article of manufacture, comprising, a sheet-metal longitudinally curved strap having integral outwardly directed approximately parallel sets of flanges at its opposite ends, the fianges of each set having alined holes therein, a tubular spacer snugly confined between each set of said end flanges in alinement with said alined holes, and a plane side flange formed integral with the strap and extending inwardly from end to end thereof.

4. An article of manufacture, comprising, a longitudinally curved sheet-metal strap having integral outwardly directed approximately parallel sets of flanges at its opposite ends, each flange being provided with a central hole and an annular recess formed concentric with the hole and recess of the other flange of the same set, a tubular spacing sleeve snugly confined in the flange recesses of each set centrally of the adjacent holes, and a longitudinally curved side flange formed integral with the strap and extending from one set of flanges to the other.

5. An article of manufacture, comprising, a longitudinally curved sheet-metal strap having integral outwardly directed approximately parallel flanges near an end thereof each having a hole therein coaxial with the hole in the other flange, and a tubular spacer confined between said flanges in axial alinement with said holes and being disposed tangential to the curved strap.

6. An article of manufacture, comprising, a longitudinally curved sheet-metal strap having integral outwardly directed approximately parallel flanges near an end thereof each having a hole therein coaxial with the hole in the other flange, each of said flanges also having an annular recess adjoining the hole therein and facing the other flange, and a tubular spacer having its opposite ends confined within said flange recesses and being disposed in axial alinement with said holes and tangential to said end of the curved strap.

HERBERT LESLIE ZIMMERMAN.