Aug. 27, 1940. J. F. LEVAN 2,212,715

METHOD OF AND MACHINE FOR FORMING TUBING

Original Filed Jan. 26, 1938

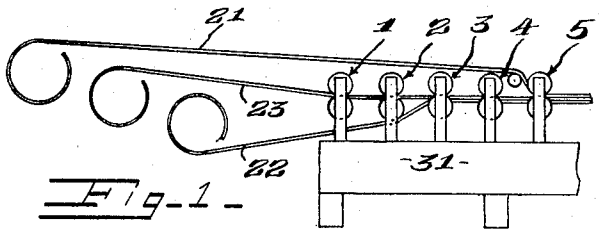


Fig-1-

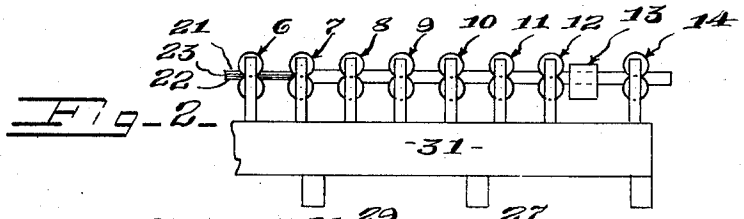


Fig-2-

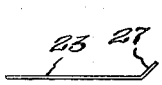


Fig-3-

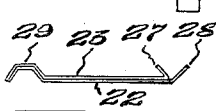


Fig-4-

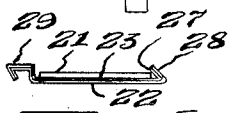


Fig-5-

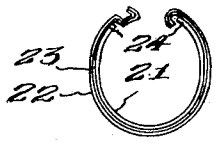


Fig-6-

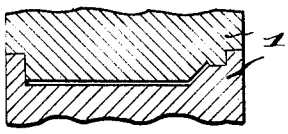


Fig-7-

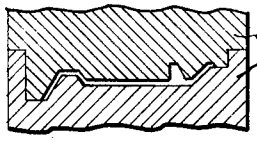


Fig-8-

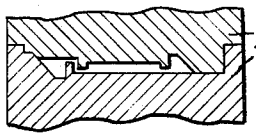


Fig-9-

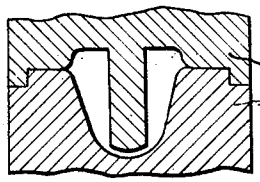


Fig-10-

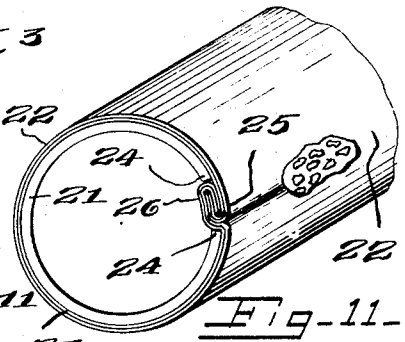


Fig-11-

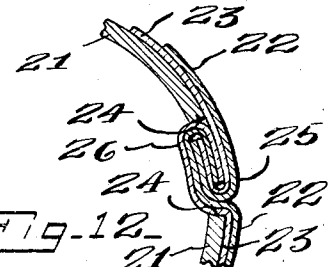


Fig-12-

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UNITED STATES PATENT OFFICE

2,212,715

METHOD OF AND MACHINE FOR FORMING TUBING

John F. Levan, Elkhart, Ind., assignor to Excel Curtain Company, Elkhart, Ind., a corporation of Indiana

Original application January 26, 1938, Serial No. 187,030. Divided and this application May 12, 1938, Serial No. 207,556

4 Claims. (Cl. 113—34)

This invention relates to tubes used primarily for rails, handholds, uprights, and tubular framing for different articles, as the frames of seats, such as are used in motor vehicles, buses, chairs, etc., or in any situation where a tube with an outer smooth polished or lustrous surface is desirable, and has for its object the method of forming such a tube from at least three flat strips and a machine for carrying out the method continuously by passing the strips in at one end of consecutively arranged forming tools and delivering the finished strip at the other end of the sets, all in one continuous operation.

The tube forms the subject matter of the application of John F. Levan, Serial No. 187,030, filed January 26, 1938 of which application this is a division.

The invention consists in the steps and in the machine hereinafter set forth and claimed.

