May 2, 1950 R. H. MURPHY 2,506,232

MACHINE FOR MAKING RETRACTABLE TUBING

Filed May 2, 1944 4 Sheets-Sheet 1

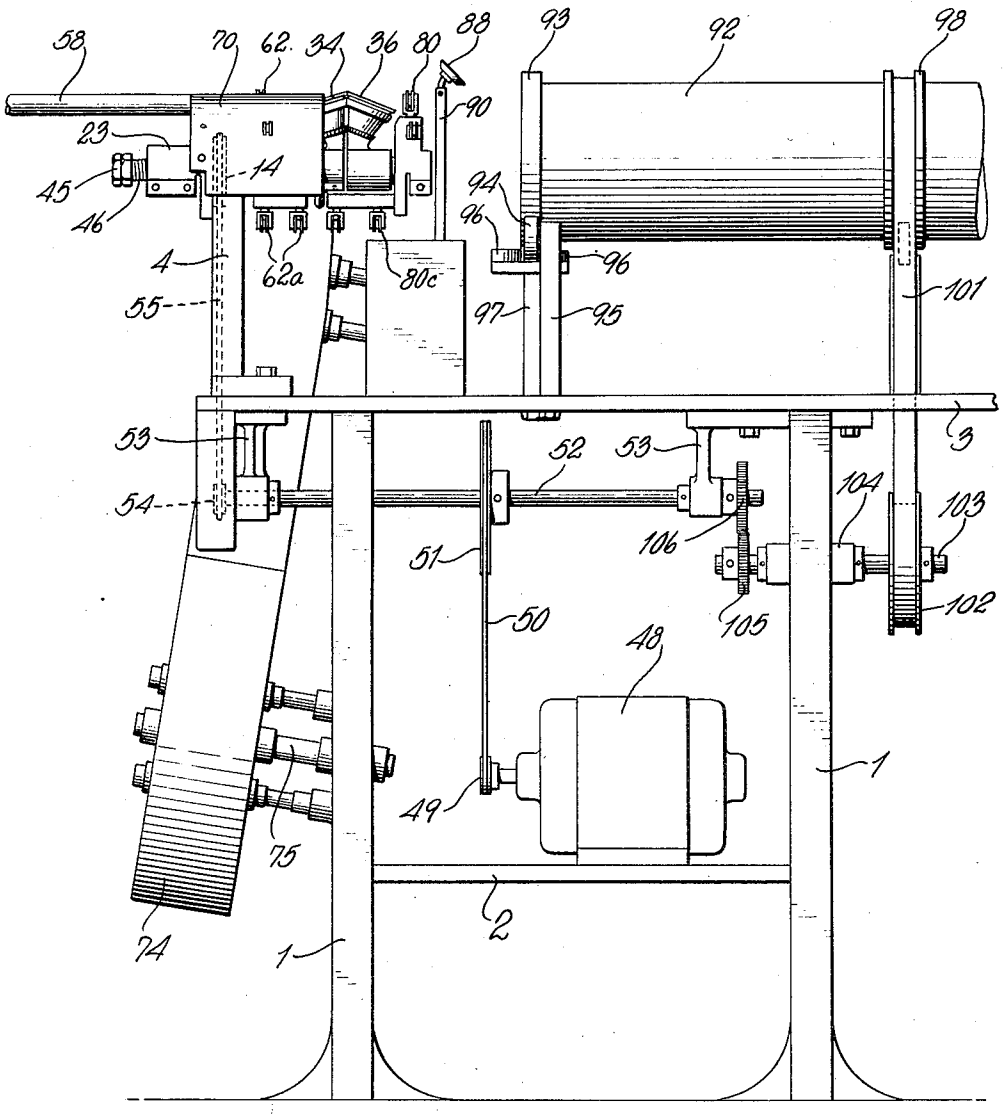


Fig. 1.

