May 20, 1930. J. R. GAMMETER 1,759,232

BAND FOLDING APPARATUS

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Fig-1

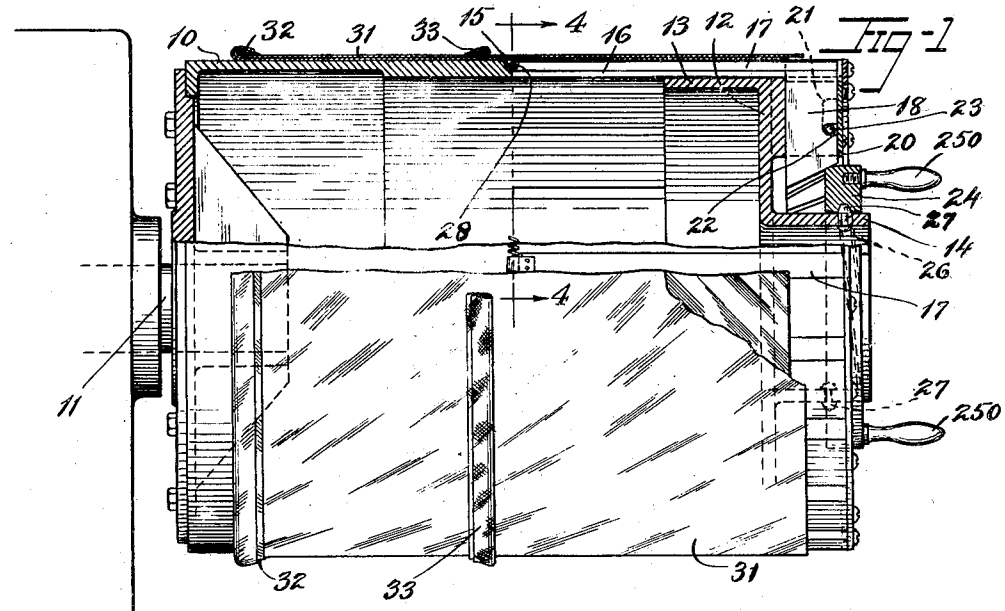
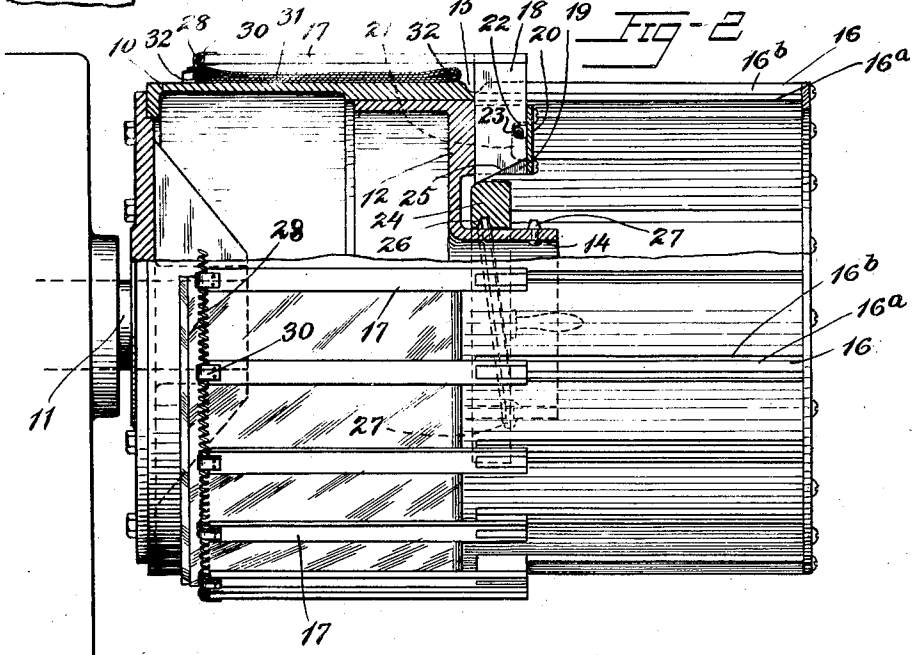


