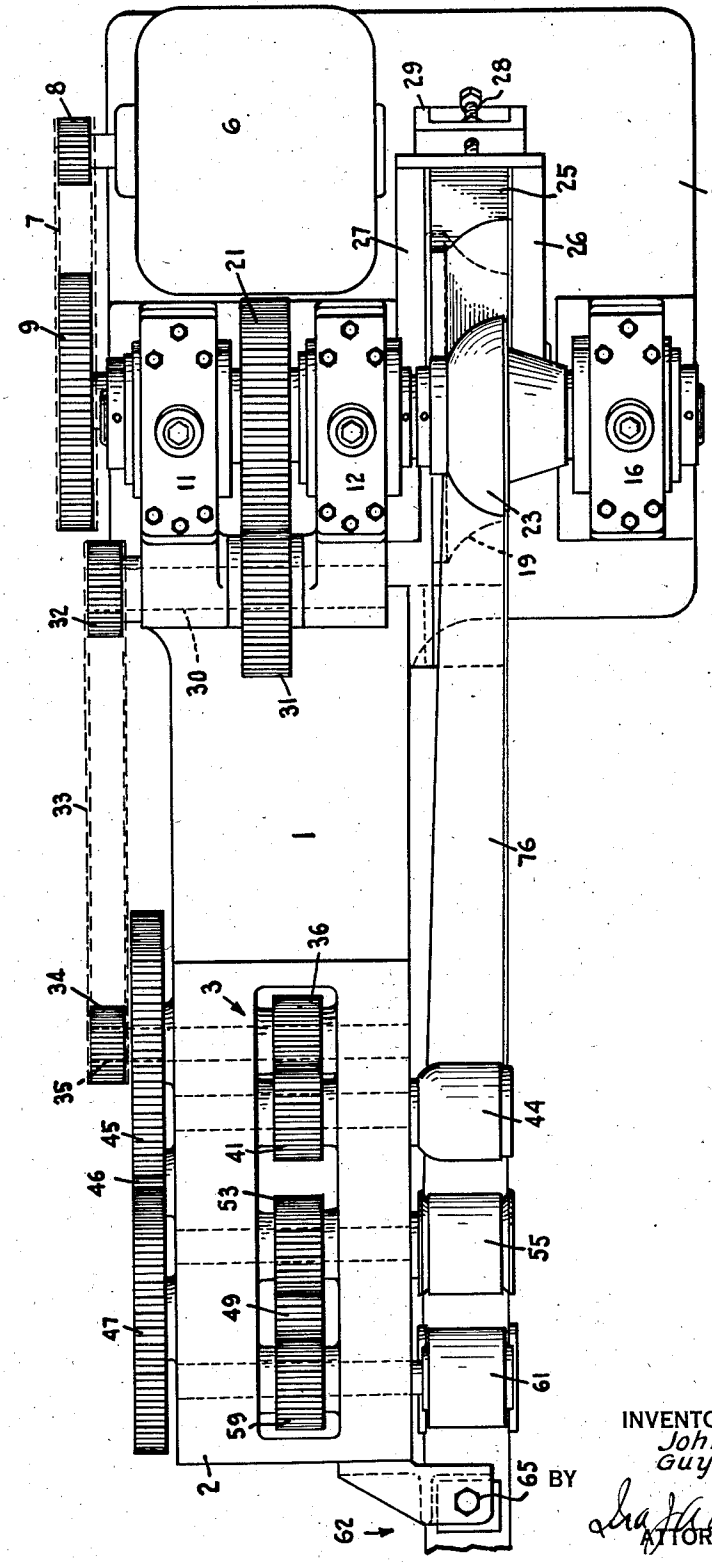
June 9, 1936. J. E. BLANK ET AL 2,043,792