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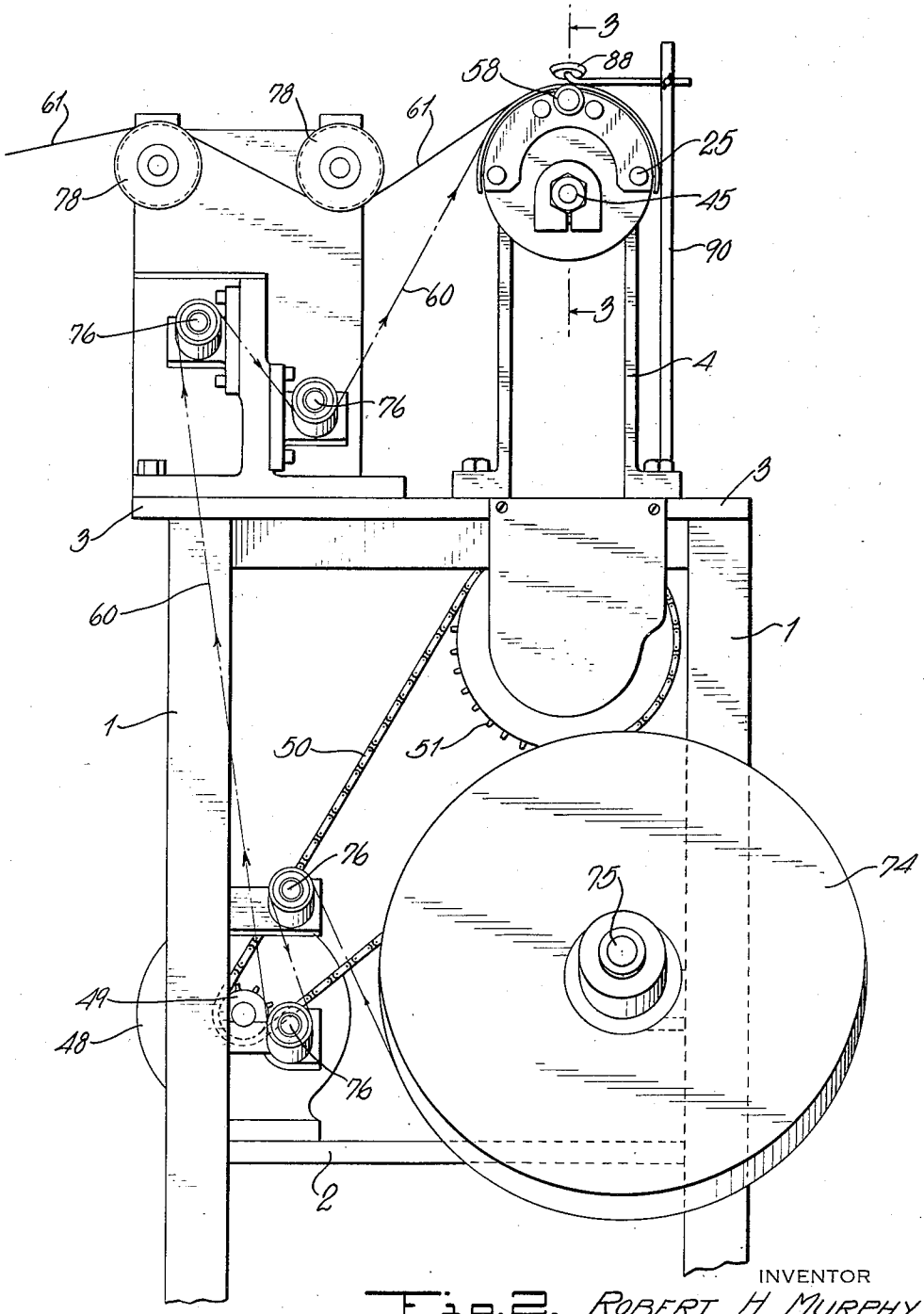


Fig. 2.

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MACHINE FOR MAKING RETRACTABLE TUBING

