Sept. 13, 1955 H. L. JOHNSON 2,717,625

APPARATUS FOR PRODUCING EDGE COMPRESSION STRESSES IN METAL STRIPS

Filed March 9, 1951 2 Sheets-Sheet 1

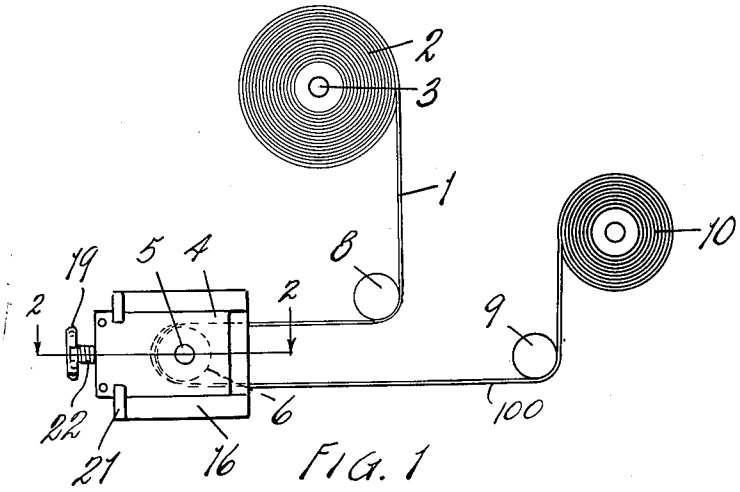

FIG. 1

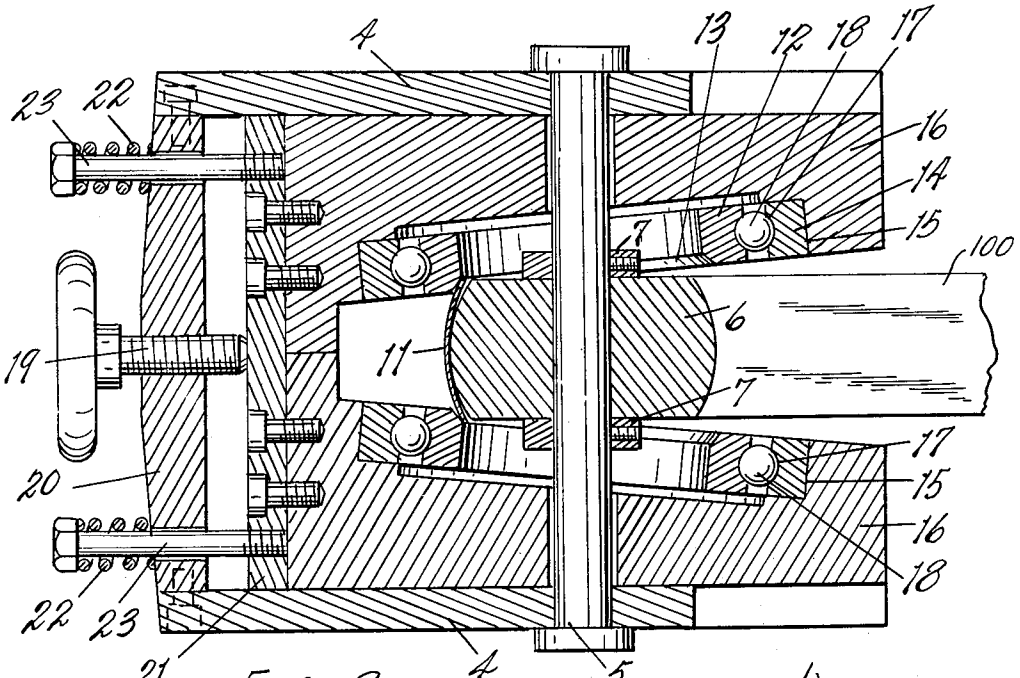

FIG. 2

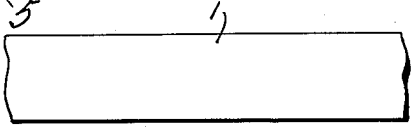

FIG. 7

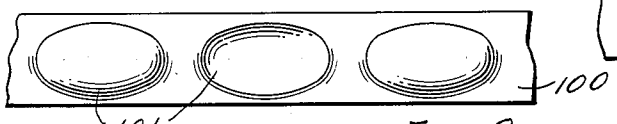

FIG. 8

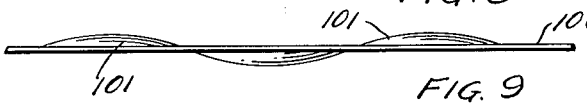

FIG. 9

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APPARATUS FOR PRODUCING EDGE COMPRESSION STRESSES IN METAL STRIPS

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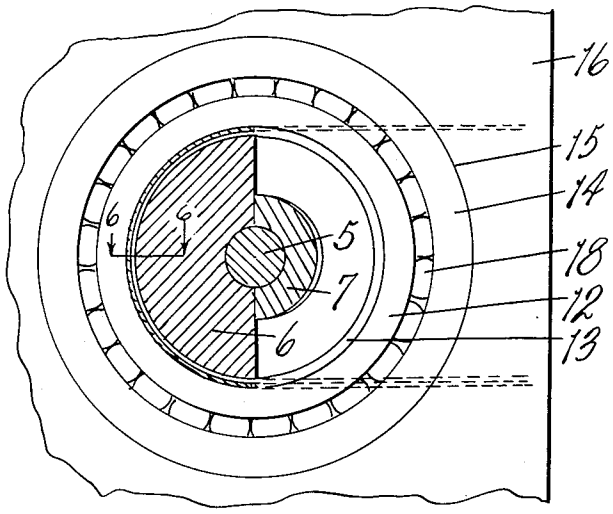

FIG. 3

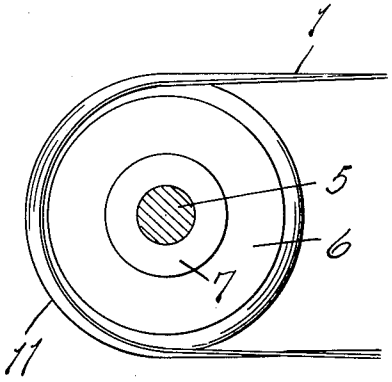

FIG. 4

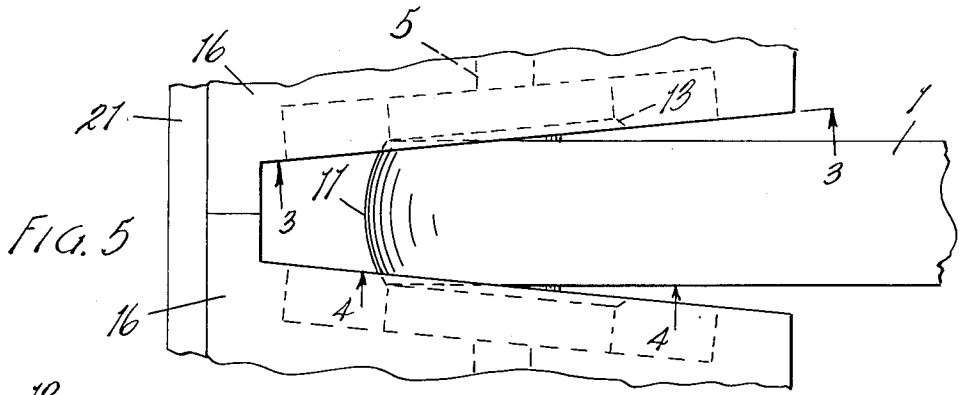

FIG. 5

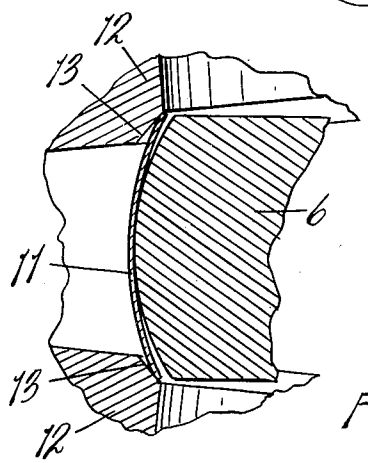

FIG. 6

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APPARATUS FOR PRODUCING EDGE COMPRESSION STRESSES IN METAL STRIPS

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Application March 9, 1951, Serial No. 214,746

7 Claims. (Cl. 153—32)

This invention relates to improvements in apparatus for producing compression stresses in the edges of an elongated flexible metal strip.

The main objects of this invention are:

First, to provide an apparatus for producing compression stresses in the edges of an elongated flexible metal strip adapting the strip for use in the forming of articles such, for example, as Venetian blind slats and particularly Venetian blind slats of curved or nonplanar cross section.