METHOD AND APPARATUS FOR ROLLING BACKBANDS FOR TIRE COVERS

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FIG. 1



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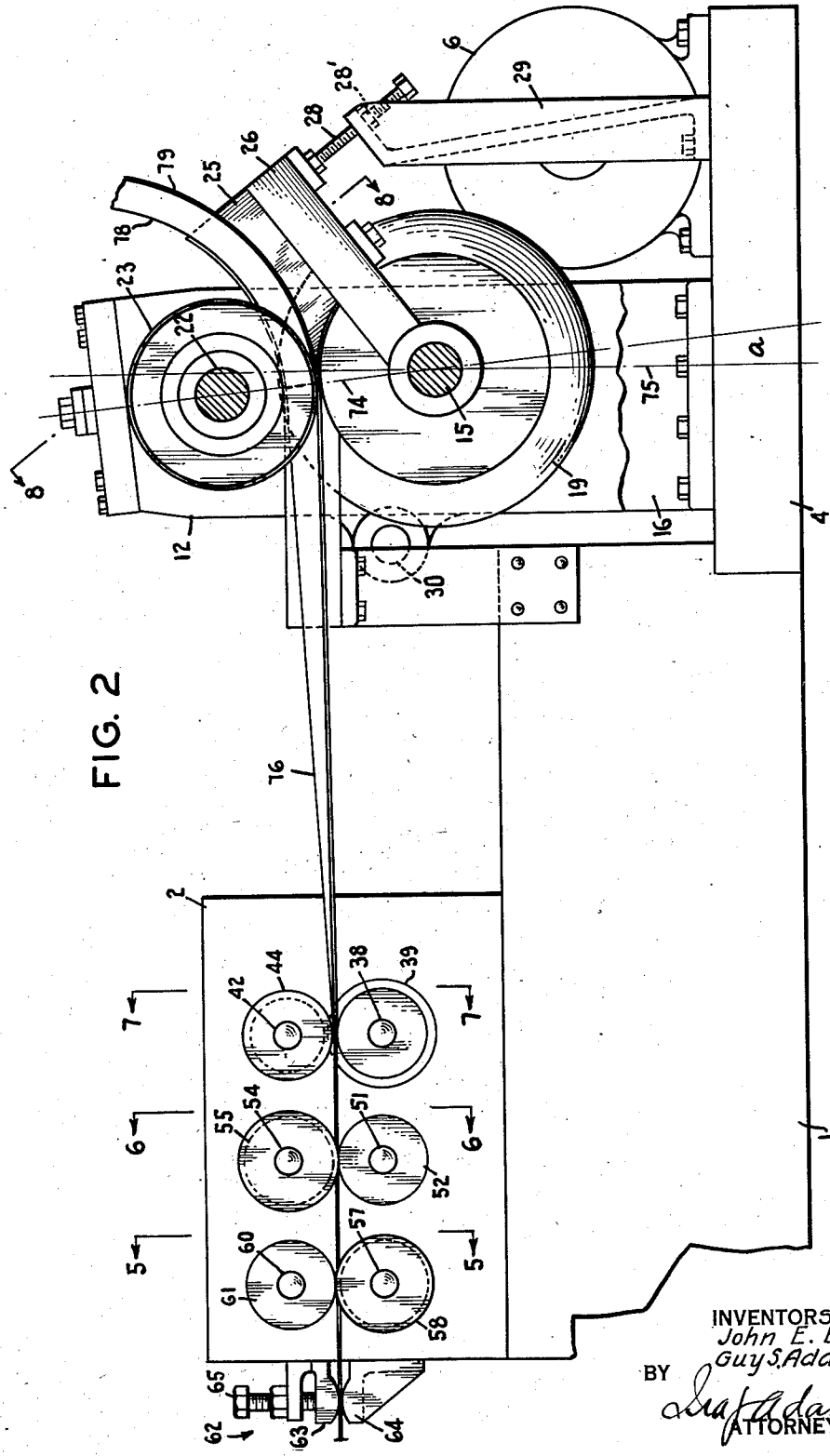


