

Dec. 11, 1962

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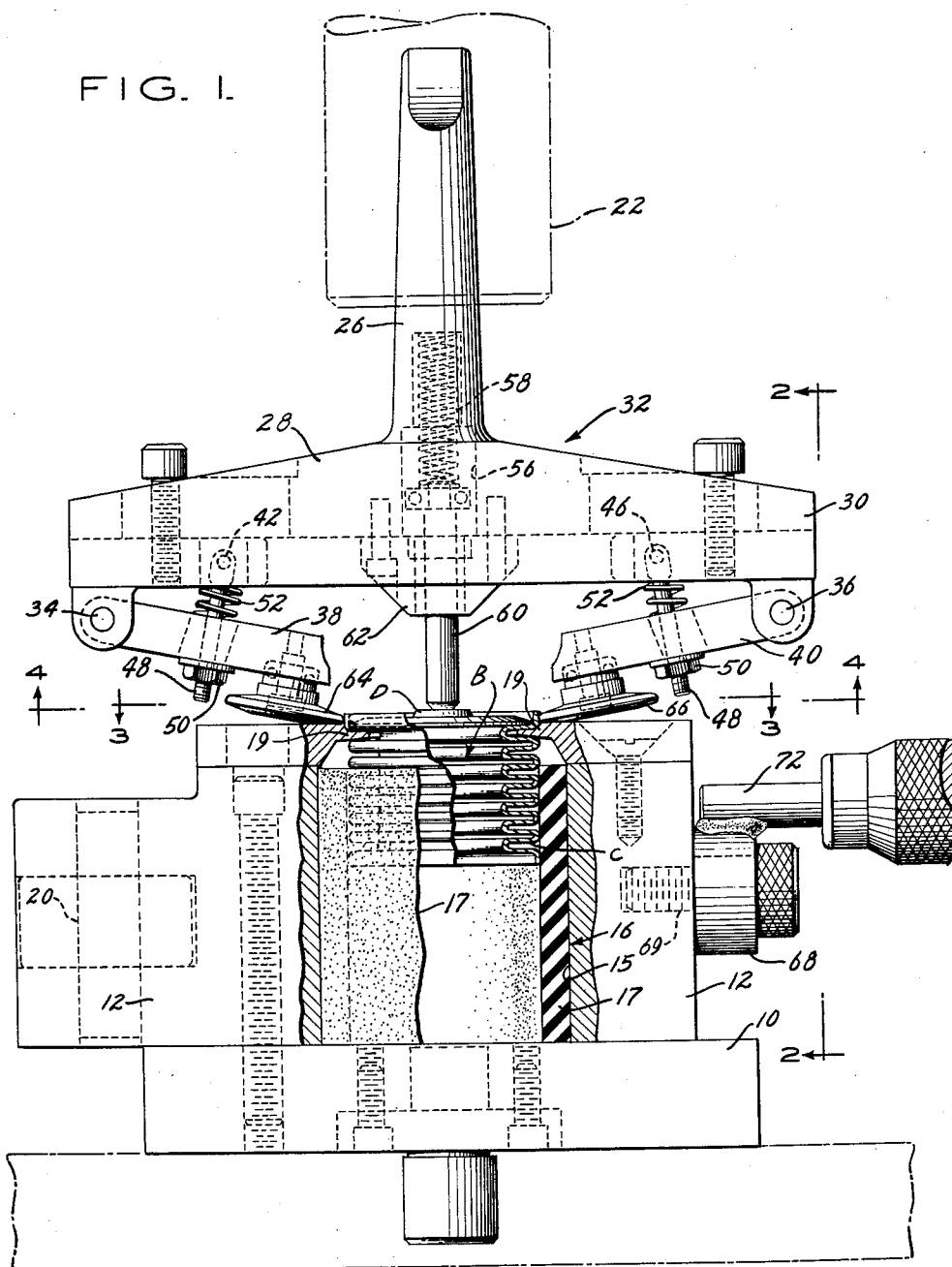
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DEVICE FOR ASSEMBLING BELLOWS ENDS TO CONVOLUTIONS

Filed Oct. 25, 1957

3 Sheets-Sheet 1

FIG. 1.



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FIG. 2.