Second, to provide an apparatus having these advantages which is very simple and economical in its structure and use.

Objects relating to details and economies of the invention will appear from the description to follow. The invention is pointed out in the claims.

A preferred embodiment of the invention is illustrated in the accompanying drawings, in which:

Fig. 1 is a side elevational view of an apparatus embodying my invention, parts being shown conventionally and details of supports and the like not being illustrated.

Fig. 2 is an enlarged fragmentary view mainly in section on a line corresponding to line 2—2 of Fig. 1.

Fig. 3 is a fragmentary view in section on a line corresponding to line 3—3 of Fig. 5.

Fig. 4 is a fragmentary view of the crowned pulley of my device or apparatus and the relation of the strip treated thereto, the view being taken in section on a line corresponding to line 4—4 of Fig. 5.

Fig. 5 is a fragmentary plan view, the relation of certain parts being illustrated by dotted lines.

Fig. 6 is an enlarged fragmentary view in section on a line corresponding to line 6—6 of Fig. 3.

Fig. 7 is a fragmentary plan view of the rolled ribbon stock.

Fig. 8 is a fragmentary plan view of the processed stock or strip after passing through the apparatus.

Fig. 9 is an edge view of Fig. 8.

In the accompanying drawing, 1 represents the strip of stock to be treated and 2 the supply coil thereof wound upon a spool 3. The numeral 100 represents the processed strip and 101 represents distortions or bulges formed centrally therein by the processing which results in the development of compression stresses in the edges of the strip without longitudinally stretching the central portion thereof. It will be understood that these distortions 101 are shown greatly exaggerated, the illustrations being merely for the purpose of indicating what occurs. They are also shown as substantially uniformly and alternately disposed, which is also for the purpose of illustration, although the distortions usually do occur alternately. Stock designed for use in the forming of Venetian blinds may desirably be approximately 2" wide and .008" thick. These dimensions in practice may be varied according to the requirements of the finished article but I am mentioning these dimensions as being suitable for certain commercial Venetian blind slats for home use, for example.

The embodiment of my invention illustrated comprises a pair of spaced support members 4—4 carrying the spindle 5. The crowned pulley 6 is rotatable on the spindle or shaft, end thrust members 7 being secured to the shaft at each side of the pulley. The shaft itself might be permitted to rotate. I have not illustrated bearing elements or bushings as they form no part of my present invention and their use would be optional.

The strip 1 is guided by the guide pulleys or rollers 8 and 9 around the pulley 6 to the winding spool 10. The guide pulleys 8 and 9 are so positioned that the strip translated around the crowned pulley 6 is bent to a U-form. As the strip is translated around the pulley 6, its bight portion designated 11 in the drawing is transversely bent by its engagement with the annular rotatable support members 12 which have beveled work engaging faces 13. These support members are mounted for free rotation in roller bearings comprising the outer race members 14 which are disposed in recesses 15 provided therefor in the supporting blocks 16, the members 12 being provided with ball races 17 for the balls 18. This mounting permits the very free rotation of the members 12 which are driven or rotated as is also the pulley by the frictional engagement of the strip therewith.

The members 13 are supported with their axes at an angle to the axis of the roller 6 and they are of such dimensions and their angularity is such that they lap peripheral edge portions of the pulley 6 as shown in Fig. 2. This lapping is throughout a substantial arc of the work engaging faces 13 of the members 12. The pulley lapping portions of the members 12 are spaced radially from the axis of the pulley substantially less than the radius of the pulley at the center of the crown thereof as is shown in Fig. 2. The lapping portions of the members 12 are spaced from each other so that the portion of the strip passing around the pulley is transversely curved during such translation around the pulley. The edges of the strip however are not clamped against the periphery of the pulley but are in diverging relation thereto as shown in Fig. 2.

It will be noted that as the strip is bent or wrapped around the pulley 6 the central portion of the bend thereof is in interiorly supported engagement with the pulley while the edge portions thereof are interiorly unsupported. The members 12 exteriorly engage the interiorly unsupported edges of the strip so that the longitudinally bent strip is bent transversely upon the pulley. The radius of the strip engaging portions of the member 12 is as stated substantially less than the radius of the pulley with the center of the crown thereof as is shown in Fig. 2, with the result that the travel of the edge portions is substantially less than the travel of the interiorly supported central portion of the strip and compression stresses are produced in the edges of the strip without any longitudinal stretching of the strip.