Fig-2



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BAND FOLDING APPARATUS

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Fig-3

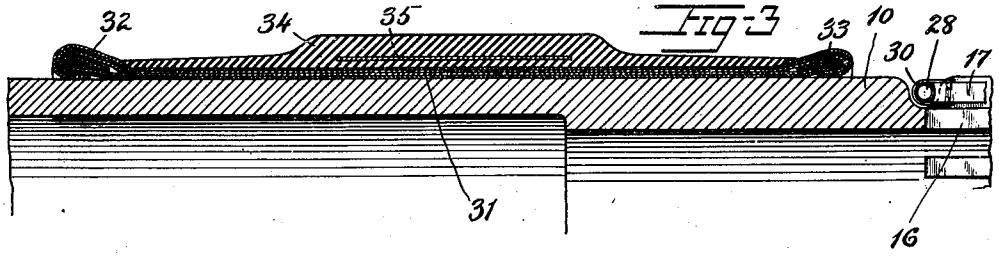


Fig-4

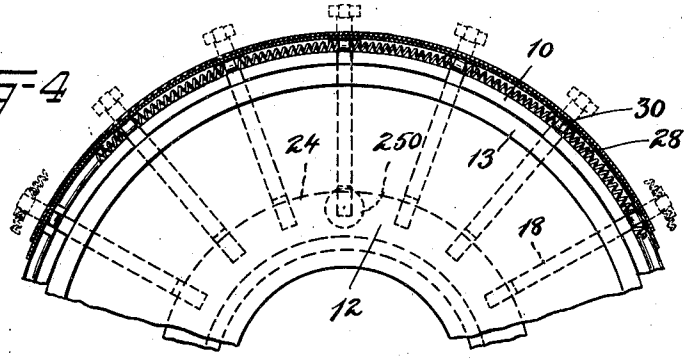
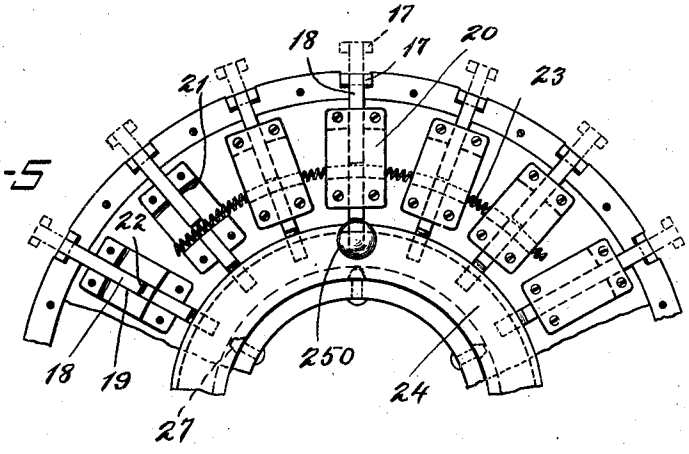


Fig-5



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UNITED STATES PATENT OFFICE

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BAND-FOLDING APPARATUS

Application filed August 16, 1929. Serial No. 386,413.

This invention relates to machines for doubling or folding a band of sheet material upon itself for the purpose of making an article such as an endless tube, a laminated band for a pneumatic tire casing or the like.

I have heretofore proposed to perform such folding operation by a blast or blasts of compressed air acting on one or both margins of the band. It has also been proposed to perform it mechanically by means of helical-spring rollers, arranged end to end in a circle and supported by spring arms mounted to slide coaxially with the forming drum.

My objects in the present invention are to provide mechanical means, more positive than the pneumatic device, for accomplishing the folding over of the material and to render such means more quick-acting and efficient than prior mechanical devices and better adapted for tire-band building and for removal of the finished band.

Of the accompanying drawings, Fig. 1 is a side elevation, partly in vertical section, showing a band-folding apparatus constructed according to my invention, with the folding devices in their retracted position.

Fig. 2 is a similar view showing the folding devices projected to make the fold.

Fig. 3 is a partial vertical section on a larger scale, showing a finished tire band on the drum.

Fig. 4 is a partial end elevation of the operative elements.

Fig. 5 is a partial outer or rear end elevation.

In the drawings, 10 is a cylindrical band-forming drum fixed to the end of a horizontal power-driven shaft 11, and 12 is a disk-like pusher member for supporting the working tools, said member being slidingly or telescopically mounted for reciprocating movement within the outer end of drum 10 and being formed with an outer, cylindrical, flanged bearing member 13 engaging a cylindrical bearing surface on the inner side of the drum, said member 12 also having a hollow hub 14.