Filed May 2, 1944 4 Sheets-Sheet 3

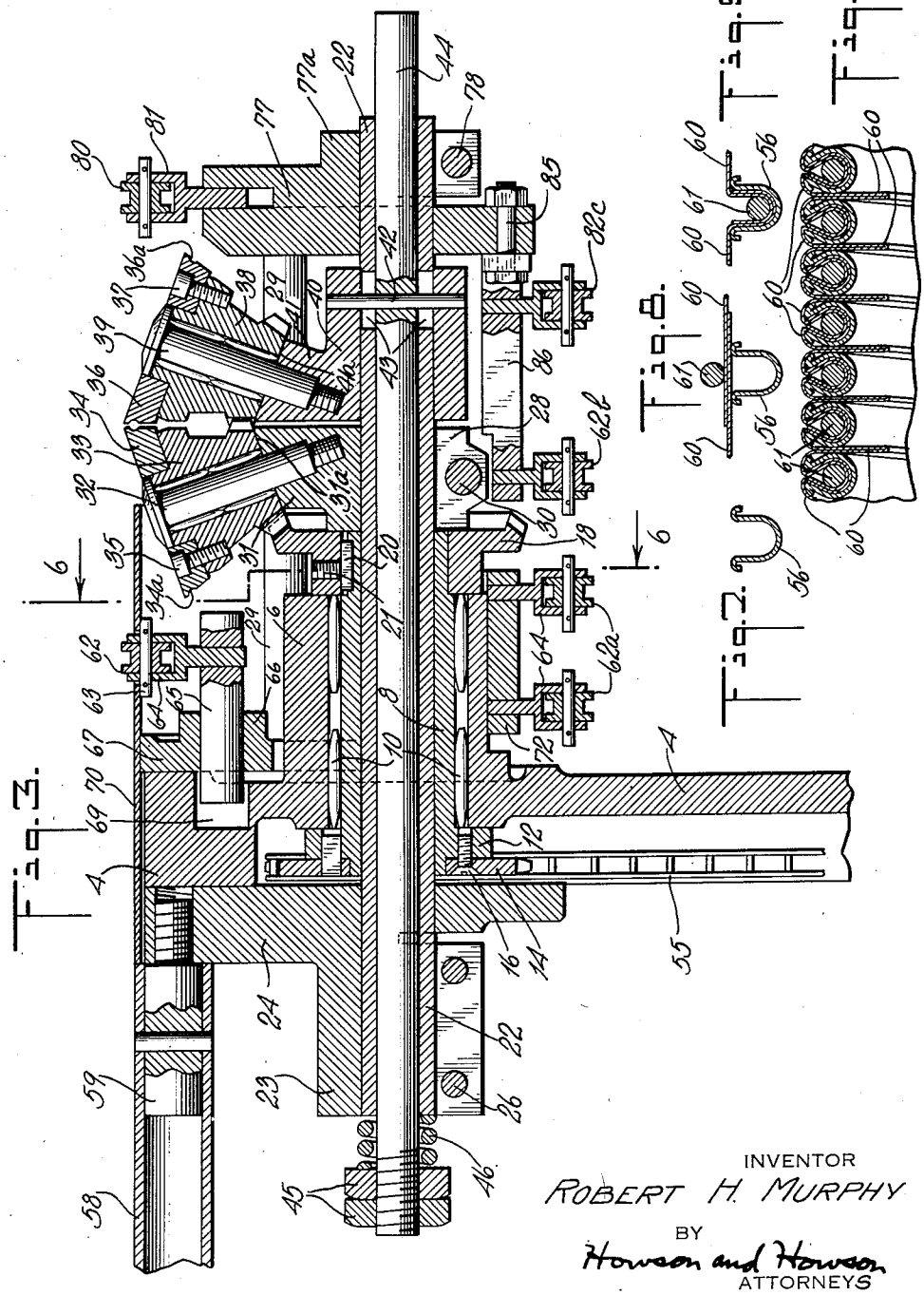


Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

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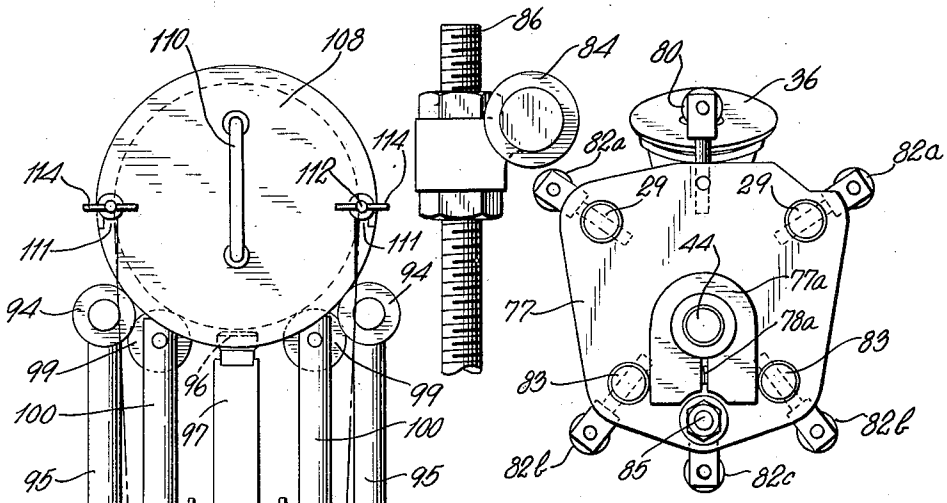