This arrangement of parts permits the treatment or processing of strip material that has been previously coated or painted, or otherwise finished. The strip is not subject to driving slippage as the pulley and the members 12 are driven through the frictional engagement of the strip therewith. Further, the strip is not subjected to stretching stresses such as might result in cracking or fracturing the coating. The compression stresses which are produced by the use of this apparatus and the practice of my method do not result in marring or fracturing the coating or finish of the strip.

To adapt the apparatus for variation in the character of the stock the support members 12 are mounted for adjustment to vary the radius thereof relative to the axis of the pulley 6.

In the embodiment illustrated the supporting block 16 for the members 12 are slidably mounted on the sup-

port member 4 and connected by the cross piece 21 for simultaneous adjustment. The adjusting screw 19 is threaded through the end member 20 of the support to engage the cross piece 2 centrally thereof. Springs 22 on the bolts or rods 23 which extend from the cross piece 21 through the frame member yieldingly urge the cross piece 21 against the adjusting screw 19.

I have not illustrated or described other apparatus which may be used in the practice of my method, or other embodiments of my invention, as it is believed this disclosure will enable those skilled in the art to provide suitable apparatus for the purpose for which it is required.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An apparatus for producing compression stresses in the edges of an elongated resilient metal strip comprising a supporting frame, a crowned pulley journaled on said frame for free rotation, means for guiding and translating a metal strip endwise around said pulley in a substantially U-bent form with a portion of the U-bend intermediate its edges in interiorly supported engagement with the crown of the pulley and with edge portions of the U-bend of substantial width projecting laterally beyond such interiorly supported intermediate portions of the strip with said edge portions interiorly unsupported, and laterally spaced exterior support members for such interiorly unsupported edge portions of the strip mounted on said frame for free rotation independently of each other and of said pulley and for adjustment relative to the axis of the pulley, said exterior support members having internal annular beveled work engaging faces in exterior supported engagement with the interiorly unsupported edges of the strip throughout a substantial arc of the bend thereof, the work engaging arcs of the support members being spaced a radial distance from the axis of the pulley substantially less than the radius of the pulley at the work engaging crown thereof, said support members being disposed in upwardly diverging relation relative to each other permitting the translation of the strip between them and into externally supported engagement with the said internal annular work engaging faces thereof whereby a substantial arc of the U-bent portion of the strip lappingly engages said support members and the U-bent portion of the strip is transversely curved simultaneously with the longitudinal curving thereof resulting from its translation around the pulley, said pulley and support members being frictionally driven by the translation of the strip around the pulley and its frictional engagement with the said support members.

2. An apparatus for producing compression stresses in the edges of an elongated resilient metal strip comprising a supporting frame, a crowned pulley journaled on said frame, means for guiding and translating a metal strip endwise around said pulley in a substantially U-bent form with a portion of the U-bend intermediate its edges in interiorly supported engagement with the crown of the pulley and with edge portions of the U-bend of substantial width projecting laterally beyond such interiorly supported intermediate portions of the strip with said edge portions interiorly unsupported, and laterally spaced exterior support members for such interiorly unsupported edge portions of the strip mounted on said frame and for adjustment relative to the axis of the pulley, said exterior support members having internal annular beveled work engaging faces in exterior supported engagement with the interiorly unsupported edges of the strip throughout a substantial arc of the bend thereof, the work engaging arcs of the support members being spaced a radial distance from the axis of the pulley substantially less than the radius of the pulley at the work engaging crown thereof, said support members being disposed in upwardly diverging relation relative to each other permitting the translation of the strip between them and into externally supported engagement with the said internal annular work engaging faces thereof whereby a substantial arc of the

U-bent portion of the strip lappingly engages said support members and the U-bent portion of the strip is transversely curved simultaneously with the longitudinal curving thereof resulting from its translation around the pulley.