FIG. 2

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METHOD AND APPARATUS FOR ROLLING BACKBANDS FOR TIRE COVERS

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FIG. 3

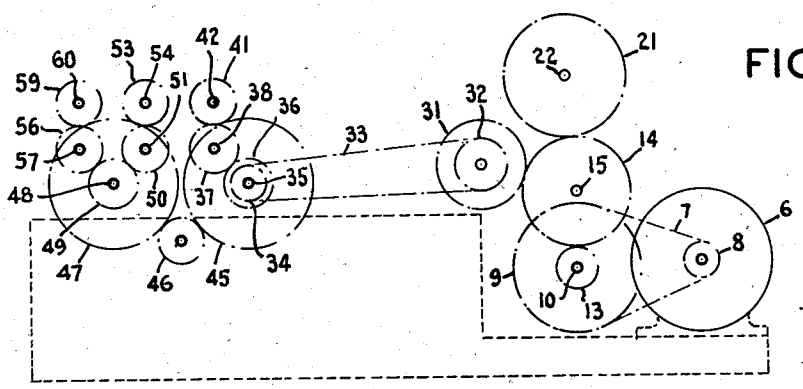
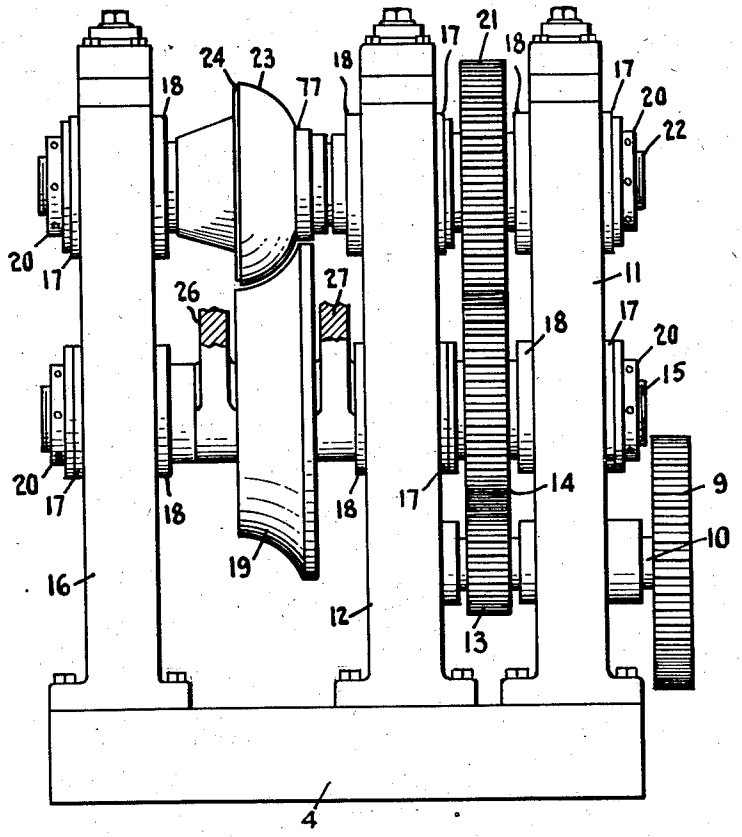


FIG. 4



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METHOD AND APPARATUS FOR ROLLING BACKBANDS FOR TIRE COVERS

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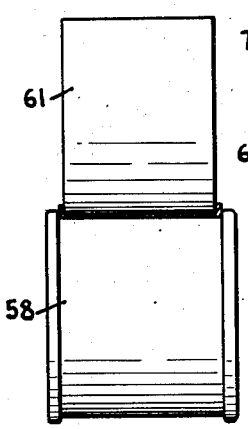


FIG. 5

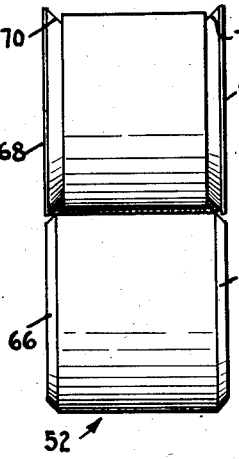


FIG. 6

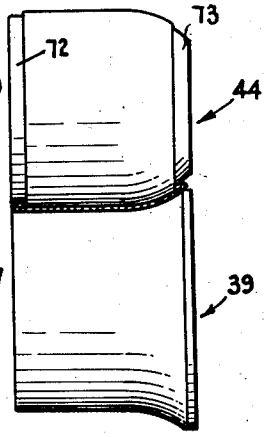


FIG 7.