Fig. 5.

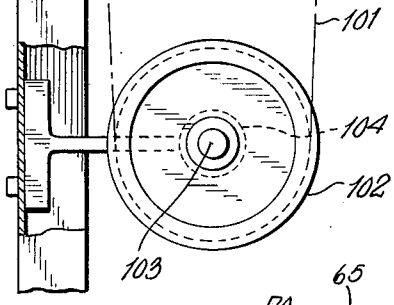


Fig. 4.

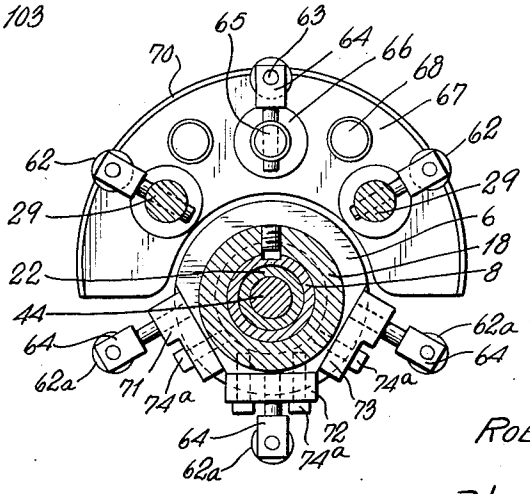


Fig. 6.

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UNITED STATES PATENT OFFICE

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MACHINE FOR MAKING RETRACTABLE TUBING

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Application May 2, 1944, Serial No. 533,782

5 Claims. (Cl. 154—6)

1

This invention relates to machines and methods for forming tubing and more particularly to machines and methods for forming tubing comprising a spiral supporting member and a flexible or retractable strip. It is an object of this invention to provide a machine for forming tubing of the class described by an improved method whereby the edges of the flexible or retractable strip are secured together along a spiral seam by the supporting member in such manner that the supporting member is covered by flexible or retractable strip. It is also an object of this invention to provide a machine of simple and rugged construction which is efficient in operation and of low cost to manufacture and which is readily adaptable for the manufacture of tubing of different diameters.

In the drawings which illustrate a preferred embodiment of this invention

Fig. 1 is a partial view in side elevation of a tube forming machine in accordance with this invention;

Fig. 2 is a view in elevation looking from the left in Fig. 1;

Fig. 3 is a partial longitudinal sectional view taken as on line 3 of Fig. 2;

Fig. 4 is a partial view in end elevation looking from the right in Fig. 1;

Fig. 5 is a partial view in elevation looking from the right in Fig. 3;

Fig. 6 is a partial vertical transverse section taken as on line 6—6 of Fig. 3;

Figs. 7, 8, and 9 are transverse sectional views showing the joint between the edges of the retractable strip at different stages in the securing of the edges of the strip together by the supporting spiral in the operation of the machine, Fig. 7 showing the supporting spiral as it is fed to the machine; Fig. 8, the relation of the overlapping edges of the retractable strip and the binding wire to each other and to the supporting spiral before the edges of the retractable strip and the binding wire are forced into the trough of the supporting spiral, and Fig. 9 showing the edges of the retractable strip and the binding wire as forced into the trough of the spiral and

Fig. 10 is a partial longitudinal sectional view of a completed section of tubing, the tubing being shown collapsed and showing the sides of the trough of the spiral pinched together so as to retain the edges of the retractable strip and the binding wire in the trough of the spiral.