3. An apparatus for producing compression stresses in the edges of an elongated resilient metal strip comprising a supporting frame, a crowned pulley journaled on said frame for free rotation, means for guiding a metal strip endwise around said pulley in a substantially U-bent form with a portion of the U-bend intermediate its edges in interiorly supported engagement with the crown of the pulley and with edge portions of the U-bend of substantial width projecting laterally beyond such interiorly supported intermediate portion of the strip with said edge portions interiorly unsupported, and spaced exterior support members for such interiorly unsupported edge portions of the strip rotatably mounted on said frame for free rotation, said exterior support members having annular internal work engaging faces in exterior supported engagement with the interiorly unsupported portions of the strip throughout a substantial arc of the bend thereof, the work engaging arcs of the support members being spaced a radial distance from the axis of the pulley substantially less than the radius of the pulley at the work engaging crown thereof, whereby a substantial arc of the U-bent portion of the strip supportedly engages said support members and the strip is transversely curved simultaneously with the longitudinally curving thereof resulting from its translation around the pulley, said pulley and support members being frictionally driven by the translation of the strip around the pulley and its frictional engagement with the said support members.

4. An apparatus for producing compression stresses in the edges of an elongated resilient metal strip comprising a supporting frame, a pulley journaled on said frame, means for guiding a metal strip endwise around said pulley in a substantially U-bent form with a portion of the U-bend intermediate its edges in interiorly supported engagement with the crown of the pulley and with edge portions of the U-bend of substantial width projecting laterally beyond such interiorly supported intermediate portion of the strip with said edge portions interiorly unsupported, and spaced exterior support members for such interiorly unsupported edge portions of the strip rotatably mounted on said frame, said exterior support members having annular internal work engaging faces in exterior supported engagement with the interiorly unsupported portions of the strip throughout a substantial arc of the bend thereof, the work engaging arcs of the support members being spaced a radial distance from the axis of the pulley substantially less than the radius of the pulley at the work engaging surface thereof, whereby a substantial arc of the U-bent portion of the strip supportedly engages said support members and the strip is transversely curved simultaneously with the longitudinally curving thereof resulting from its translation around the pulley.

5. An apparatus for producing compression stresses in the edges of an elongated resilient metal strip comprising a supporting frame, a crowned pulley journaled on said frame, means for guiding and translating a metal strip endwise with a central portion thereof curvedly bent around and in interiorly supported engagement with a substantial arc of the crown of the pulley and with edge portions of the strip of substantial width projecting laterally beyond said interiorly supported portion of the strip, said projecting portions being interiorly unsupported and spaced exterior support members for the interiorly unsupported edge portions of the strip rotatably mounted on said frame and having internal annular work faces engaging edge portions only of the strip and in laterally spaced relation to the portion of the strip in interiorly supported engagement with said pulley, said support members being mounted in diverging relation to each other with arcuate portions of their said annular work faces in

exterior lapping relation to the interiorly unsupported edge portions of the strip, the work engaging arcuate portions being spaced a radial distance from the axis of the pulley substantially less than the radius of the pulley at the strip engaging portion thereof, the edge portions of the strip urged upon the said exterior support members only by the inherent resilience of the strip resulting from the transverse curving of the arcuate portion in interior supported engagement with the pulley.

6. An apparatus for producing compression stresses in edge portions of an elongated metal strip comprising a supporting frame, a pulley rotatably mounted on said frame, means for guiding and translating the strip around said pulley with an intermediate portion of the strip in interiorly supported engagement with the pulley and longitudinally curved around a substantial arc thereof and with edge portions of the strip of substantial width interiorly unsupported for free flexing radially of the pulley, and exterior support members for said interiorly unsupported edge portions of the strip rotatably mounted on said frame and having annular work engaging surfaces spaced laterally from the work engaging arc of the pulley and in exterior supporting engagement with substantial arcs of the interiorly unsupported edge portions of the work, the work engaging arcs of said exterior support members being spaced a radial distance from the axis of the pulley substantially less than the radius of the pulley at the work engaging surface thereof.

7. An apparatus for producing compression stresses in edge portions of an elongated metal strip comprising a supporting frame, a pulley rotatably mounted on said frame, means for guiding and translating the strip around

said pulley with an intermediate portion of the strip in interiorly supported engagement with the pulley and longitudinally curved around a substantial arc thereof and with edge portions of the strip of substantial width interiorly unsupported for free flexing radially of the pulley, and exterior support members for said interiorly unsupported edge portions of the strip rotatably mounted on said frame and having annular work engaging surfaces spaced laterally from the work engaging arc of the pulley and in exterior supporting engagement with the interiorly unsupported edge portions of the work, the work engaging faces of said exterior support members being spaced a radial distance from the axis of the pulley substantially less than the radius of the pulley at the work engaging surface thereof.

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