In describing this invention, reference is had to the accompanying drawing in which like characters designate corresponding parts in all the views.

Figures 1 and 2 are diagrammatic views of the machine for forming the three-piece tube, Figure 2 being a continuation of Figure 1.

Figures 3, 4, 5 and 6 illustrate the operations of the successive forming tools, Figure 3 showing the operation on one of the strips, as the intermediate strip, Figure 4 showing the operation on the intermediate strip and the veneer strip together, Figure 5 on all three strips prior to the rolling operation, and Figure 6 showing the operation on all three strips during the rolling and final operation.

Figure 7 is a fragmentary cross-sectional view through the forming dies or rolls acting individually on the intermediate strip.

Figure 8 is a view similar to Figure 7 of the second set of forming dies acting on both the intermediate and the veneer strips to form and nest the lock seam flange thereon.

Figure 9 is a fragmentary cross-sectional view of the dies for operating on all three strips and forming the same into the form shown in Figure 5.

Figure 10 is a cross-sectional view of the dies or rolls for rolling up the three strips into the form shown in Figure 6.

Figure 11 is an isometric view of a section of the tube formed by this method and apparatus.

Figure 12 is an enlarged fragmentary sectional view of the tube through the lock seam joint.

The method consists generally in passing the body, veneer and intermediate strips in one continuous path and while so passing, forming marginal lock seam flanges on the intermediate strip and the veneer strip, successively bringing the intermediate and veneer strips together flatwise one on the other and nesting the flanges together, bringing the body strip flatwise on the intermediate strip between the nested flanges, forming the three strips into tubular formation and interlocking the flanges together.

More specifically, the method consists in continuously passing the three flat strips to successively-arranged sets of forming tools operating successively, to form the margins of the veneer strip and the intermediate stiffening strip into lock seam flanges and nest the flanges on like margins of each strip together, to bring the intermediate and veneer strips with their flanges nested and the body strip together, one lying flatwise on the other, to roll the three strips into tubular form, and to interlock the nested flanges on the side margins of the intermediate and veneer strips into a lock seam between the edges of the rolled up body strip.

The machine comprises a suitable base having successively arranged forming tools or forming dies or rolls, the first set consisting of successively arranged tools designated 1 and 2; the second set being designated 3 and 4; the third set, 5, 6, 7, 8, 9, 10 and 11. There is also a fourth set arranged in succession with the third set designated respectively 12, 13, and 14.

The finished article as a tube, Figures 11 and 12, comprises three pieces, an inner tubular body 21, an outer veneer strip 22 of metal, as stainless steel, capable of receiving and maintaining a polished lustrous finish, and an intermediate reinforcing tubular strip 23 for the veneer strip and being of a softer metal, as carbon steel, than the veneer strip, the outer and intermediate strips being co-extensive and having their margins nested and locked together by a lock seam joint.

The body 21 may be made of any desired thickness relatively cheap metal and is divided or slotted longitudinally with the edges 24 on opposite sides of the division or slot spaced apart to provide a recess for the lock seam joint. The outer strip 22 is of stainless steel and the intermediate strip 23 of a softer or tougher reinforcing metal. These outer strips 22, 23 are divided longitudinally and the two strips are substantially co-extensive with each other. The margins of the strips 22, 23 on one side of the line of division of said strips are folded reversely and

nested to form a hook-shaped loop at 25, and the other margins of said strips are folded and nested to form hook-shaped loops at 26. These two loops are hooked together to form a lock seam joint which is flattened into the slot between the edges 24 of the body strip 21. When interlocked, the lock seam joint consists of layers of stainless steel and reinforcing steel. The portions of the metal constituting the lock seam joint may be welded together and the outer surface of the stainless steel at the joint finished, so that the tube has a seamless appearance.