A machine in accordance with this invention comprises, as shown in the drawing, a supporting stand having vertical members 1 supporting lower

2

and upper base members 2 and 3, respectively. Secured to the upper base member 3 is a bracket or standard 4 having an enlarged boss 6 bored to receive a sleeve 8 mounted on roller bearings 10 in the boss 6. The sleeve 8 is flanged at one end, as at 12, and a sprocket 14 is secured to the flange 12 by bolts 16. At its other end the sleeve 8 has a bevel gear 18 secured thereon by a key 20 and set screw 21. Extending through the sleeve 8 is a sleeve 22 which projects at both ends beyond the sleeve 8 and at one end extends into an opening in a boss 23 on an end piece 24 secured to the standard 4 by bolts 25. The boss 23 is partly cut from the end piece 24 and is split throughout its length so as to be drawn together by bolts 26 to hold the sleeve 22 against movement.

Mounted on the sleeve 22 adjacent the gear 18 is a split collar 28 which is clamped against movement on the sleeve 22 by a bolt 30. The collar 28 is provided with a projection 31 having an inclined face at 31a against which bears a bevel gear 33 which meshes with the gear 18 and is journaled on a bearing pin 32 secured in the collar 28. The gear 33 is formed with a projecting hub which is cut away at its outer end to provide a seat for a forming roll 34 secured to the gear hub by bolts 35.

The roll 34 cooperates with a similar roll 36 secured by bolts 37 to its seat on the hub of a gear 38. The gear 38 meshes with the gear 33 and is journaled on a bearing pin 39 mounted in a collar 40. The pin 39 secures the gear 38 to its seat on an inclined face 41a on a projection 41 on the collar 40. The inclined faces on the collars serve to maintain the cooperating forming rolls 34 and 36 at the proper angle to enable the grooves 34a and 36a in the respective rolls to pinch together the sides of the metallic supporting spiral 56 of the tubing. The collar 40 is snugly but movably mounted on the sleeve 22 and is secured in position on the sleeve 22 by a pin 42 which extends through slots 43 in opposite sides of the sleeve 22 and which tightly fits an opening in a rod 44 slidably mounted in the sleeve 22. The rod 44 projects beyond the sleeve 22 at the boss 23 and has its end threaded to receive nuts 45 which maintain under suitable compression a spring 46 surrounding the rod 44 and confined between the nuts 45 and the sleeve 22. The spring 46 serves to yieldingly maintain the cooperating rolls 34 and 36 in proper operative relation but permits the roll 36 to be moved away from the roll 34 in the event an extra thickness of material is fed between the rolls 34 and 36, the

collar 40 and rod 44 moving relatively to the sleeve 22 at this time.

The rolls 34 and 36 are driven in opposite directions from the gear 18 through the gears 33 and 38. The gear 18 is driven from a motor 48 mounted on the lower bed plate 2 by a sprocket 49 on the motor shaft connected by a chain 50 to another sprocket 51 which is fixed on a shaft 52 journaled in bearing brackets 53 carried by the upper bed plate 3. At one end the shaft 52 has fixed thereon a small sprocket 54 connected by a chain 55 to the sprocket 14 which, as stated, is fixed on the sleeve 8.

In forming the tubing, strip metal of sufficient length to form the length of tubing desired is passed through forming rolls to give it a U-shape with the edges curled back, such as the shape of the strip 56 shown in Fig. 7, and at the same time the formed strip is coiled in helical shape. The coiled strip is placed upon a tubular support 58 carried by a pin 59 engaged in the end plate 24 and is guided by suitable guide rolls as it moves about the machine to the rolls 34 and 36. Before the formed strip 56 passes between the rolls 34 and 36, the edges of a suitable collapsible strip, as a textile strip 60, are overlapped over the trough of the strip 56 and the binding or retaining wire or cord 61 is placed over the overlapped edges of the strip 60, as shown in Fig. 8. The wire or cord 61 is under sufficient tension to force the overlapping edges of the strip 60 into the trough of the strip 56 and to hold the overlapping edges of the strip 60 in that position, as shown in Fig. 9, as the strip 56, the overlapping edges of the strip 60 and wire or cord 61 pass between the rolls 34 and 36. The rolls 34 and 36 press in the sides of the trough in the metal strip 56, as shown in Fig. 10, so that the overlapping edges of the strip 60 are frictionally held between the sides of the trough of the metal strip 56 and between the wire or cord 61 and the metal strip 56.