Drum 10, at about the middle thereof, is formed with a circumferential groove 15 and with a series of longitudinal slots 16 extending from said groove to the outer end of the drum. 17, 17 are a series of longitudinal arms or rods mounted for radial positioning movement into and out of the slots 16, and also for longitudinal reciprocating movement with the pusher 12 to perform the folding operation and the reverse or retracting movement. The arms 17 are individually mounted at the outer ends of a seres of actuating slides 18 fitted in external radial guideways 19 formed on the pusher 12 and held against axial displacement by retaining plates 20, said actuators 18 projecting through the slots 16, which latter are provided with relatively-narrow inner portions 16^a to receive said actuators and with relatively-wide outer portions 16^b to receive the arms 17.

The side walls of the guide-ways 19 are formed with recesses 21 and the rear or outer edges of the actuators 18 are formed with shallower recesses 22, these respective recesses being occupied by an endless, circumferentially-extending, helical spring 23, which acts collectively upon the several actuators 18 to retract the latter radially inward after they have been projected outwardly. The outward projection of the actuators 18 is accomplished by means of a ring 24 supported on the hub 14 of pusher 12 and having a rounded forward corner adapted to exert a cam action upon the inclined inner edges 25 of the actuators when ring 24 is moved axially forward. The axial travel of ring 24 upon hub 14 is accomplished by rotation of said ring with a pair of horizontal handles 250 located at opposite points thereon, in conjunction with a screw-thread connection between the ring and hub constituted by a helical groove 26 cut in the inner periphery of the ring and engageable with studs 27 fixed on the outer surface of the hub.

At the inner or forward ends of the arms 17, they carry a circumferentially-arranged, endless, helical-spring roller 28 retained in position on the arms by means of U-shaped bearing clips 30 in which the roller is adapted to turn for the purpose of acting on the sheet material to double or fold it over upon itself. Any other suitable roller structure, expansible and contractible as a whole, could be substituted.

In the operation of this apparatus, assuming that a flat band for forming a pneumatic cord-tire casing is to be made, strips 31 of rubberized tire farbric, preferably two in number and successively applied to make a 2-ply construction with threads running diagonally in opposite directions in the respective plies, are wrapped about the surface of the drum 10 and their ends united in a suitable splice to make an endless laminated band, this band being of twice the width, or slightly more, of the tire band to be formed, and the edges of the plies being stepped or staggered for tapering the carcass structure at the left-hand bead as viewed in Figs. 1, 2 and 3. The right-hand portion of said band extends out over the wire roller 22 and the arms 17 as shown in Fig. 1. The left-hand bead core 32, enclosed in the usual flipper, is then laid over said band 31 near its left-hand edge, and the right-hand flippered bead-core 33 is laid on the band parallel with bead core 32 at a distance therefrom corresponding to the desired width of the tire band to be formed.

The operator then grasps the handles 250 and by turning the cam ring 24 angularly clockwise around the axis of the drum, he causes it to move forward on its screw thread over the hollow hub 14 of the slide 12 and exert a cam action on the inclined inner ends of the actuators 18, thus moving said actuators radially outward through the slots 16, the actuators carrying with them the arms 17, expanding the band-folding roller 28, moving it out of the groove 15, expanding the right-hand portion of the band 31 which overlies the arms and spring roller and positively initiating the folding action adjacent to the bead core 33. Then by pushing inwardly on the handles 250, the operator moves the slide 12 longitudinally inward, carrying with it the arms 17 and the spring roller 28 and the latter carries the band material over the bead 33 and then over the underlying portion of the band between the bead cores until the left-hand bead core 32 is reached as represented in Fig. 2. The slide 12 and attached parts are then withdrawn to the outer end of the drum, the cam ring 24 is turned counter-clockwise and the spring 23 retracts the actuators 18 and arms 17 radially inward until the arms reenter the outer portions of the slots 16 and the spring roller 28 again rests in the groove 15.

The left-hand bead may then be completed by folding inwardly the edges of the overlying fabric plies and the adhesion of the folded over portion of the band to the underlying portion may be perfected if desired by a rolling operation. The tire-forming band is then completed by wrapping around it the rubber tread and side-wall strip 34 having the breaker strip 35 incorporated therein, abutting its ends and rolling it down upon the underlying carcass. The tire band is then slipped endwise off the drum over the depressed arms and spring roller without requiring the removal of any parts of the mechanism.