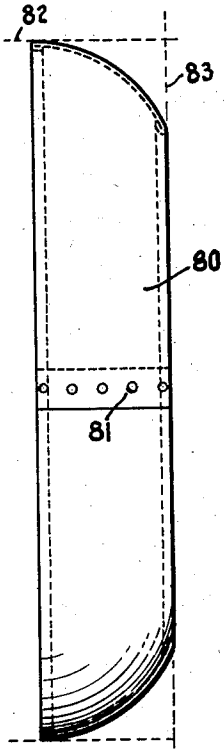
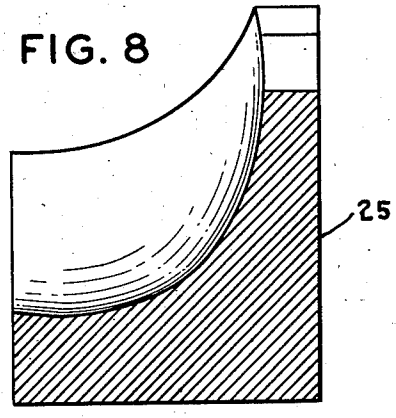


FIG. 9

FIG. 8



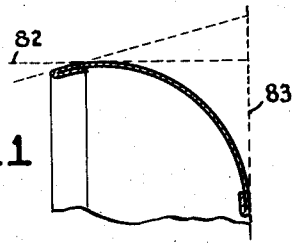
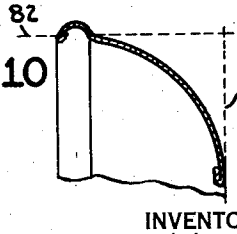


FIG.11

FIG.10



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Patented June 9, 1936 2,043,792

UNITED STATES PATENT OFFICE

2,043,792

METHOD AND APPARATUS FOR ROLLING BACKBANDS FOR TIRE COVERS

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Application July 18, 1933, Serial No. 680,918

16 Claims. (Cl. 153—3)

This invention relates to the rolling of circular bands from strip stock.

The object of the invention is to roll deep backbands for tire covers from flat strip steel or other appropriate metal and weld or otherwise fasten the ends together.

Another object of the invention is to roll flat strip steel into the form of a section of a surface of revolution in which one edge has a diameter very materially larger than the diameter of the other edge.

Another object of the invention is to roll a curved band with convex outer surface by rotating the feeding rolls at substantially the speed of that portion of the final shaping rolls through which passes the smallest diameter of the convex band.

More specifically an object is to roll a backband of a tire cover strip stock that has its marginal edges substantially tangent to a cylindrical and a radial surface.

Other objects of the invention will appear in the following description with reference to the drawings in which:

Fig. 1 is a plan view of the rolling machine or apparatus.

Fig. 2 is an elevation of the apparatus of Fig. 1 partly broken away for clarity.

Fig. 3 is a diagrammatic illustration showing the relation of the gears and driving chains.

Fig. 4 is an end view of the apparatus of Fig. 2 viewed from the right of the latter figure partly broken away for clarity.

Fig. 5 is a section taken on line 5—5 of Fig. 2.

Fig. 6 is a section taken on the line 6—6 of Fig. 2.

Fig. 7 is a section taken on the line 7—7 of Fig. 2.

Fig. 8 is a section of the coiling shoe taken on the line 8—8 of Fig. 2.

Fig. 9 is a view of the backband of the tire cover made in accordance with the invention.

Figs. 10 and 11 are modifications of the band rolled by the machine with change in roll contour.

Referring to the drawings, the frame 1 is a casting of general rectangular shape containing a housing 2 for the internal gears indicated generally by reference character 3. The frame has an extension or platform 4 at the right in Figs. 1, 2 and 3 on which is mounted the driving motor 6. A chain 7 connects the sprocket wheel 8 with the sprocket 9 of shaft 10 journaled in the lower part of pillow blocks 11 and 12 bolted to the platform 4. Shaft 10 has a pinion 13 meshing with gear 14 keyed to shaft 15 journalled in the pillow blocks 11, 12 and 16. This shaft has thrust plates 17, 18, on opposite sides of each of the pillow blocks to resist the side thrust of the bottom roll 19 keyed to the shaft 15. Nuts 20 are threaded on each of the shafts to control the adjustment of the thrust bearings in the outer pillow blocks 11 and 16.

Gear 21 is keyed to shaft 22 which is journalled in the pillow blocks 11, 12 and 16. Thrust bearings located on this shaft are given similar numbers to those given to shaft 15. Upper roll 23 is keyed to the shaft 22. The roll 23 is notched slightly at 24 to accommodate the turned over edge of the band passing between the rolls as will later be described. A coiling shoe 25 shown in section in Fig. 8 has spaced prongs 26, 27, through which the axle 15 passes. This coiling shoe is adjusted about the shaft 15 by stud 28 threaded through a bracket 29 bolted to the platform 4. By screwing the stud 28 to the bracket the coiling shoe may be rotated around the shaft 15 for different size backbands. A nut 28' holds the stud in adjusted position.