To guide the helix formed of the strip 56 to the rolls 34 and 36, there is provided a plurality of guide rolls 62 (three being shown in Fig. 6), mounted on pins 63 fixed in yokes 64. The yokes 64 each have a stem, one being pivotally mounted in an opening in a pin 65 as shown in Figure 3 and the other two stems being pivotally mounted in openings in rods 29. The pin 65 and rods 29 are mounted in openings in bosses 66 on a plate 67 secured to the standard 4 by bolts 68. They extend through plate 67 into recesses 69 in the standard 4. At their opposite ends the rods 29 extend into openings in a bracket 77 mounted on the sleeve 22. The upper portions of the guide rolls 62 project through openings in a semi-cylindrical cover plate 70 secured to the standard 4 by suitable screws (not shown).

Similar to the guide rolls 62 and similarly mounted in yokes 64 which are pivotally mounted in brackets 71, 72, and 73 are three rolls 62^a. The brackets 71, 72 and 73 are secured by screws 74^a to flat surfaces formed upon the lower portion of the boss 6, at points equally spaced around the lower half of the boss 6.

The textile strip 60 may be supplied from a suitable roll 74 rotatably mounted on a support 75 carried by a frame member 1. From the roll the strip may pass over suitable guide rolls 76 carried by brackets secured to a frame member 1 and the base member 3 while the cord or wire 61 may be fed from a suitable spool or reel (not shown) mounted adjacent the machine and passed over guide rolls 78, suitable braking means being applied to the reel or spool so as to place the wire or cord 61 under the desired tension.

The tubing, as its passes from the rolls 34, 36 is guided and supported by the engagement of the metallic strip 56 in suitable guide rolls 80, 82^a, 82^b, 82^c (see Figures 3 and 5). These guide rolls are supported by the rods 29 and by the bracket 77 respectively. The bracket 77 has a portion 77^a formed as a split collar fitting the sleeve 22 and adapted to be tightened by a bolt 78^a to tightly engage the sleeve 22 and hold the bracket 77 in adjusted position. The tubing guide roll 80 is rotatably mounted in a yoke 81 which has a stem pivotally supported in a recess in the bracket 77. The tubing rolls 82^a and 82^b are mounted in yokes whose stems are pivotally mounted in rods 29 and pins 83, respectively (see Figure 5), the pins 83 being fixed in openings in the bracket 77. For supporting the two guiding rolls 82^c there is secured to the bracket 77 by the bolt 85 a bracket 86 having openings in which are pivotally mounted a yoke supporting a roll 82^c and a yoke supporting a roll 62^b. The roll 82^c cooperate with the rolls 80, 82^a and 82^b in guiding the tubing after the metal strip 56 has passed between the rolls 34 and 36 while the roll 62^b cooperates with the rolls 62 and 62^a in guiding the metal strip 56 to the rolls 34 and 36. The various guide rolls are positioned axially of the machine to conform to the helical shape of the strip 56.

As the tubing passes from the rolls 34, 36 to the first of the guide rolls, a roller 84 (Figure 4) adjustably supported on a standard 86 carried by the bed plate 3 bears against the tubing so as to press the metal strip 56 against the first guide roll, (one of the rolls 82^a as shown in Fig. 5), while an inclined roller 88 adjustably supported by a standard 90 carried by the base plate 3 bears against the side of the metal strip 56 so as to maintain the helical coil of the strip 56 spread apart and to cause the tubing to move away from the rolls 34, 36.

To receive the tubing as it passes from the machine there is provided a cylinder 92 having rings or collars 93 at its ends by which it is rotatably mounted on rolls 94 suitably mounted on supports 95 carried by the bed plate 3. Rolls 96 suitably mounted on a support 97 carried by the bed plate 3 engage opposite sides of a ring 93 to prevent longitudinal movement of the cylinder. Intermediate its ends, the cylinder 92 is provided with a flanged collar 98 which rides on supporting rolls 99 mounted on supports 100 carried by the bed plate 3. The collar 98 serves as a pulley to rotate the cylinder 92 and is engaged by a belt 101 driven by a pulley 102 fixed on an end of a shaft 103. The shaft 103 is journaled in a bearing 104 supported from a frame member 1 and has fixed on its other end a gear 105 which engages with a gear 106 fixed on the shaft 52 which is driven from the motor 48.