The dies are mounted on a suitable base 31. The first set of dies or rolls of the machine are of the form shown in Figure 7 and the intermediate strip 23 is fed from a suitable reel or other support between the dies 1, 2 forming the intermediate strip 23 with a marginal flange 27 (Figure 3). The veneer strip 22 is fed from a suitable reel to the second set of dies 3, 4 first to the dies or forming tools 3, to which is also being fed the intermediate strip 23 from the first set of dies or forming tools 1, 2 and the second set of dies 3, 4 are common to both the intermediate strip 23 and the veneer strip 22 and form the veneer strip with a flange 28 and both the intermediate strip 23 and the veneer strip 22 with nested flanges 29. The second set of dies or forming tools are of the form shown in Figure 8. The body strip 21 is fed from a suitable reel to the third set of forming tools 5 to 11 inclusive, and also the intermediate strip 23 and the veneer strip 22 nested together and coming from the second set of dies 3, 4 are fed with the body strip through the third set of dies 5 to 11 inclusive, this set of dies being of the form shown in Figure 9 and serving also to nest the flange 27 of the intermediate strip with the flange 28 of the intermediate strips and also nest the flanges at 29 together, as shown in Figure 5. Then the three pieces assembled, as in Figure 5, are passed through the dies 7 to 11 inclusive into the form shown in Figure 6, these dies being of the form shown in Figure 10. Thereafter, the tube is passed through the finishing dies 12, 13 and 14 completing the formation of the tube with the exception of the welding, if welding is performed, or bringing the tube into the form shown in Figure 11. The dies operate progressively and form the tubing consisting of three pieces complete in one continuous operation.

The dies, which for the most part or with the exception of the die 13, are rollers which are actuated in any suitable manner to feed the strips. The pulling force may also be applied to the finished end of the tube beyond the die 14.

This method and machine permits the use of metals of various tempers and hardness so that maximum strength is secured. It is obvious that by this method a soft strengthened material may be used capable of bending flat on itself at the portion forming the lock seam joint. It is also possible to use steel of very high tensile strength at the lock seam joint of metal of a high tensile strength to reinforce the lock seam joint, as the strength of the stainless steel veneer is not depended upon to give strength to the lock seam joint. The tube itself, when thus formed, may be made of any desired strength or weight by varying the thickness of the body strip and having a veneer of relatively expensive thin stainless steel reinforced by the intermediate strip.

What I claim is:

1. A machine for forming tubes from three strips, an inner body strip, an outer veneer strip, and an intermediate strengthening strip for the veneer strip, comprising sets of successively-arranged forming tools, the first set being individual to the intermediate strip to form a marginal lock seam flange thereon and the second set being common to the veneer strip and the intermediate strip with one lying on the other and operating to further provide lock seam flanges on the intermediate strip and to provide lock seam flanges on the veneer strip nested with those on the intermediate strip, the third set being common to all three strips and operating to roll all three strips into tubular formation.

2. A machine for forming tubes from three strips, an inner body strip, an outer veneer strip, and an intermediate strengthening strip for the veneer strip, comprising sets of successively-arranged forming tools, the first set being individual to the intermediate strip to form a marginal lock seam flange thereon and the second set being common to the veneer strip and the intermediate strip with one lying on the other and operating to further provide lock seam flanges on the intermediate strip and to provide lock seam flanges on the veneer strip nested with those on the intermediate strip, and the third set being common to all three strips and operating to roll all three strips into tubular formation and a fourth set operating to interlock the lock seam flanges of the intermediate and veneer strips into a lock seam joint to finish the assembled strips in circular form in cross-section.

3. A machine for forming tubes, each of which comprises an inner tubular body slotted longitudinally, an outer veneer strip of finishing material, and an intermediate strengthening strip for the veneer strip with the outer and intermediate strips having their margins interlocked to provide a lock seam joint and the lock seam joint located in the slot of the body, the machine comprising consecutively arranged sets of forming tools, the first set being located to receive the intermediate strip and partly form a marginal lock seam flange thereon, the second set to receive the intermediate and veneer strips and form lock seam flanges in nested relation thereon, the third set to receive the three strips with one strip lying on the other and roll the three strips into tubular form, and a fourth set to interlock the flanges in a lock seam.

4. The method of forming a tube which consists of an inner tubular body, an outer tubular veneer strip, and an intermediate tubular reinforcing strip for the veneer strip, the margins of the two latter strips being nested and interlocked to form a lock seam joint, the method consisting in passing the strips in one continuous path, forming a marginal lock seam flange on the intermediate strip, bringing the intermediate and veneer strips together flatwise one on the other and forming lock seam flanges on the two strips in nested relation, then bringing the body strip flatwise on the intermediate strip between the nested flanges, and finally forming the three strips into tubular formation and interlocking the flanges thereof.

JOHN F. LEVAN.