The shaft 30 (Fig. 2) journalled in the pillow blocks 11—12 has a gear 31 (Fig. 1) keyed thereon which meshes with the gear 14. On shaft 30 on the top of Fig. 1 is keyed sprocket gear 32 which drives chain 33 and sprocket gear 34 keyed to shaft 35. Shaft 35 has a gear 36 (Fig. 3) meshing with gear 37 keyed to shaft 38 to which the bottom roll 39 is keyed. Gear 37 meshes with gear 41 keyed on shaft 42 to which the top roll 44 (Figs. 1 and 2) is also keyed.

Gear 45 is keyed to shaft 35 and drives idler gear 46 which drives gear 47 keyed to a shaft 48 to which gear 49 is also keyed. This gear 49 meshes with gear 50 on shaft 51 to which the bottom roll 52 (Fig. 2) is keyed. Gear 50 meshes with gear 53 keyed to shaft 54. Top roll 55 (Fig. 1) is keyed to the shaft 54.

Gear 49 meshes with gear 56 on shaft 57. Botton roll 58 (Fig. 2) is keyed to this shaft 57. The gear 56 also meshes with gear 59 on shaft 60. Roll 61 (Fig. 2) is keyed to this shaft 60.

At the left hand side of the frame in Fig. 2 a brake 62 is located. This brake has friction shoes 63, 64, 63 being adjustable by means of set screw 65. Of the first-pass rolls 58, 61, the roll 58 has a flange at each side as shown in Fig. 5. These flanges are spaced from the sides of the top roll 61 sufficiently to accommodate the edges of the strip steel passed therebetween.

Of the second pass rolls the bottom roll 52 has beveled flanges 66, 67, the roll 55 having flanges 68, 69 defining notches 70, 71, in the top roll. Of the third pass rolls the bottom one 39 has its diameter increased gradually towards the right in Fig. 7 and the top roll 44 is reversely shaped. The edge 72 of this top roll has a cylindrical surface of slightly less diameter than the rest of the roll and the right hand side of the roll has a conical surface 73. The side portions 72, 73, are of sufficiently reduced diameter to accommodate the turnover seams of the strip steel

passing therebetwen as will be more fully described later. The operation of the machine will now be described.

As will be seen from Figs. 2 and 3, the plane 74 of the center of shafts 15 and 22 makes an angle a with the plane 75 vertical to the common tangent plane of the first, second and third pass rolls. This backward tilt of the axle plane of the fourth-pass rolls aids in the coiling of the band.

The coiling shoe 25 is adjusted to the proper position for the size of the band to be coiled within the limits of the machine and strip steel or other metal 76 is passed through the friction shoes 63, 64, and started between the first rolls 58, 61. These rolls draw the strip through and turn the edges, as shown in Fig. 5. As the strip feeds between the rolls 52, 55, the edges are turned over still further, as shown in Fig. 6. Rolls 39 and 44 complete the turning over of the edges and further give the strip a slight concavity, as shown by Fig. 7. The first, second and third pass rolls preferably rotate at the same peripheral speed which peripheral speed is equal to or less than the peripheral speed of the smallest diameter 77 of the top roll 23 (Fig. 4). This is an important feature of the machine and method of coiling the band as it insures that the inner edge 78 of the coiled cover band will always be under tension. It is only by this method that one is able to coil a band of the shape referred to in which there are no corrugations or uneven places due to buckling. The lower roll 19 of the fourth-pass rolls rotates at a greater speed than the top roll 23 which works the steel or other metal strip and stretches the outer edge 79 of the band into the proper shape. In general, the band is shaped by the two rolls 23, 19, after the preliminary shaping accomplished by the third-pass rolls, but the diameter of the band may be increased or diminished between certain limits by adjustment of the coiling shoe 25. It is desirable to place additional pressure on the strip 76 and this may be adjusted to the right value by means of the screw 65 of the friction brake at the left in Fig. 2.

An attendant positioned at the right of the machine in Fig. 2 will cut off the back band when it has reached a certain position in the coiling operation by means of metal snips. This band will then be substantially a complete ring and by separate operation the open ends of the band are spot-welded together, though they may be riveted or otherwise fastened, as desired.