The cylinder 92 is open at the end adjacent the rolls 34, 36 to receive the tubing as it is formed and is closed at its other end by a slide 108 having a handle 110 and open ended slots 111 at each side to fit over threaded pins 112 fixed in the end ring 93. Wing nuts 114 threaded on the pins 112 secure the slide in position. The cylinder 92 is of less length than the extended length of the finished tubing so that the tubing is collapsed after it engages the slide 108. The rotation of the cylinder 92 is adjusted to give the cylinder a peripheral speed substantially greater than the rate of feed of the metal strip 56 by the rolls 34,

36 so as to assist the retracting and packing of the finished tubing in the cylinder 92.

Many modifications within the scope of my invention will occur to those skilled in the art and therefore the invention is not limited to the specific form and embodiment shown.

What is claimed is:

1. In a machine for forming tubing of a strip of collapsible material and a helix of strip metal clamping the overlapping edges of the collapsible material together, a standard having a bearing opening therein, a sleeve rotatably mounted in said bearing opening, a second sleeve mounted in said first sleeve, means holding said second sleeve against rotation, cooperating rolls for clamping the helix on said collapsible material, means supporting said rolls from said second sleeve, said supporting means being constructed and arranged to permit relative displacement of said cooperating rolls, means for driving said cooperating rolls from said first sleeve, driving means for said first sleeve and means yieldingly opposing relative displacement of said cooperating rolls.

2. In a machine for forming tubing of a strip of collapsible material and a helix of strip metal clamping the overlapping edges of the collapsible material together, a standard having a bearing opening therein, a sleeve journaled in said opening, means for operating said sleeve, a second sleeve mounted in said first sleeve, means connecting said second sleeve and standard and preventing rotation of said second sleeve, cooperating rolls for clamping the helix on the collapsible material, means for operating said cooperating rolls from said first sleeve, relatively movable means supporting said cooperating rolls from said second sleeve and means yieldingly opposing relative movement of said supporting means.

3. In a machine for forming tubing of a strip of collapsible material and a helix of strip metal clamping the overlapping edges of the collapsible material together, a standard having a bearing opening therein, a sleeve journaled in said opening, means for operating said sleeve, a second sleeve mounted in said first sleeve, means preventing rotation of said second sleeve, cooperating rolls for clamping the helix on the collapsible material, means for operating said cooperating rolls from said first sleeve, supporting means for one of said cooperating rolls fixed on said second sleeve, supporting means for the other of said cooperating rolls slidably mounted on said second sleeve and means yieldingly opposing movement of said supporting means on said second sleeve.

4. In a machine for forming tubing of a strip of collapsible material and a helix of strip metal clamping the overlapping edges of the collapsible material together, a standard having a bearing opening therein, a sleeve journaled in said opening, means for operating said sleeve, a second sleeve mounted in said first sleeve, means preventing rotation of said second sleeve, cooperating rolls for clamping the helix on the collapsible material, means for operating said cooperating rolls from said first sleeve, supporting means for one of said cooperating rolls fixed on said second sleeve, supporting means for the other of said cooperating rolls slidably mounted on said second sleeve, a rod slidably mounted in said second sleeve and movable with said movable roll supporting means and a spring engaging said rod to oppose relative displacement of said cooperating rolls.

5. In a machine for forming tubing of a strip of collapsible material and a helix of strip metal clamping the overlapping edges of the collapsible material together, a standard having a bearing opening therein, a sleeve rotatably mounted in said bearing opening, a second sleeve mounted in said first sleeve, means holding said second sleeve against rotation, cooperating rolls for clamping the helix on said collapsible material, means supporting said rolls from said second sleeve, said supporting means being constructed and arranged to permit relative displacement of said cooperating rolls, means for driving said cooperating rolls from said first sleeve, means yieldingly opposing relative displacement of said cooperating rolls and guiding means substantially maintaining the helix of the desired diameter around said sleeves as the helix passes to and from said cooperating rolls.

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