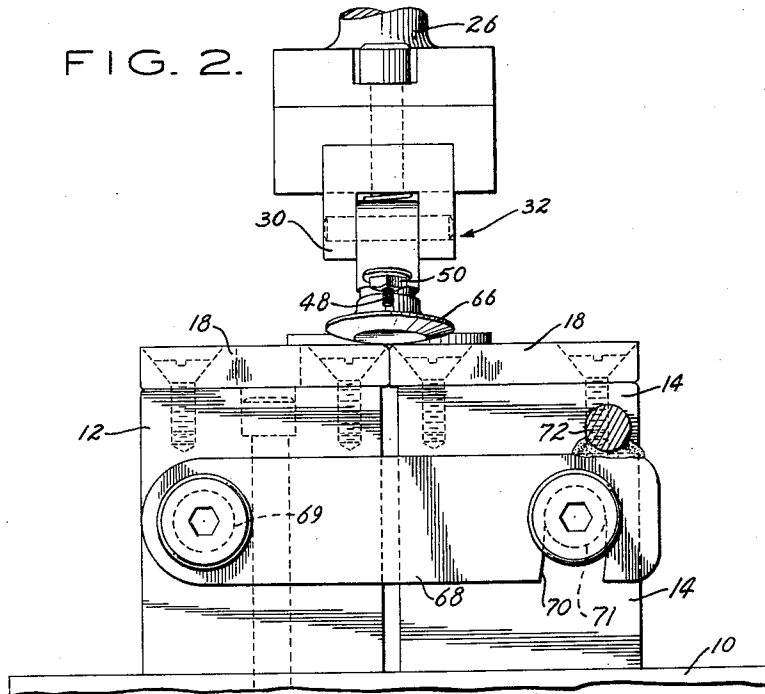
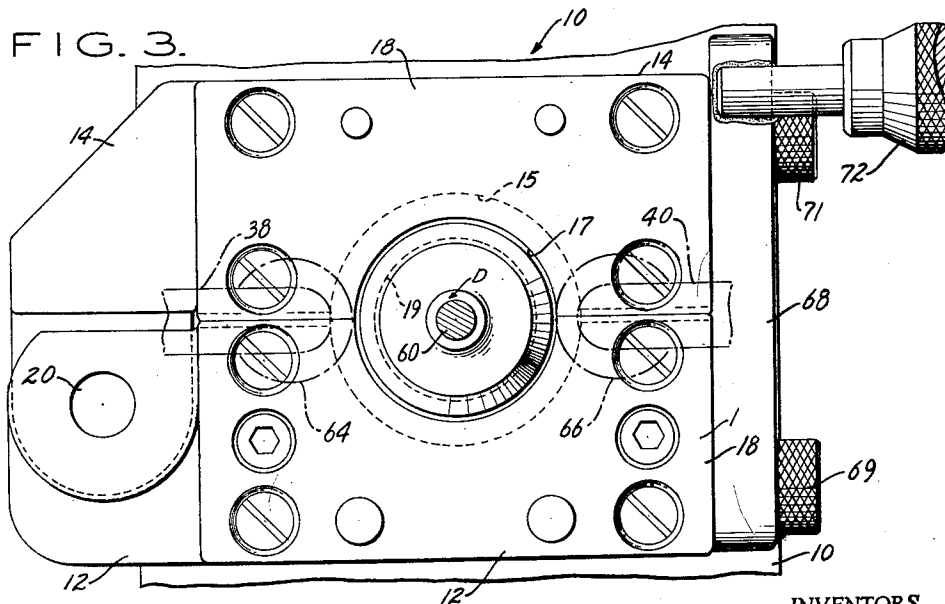


FIG. 3.



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DEVICE FOR ASSEMBLING BELLOWS ENDS TO CONVOLUTIONS

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Filed Oct. 25, 1957, Ser. No. 692,288
8 Claims. (Cl. 113—52)

This invention relates to the manufacture of bellows. More specifically, it relates to that operation wherein the disk-like ends of the bellows are attached by spinning to the convolutions or corrugations.

In the past, the general procedure for attaching these ends was to mount the convolutions in a lathe chuck and hold the end piece against the convolutions while the extended flange of the said convolutions was turned over the end piece. Losses in end piece concentricity and squareness, wrinkles in the turned-over flange, tearing of the flange, and a change in convolute spacing at the ends resulted from this method.

It is therefore a general object of the invention to provide an improved apparatus for applying bellows and disks to the convolutions or corrugations of the same by a spinning operation, in accordance with which the bellows proper is positioned and held in an improved manner, and in which the spinning is performed by an improved spinning structure, with resultant unfailingly perfect securement of the disks to the convolution, without the disadvantageous results noted above.