The completed band 80 in Fig. 9 after being spot-welded or otherwise fastened is shown at 81. Heretofore it has been considered impossible to roll a deep back band for tire covers of strip steel where the section covered any substantial amount of the surface of the tire. This back band accordingly has been spun or stamped from circular discs of flat steel. This is expensive and it was only after experimentation and repeated trials that we were able to construct a machine for rolling such back bands continuously from strip steel in which there were no corrugations or uneven spots due to buckling. In fact, with the principles of the invention it would be possible to make the front part of the tire cover by slight changes in proportions and the invention is not to be limited to any definite size or proportions of coil band.

By referring to Fig. 9 it will be seen that the band covers substantially a quarter of a circle so that at the larger diameter the surface approaches an imaginary cylinder 82 and at the smaller diameter the surface approaches a radial plane 83. The rolls 19 and 23 have surfaces similarly approaching such imaginary surfaces.

In Fig. 10 the band at the outer diameter is beaded. This beaded surface would be made by similarly shaping the rolls 19 and 23. In general, however, the surface at this point approaches the cylindrical surface.

In Fig. 11 the surface at the outer diameter is rolled inwards so that the surface at this point passes beyond the imaginary cylindrical surface which would necessitate only that the surface of the rolls 19 and 23 be appropriately modified to correspond to the band to be rolled.

In all the forms of Figs. 9, 10 and 11 the band has a smooth surface without buckling due to the features of the machine already pointed out.

The backband itself is not claimed in this application but is claimed in our divisional case Serial No. 695,994, filed October 31, 1933.

Various modifications may be made in the invention without departing from the spirit thereof.

Having described our invention, what we claim is:

1. In apparatus for rolling bands from strip metal, a roller having a concave rolling surface of revolution approaching a substantially cylindrical surface at one edge and a plane surface at the other edge, a second roller having a convex surface of revolution sufficiently spaced from the other surface to receive the strip metal and two additional spaced rollers adapted to pass the strip metal to the first mentioned rollers.

2. In apparatus for rolling bands from strip metal, a roller having a concave rolling surface of revolution approaching a cylindrical surface at one edge and a plane surface at the other edge, a second roller having its axis parallel to that of the first roller and having a convex surface of revolution sufficiently spaced from the other surface in the plane of said axes to receive the strip metal and two additional spaced rollers adapted to pass the strip metal to the first mentioned rollers.

3. In apparatus for rolling bands from strip metal, a pair of spaced rollers, an additional pair of spaced rollers, the axes of all said rollers being parallel, one of the second pair of rollers having a concave surface of revolution about its axis approaching a coaxial cylindrical surface at one edge and a radial plane surface at the other and the other one of said second pair of rollers having a convex surface of revolution uniformly spaced in the coaxial plane from the other surface of revolution about its axis with the edges approaching respectively coaxial cylindrical and radial plane surfaces, and the axial plane of the second pair of rollers being tilted in respect to the axial plane of the first pair of rollers.

4. In apparatus for rolling bands from strip metal, a pair of spaced rollers, an additional pair of spaced rollers, the axes of all said rollers being parallel, one of the second pair of rollers having a concave surface of revolution about its axis approaching a coaxial cylindrical surface at one edge and a radial plane surface at the other and the other one of said second pair of rollers having a convex surface of revolution uniformly spaced in the coaxial plane from the other surface of revolution about its axis with the edges approach-

ing respectively coaxial cylindrical and a radial plane surface, and means to rotate one of said second pair of rollers with a peripheral speed at said radial plane greater than the peripheral speed of the first pair of rollers.

5. In apparatus for rolling bands from strip metal, a pair of spaced rollers, an additional pair of spaced rollers, the axes of all said rollers being parallel, one of the second pair of rollers having a concave surface of revolution about its axis approaching a coaxial cylindrical surface at one edge and a radial plane surface at the other and the other one of said second pair of rollers having a convex surface of revolution uniformly spaced in the coaxial plane from the other surface of revolution about its axis with the edges approaching respectively coaxial cylindrical and radial plane surfaces, and means to rotate one of said second pair of rollers with a peripheral speed at said radial plane greater than the peripheral speed of the first pair of rollers, and means for supplying strip metal to be moved between said rollers.