Various changes in the above described embodiment may be made without departing from the scope of my invention as defined in the claims.

I claim:

1. Band-folding apparatus comprising a band support, means adapted to engage the inner side of the band adjacent the line of fold, and mechanism for positively moving said means radially outward to initiate the fold and for then moving it longitudinally to complete the folding operation.

2. Band-folding apparatus comprising a band-supporting drum, folding means movable longitudinally thereover to double the material upon itself, and operating mechanism for moving said means radially outward to initiate the fold.

3. Band-folding apparatus comprising a band-supporting drum, a series of arms movable longitudinally thereover and having band-folding means at their forward ends, and radially-movable actuating means for causing fold-initiating movements of said arms.

4. Band-folding apparatus comprising a band support, and an endless, resilient band-folding roller movable longitudinally thereover.

5. Band-folding apparatus comprising a band-supporting drum, a circumferentially-distributed series of roller supports movable longitudinally thereover and having bearings for a roller, and a helical-spring band-folding roller extending through a plurality of said bearings.

6. Band-folding apparatus comprising a band-supporting drum, a series of arms movable longitudinally thereover and having U-shaped bearing clips at their forward ends, and an endless, helical-spring band-folding roller supported by said clips and adapted to turn therein.

7. Band-folding apparatus comprising a band support, a series of arms movable longitudinally thereover and having band-folding means, and a series of radially-slidable actuators carrying said arms.

8. Band-folding apparatus comprising a band-supporting drum, a series of arms, each movable as a whole radially and longitudinally of said drum and having band-folding means, and an operating device common to said arms for imparting radial movements thereto.

9. Band-folding apparatus comprising a band-supporting drum, band-folding means movable radially of said drum and longitudinally thereover, a slide for imparting the longitudinal movement, and an operating de-

vice on said slide movable angularly around the drum axis for imparting the radial movement.

10. Band-folding apparatus comprising a longitudinally-slotted band-supporting drum, a series of actuators movable radially and longitudinally in the slots, and a series of arms carried by the actuators and having band-folding means.

11. Band-folding apparatus comprising a band-supporting drum, a slide movable longitudinally within the drum, and band-folding means carried by said slide and located outside of the drum.

12. Band-folding apparatus comprising a longitudinally-slotted band-supporting drum, a longitudinal slide telescoping within the slotted portion of the drum and having a series of radially-movable actuators passing through the drum slots, and a series of arms carried by said actuators and having band-folding means.

13. Band-folding apparatus comprising a band-supporting drum, a series of band-folding arms movable radially of said drum and longitudinally thereover, a series of actuators carrying said arms, and a cam device common to said actuators for imparting radial outward movement thereto.

14. Band-folding apparatus comprising a band-supporting drum, a series of band-folding arms movable radially of said drum and longitudinally thereover, means for yieldingly retracting said arms radially inward and means common to said arms for positively moving them as a group in an outward radial direction.

15. Band-folding apparatus comprising a band-supporting drum, a series of band-folding arms movable as a group longitudinally thereover, a series of radially-movable actuators carrying said arms, and a spring common to said actuators and arranged circumferentially of the group for yieldingly retracting them.

16. Band-folding apparatus comprising a band-supporting drum, a series of radially-movable band-folding arms associated therewith, a support for said arms, and an operating device mounted on said support and having angular and longitudinal movements with respect to the drum for imparting the radial movements to said arms.

17. Band-folding apparatus comprising a longitudinally-slotted band-supporting drum, band-folding arms adapted to rest in retracted position within the slots, a circumferential groove formed in the outer drum surface, a resilient band-folding roller carried at the forward ends of said arms and occupying said groove when the arms are retracted, and means for radially projecting said arms.

18. Band-folding apparatus comprising a longitudinally-slotted band-supporting drum, a longitudinally-movable slide telescoping within the slotted portion of said drum, a series of arms movable with the slide longitudinally over the drum and having band-folding means at their forward ends, a series of actuators supporting said arms at the rear ends of the latter and radially movable on said slide, and a manually-operable cam ring having screw-threaded engagement with said slide, coaxial therewith, for radially projecting the actuators and arms by its angular movement to initiate the fold and for then longitudinally projecting the slide and arms to complete the folding operation.

In witness whereof I have hereunto set my hand this 15th day of August, 1929.

JOHN R. GAMMETER.