The foregoing as well as other objects will become more apparent as this description proceeds, especially when considered in connection with the accompanying drawings illustrating a preferred embodiment of the invention, wherein:

FIG. 1 is a fragmentary view in elevation, partially broken away and in vertical or axial section, of the improved apparatus of the invention;

FIG. 2 is a further fragmentary view in end elevation, as from the line 2—2 of FIG. 1;

FIG. 3 is a view in top plan, as from the line 3—3 of FIG. 1;

FIG. 4 is a bottom plan view of the spinning structure, as from the line 4—4 of FIG. 1; and

FIG. 5 is a view generally similar to FIG. 1, showing the bellows as finally assembled by employing the method and apparatus of the invention.

In FIG. 1, a drill press table is indicated generally at 10. Two locating blocks 12 and 14 are mounted on table 10, for the purpose of locating and clamping a bellows B for the spinning operation. Block 12 is rigidly secured to said table, while block 14 is positively hinged to block 12 at 20, and has freedom of movement parallel to the plane of the drill press table 10.

When blocks 12 and 14 are brought into juxtaposition with each other, they form a cylindrical hole 15 which is perpendicular to the plane of table 10. The diameter of this hole is such as to accommodate a rubber liner bushing 16 comprised of semi-cylindrical sections 17. The use of such a liner bushing, as will later be seen, enables bellows convolutions C of various diameters to be accommodated in the device.

A pair of diametrically opposed top plates 18 are fixedly secured on the top of the respective blocks 12, 14, at the upper axial end of the hole or cavity 15 therebetween, the plates having facing semi-circular arcuate recesses defined by a radially inwardly flanged ridge 19. The ridges 19 coact to afford vertical support for the convolutions and at the same time properly locate said convolutions.

The blocks 12 and 14 are so positioned on table 10

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that the hole 15 therebetween is on the same centerline as a drill press tool spindle 22 (FIG. 1), and a spinning device, generally indicated 32, is held in spindle 22 so that the rotary and vertical motions of said spindle are imparted to it.

The spinning structure 32 is substantially comprised of a taper shank 26 rigidly fixed to suitable opposed arms 28 and 30. The ends of arms 28 and 30 carry pins 34 and 36, respectively, which serve as supporting pivots for the respective spinning roller arms 38 and 40.

Arms 28 and 30 also carry transverse pivot pins 42 and 46, which pins hinge the threaded retaining bolts 48 on the device 32. Bolts 48 extend through openings in the roller arms 38 and 40 and have retaining nuts 50 threaded thereon to limit movement of the arms 38, 40 in the direction to which they are urged by coil springs 52 surrounding the pins 48. The position of the arms may be adjusted as desired by reference to calibrations (FIG. 4) on the lower side of the fixed arms 28, 30.

Spinning structure 32 has a cavity 56 formed on the same centerline as the taper shank 26, which cavity houses a spring 58 and locating center 60. This spring and locating center are held in structure 32 in a suitable manner by retainer plate 62.

Free spinning rollers 64 and 66 are suitably journaled at the free ends of roller arms 38 and 40 respectively. These rollers are placed on the arms in such a manner that the centerlines of the rollers intersect at a point on the centerline of the spindle 22, above the locating blocks 12 and 14. These blocks are held in their operative bellows locating and clamping position in any suitable way, as by a latch bar 68 pivoted at 69 on a side of the block 12 and having a slot 70 in the opposite end thereof which engages a projecting latch pin 71 on the block 14. The shape and arrangement of the slot 70 is such that latch bar 68 exerts a downward wedging action on block 14 to urge it toward the fixed mounting block 12. A hand piece 72 on bar 68 facilitates this operation.

In the operation of the device, the block 14 is opened and the bellows convolutions or corrugations C of bellows B are placed in the semi-cylindrical opening formed by a plate 18 and split liner section 17 of block 12, in such a manner that the top convolution C is located on the ridge 19 formed on the adjacent plate 18. The movable block 14 is then shut and locked securely by latch bar 68. The end apertured disk D for the bellows is then placed atop the top convolution.

Spindle 22 is then rotated and lowered onto the plates 18, which causes the spindle locating center or pilot 60 to seat itself in the hole of the bellows end disk D. The pilot 60 insures concentricity between the end disk and outer diameter of the convolutions.

The spinning roller arms 38 and 40 are preferably restricted by bolts 48 and nuts 50 from moving outwardly to a point which would result in a greater angle, between the arm and the top surfaces of plates 18, than 45 degrees.