6. In apparatus for rolling bands from strip metal, a pair of spaced rollers, an additional pair of spaced rollers, the axes of all said rollers being parallel, one of the second pair of rollers having a concave surface of revolution about its axis approaching a coaxial cylindrical surface at one edge and a radial plane surface at the other and the other one of said second pair of rollers having a convex surface of revolution uniformly spaced in the coaxial plane from the other surface of revolution about its axis with the edges approaching the said cylindrical and plane surfaces, and said coaxial plane being tilted in respect to the plane of the axes of the first pair of rollers, and means to rotate one of said second pair of rollers with a peripheral speed at said radial plane greater than the peripheral speed of the first pair of rollers.

7. In apparatus for rolling bands from strip metal, a pair of spaced rollers, an additional pair of spaced rollers, the axes of all said rollers being parallel, one of the second pair of rollers having a concave surface of revolution about its axis approaching a coaxial cylindrical surface at one edge and a radial plane surface at the other and the other one of said second pair of rollers having a convex surface of revolution uniformly spaced in the coaxial plane from the other surface of revolution about its axis with the edges approaching the said cylindrical and plane surfaces, and said coaxial plane being tilted in respect to the plane of the axes of the first pair of rollers, and means to rotate one of said second pair of rollers with a peripheral speed at said radial plane greater than the peripheral speed of the first pair of rollers, and means for supplying strip metal to be moved between said rollers.

8. The method of forming strip stock into a curved concavo-convex object having different edge curvatures which consists in rotating two rolls each having different edge circumferences, feeding said strip stock between the peripheral surfaces of said rolls and exerting sufficient braking action on the movement of the entering strip stock to prevent development of longitudinal compression stresses at the edges thereof.

9. The method of forming strip stock into a curved concavo-convex object having different edge curvatures which consists in rotating two rolls each having different edge circumferences and exerting sufficient braking action on said strip stock to prevent development of longitudinal compression stresses at the edges thereof.

10. The method of forming strip stock into a concavo-convex ring having different edge circumferences which consists in rotating two rolls each having different edge circumferences, feeding said strip stock between the peripheral surfaces of said rolls and exerting sufficient braking action on said strip stock to prevent development of longitudinal compression stresses at the edges thereof.

11. The method of forming strip stock into a curved concavo-convex object having different edge curvatures which consists in rotating two rolls each having different edge circumferences, feeding said strip stock between said rolls at an angle to their coaxial plane and exerting sufficient braking action on said strip stock to prevent development of longitudinal compression stresses at the edges thereof.

12. The method of forming strip stock into a curved concavo-convex object having different edge curvatures which consists in rotating two rolls each having different edge circumferences, feeding said strip stock between the peripheral surfaces of said rolls at an angle to their coaxial plane and exerting sufficient braking action on said strip stock to prevent development of longitudinal compression stresses at the edges thereof.

13. The method of forming curved articles of curved cross section from strip stock, which consists in applying bending forces to said strip stock along curved paths that increase in radius from one edge of the strip stock to the other and simultaneously maintaining longitudinal tension in the strip stock at the edge being acted upon by the bending force exerted at least radius, and longitudinally curving the curved strip.

14. The method of forming curved articles of curved cross section from strip stock, which consists in applying bending forces to said strip stock along curved paths that increase in radius from one edge of the strip stock to the other and simultaneously maintaining longitudinal tension in the strip stock at a plurality of bending points to prevent buckling thereat, and longitudinally curving the curved strip.

15. The method of forming curved articles of curved cross section from strip stock, which consists in applying bending forces to said strip stock along curved paths that increase in radius from one edge of the strip stock to the other and simultaneously maintaining longitudinal tension in the strip stock at the edge being acted upon by the bending force exerted at least radius, said tension being maintained by a resisting force applied at less than a right angle to the direction of application of said bending forces, and longitudinally curving the curved strip.

16. The method of forming curved articles of curved cross section from strip stock which consists in applying bending forces to said strip stock along curved paths that increase in radius from one edge of the strip stock to the other and maintaining longitudinal tension in the strip stock at a plurality of bending points, the said tension being maintained by a resisting force applied at less than a right angle to the direction of application of said bending forces to prevent buckling thereat, and longitudinally curving the curved strip.

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