Spindle 22 continues to rotate and move downwardly. This causes the rollers 64 and 66 to come into engagement with the top surfaces of plates 18, by which surfaces the rollers are thus supported or sustained against further movement in the direction axially of the hole or cavity 15 formed by blocks 12 and 14, and at the same time move inwardly about their pivots 34, 36 towards the centerline of the spindle 22. Thus, the downward force of the spindle is transmitted to urge the roller arms inwardly and perpendicular to the motion of the spindle. As the spindle 22 is continued to be lowered, the rollers 64 and 66 come into contact with the top flange of the convolutions C and, in effect, roll the metal up and over the end disk D. Downward force on the arms 38 and 40 is supplied by the compression springs 52.

When this operation is completed, the spindle 22 is

raised, to raise the spinning structure 32 with all of its attached parts.

In tests conducted with this device, it was found that such metals as stainless steel and Monel could be turned over, without a prior annealing operation and with uniformly satisfactory results.

The drawings and the foregoing specification constitute a description of the improved device for assembling bellows ends to convolutions in such full, clear, concise and exact terms as to enable any person skilled in the art to practice the invention, the scope of which is indicated by the appended claims.

What we claim as our invention is:

1. Apparatus for assembling end disks to corrugated bellows bodies which are of circular cross section about a longitudinal axis, comprising a locating and holding structure including adjustably connected and relatively movable mounting blocks having arcuate recesses adapted to provide a cavity having a longitudinal axis to receive and clamp a bellows body between said blocks, said blocks providing exposed roller engaging surfaces at an axial end of said blocks and extending radially outwardly of said cavity normal to the axis of the latter; and a rotary spinning structure mounted for coaxial rotation above said cavity and movement in a direction toward said blocks, said spinning structure including opposed radial roller arms pivotally mounted on the spinning structure in convergent relation to the rotative axis of said spinning structure, being mounted on the latter at points spaced outwardly of the last named axis, said arms having spinning rollers journaled thereon and positioned for engagement in an axial direction with said surfaces of said blocks under predetermined pressure upon movement of said spinning structure in an axial direction, thus to swing said arms about the respective pivots thereof and to urge said rollers radially inwardly toward the axis of said cavity and a bellows body clamped therein.

2. Apparatus in accordance with claim 1, in which said blocks are each provided with an arcuate, inwardly extending ledge adjacent said upper axial end thereof for external engagement with an upper corrugation of the bellows body to grip the latter against radial and axial displacement.

3. Apparatus in accordance with claim 1, in which said spinning structure includes a centering element mounted for axial movement therewith and axially engageable with a disk applied to said bellows body to locate said structure relative to said bellows body.

4. Apparatus in accordance with claim 1, in which said blocks are each provided with an arcuate, inwardly extending ledge adjacent said upper axial end thereof for external engagement with an upper corrugation of the bellows body to grip the latter against radial and axial displacement, and in which said spinning structure includes a centering element mounted for axial movement therewith and axially engageable with a disk applied to said bellows body to locate said structure relative to said bellows body.

5. Apparatus for assembling end disks for corrugated bellows bodies which are of circular cross section about a longitudinal axis, comprising a body locating and holding structure having body holding means providing a body receiving cavity having an axis coinciding with that

of a body held therein, and a roller engaging surface adjacent said means extending outwardly of the cavity axis, and a rotary spinning structure mounted for coaxial rotation above said cavity and for movement in a direction toward said roller engaging surface, said spinning structure including roller mounting members mounted for radial movement toward the axis of the cavity and located at positions spaced about the rotative axis of said spinning structure, said members having spinning rollers journaled thereon and positioned for engagement in an axial direction with said roller engaging surface of said locating and holding structure, and means operatively connecting said members to said spinning structure whereby, upon movement of said spinning structure in an axial direction, to urge said rollers radially inwardly of said cavity axis and against a bellows body held in the cavity.

6. Apparatus in accordance with claim 5, in which said locating and holding structure includes a pair of adjustably connected and relatively movable mounting blocks having arcuate recesses adapted to receive and clamp a bellows body therebetween.

7. Apparatus in accordance with claim 5, in which said spinning structure includes a centering element carried thereby and axially engageable with a disk applied to said bellows to locate said spinning structure relative to the disk and bellows body.

8. Apparatus in accordance with claim 5, in which said spinning structure includes a centering element carried thereby and axially engageable with a disk applied to said bellows to locate said spinning structure relative to the disk and bellows body, said members being arms pivotally mounted on said spinning structure in convergent relation to the rotative axis of the latter, being pivotally mounted on said spinning structure on points spaced outwardly of the last named axis, said spinning rollers being journaled on said arms on axes at an angle to the respective arms.

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