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METHOD OF AND APPARATUS FOR PRODUCING CORRUGATED TUBING

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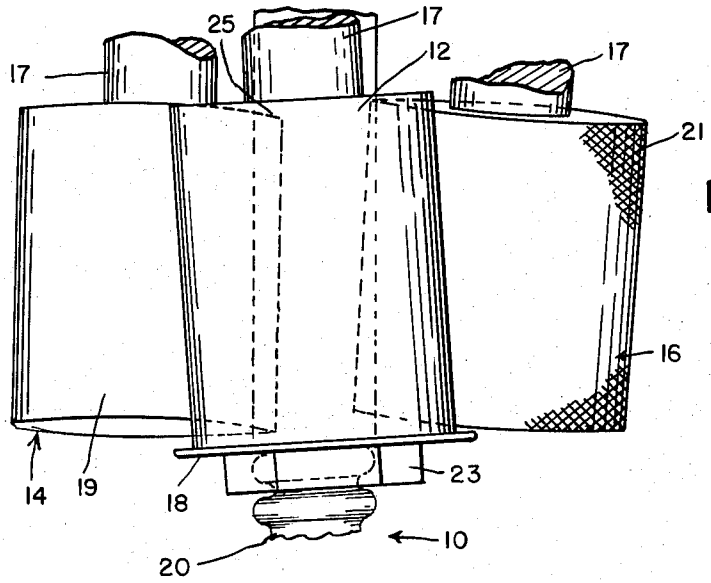


FIG.1.

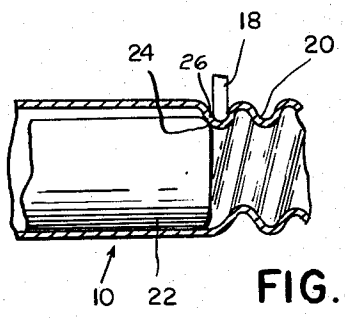
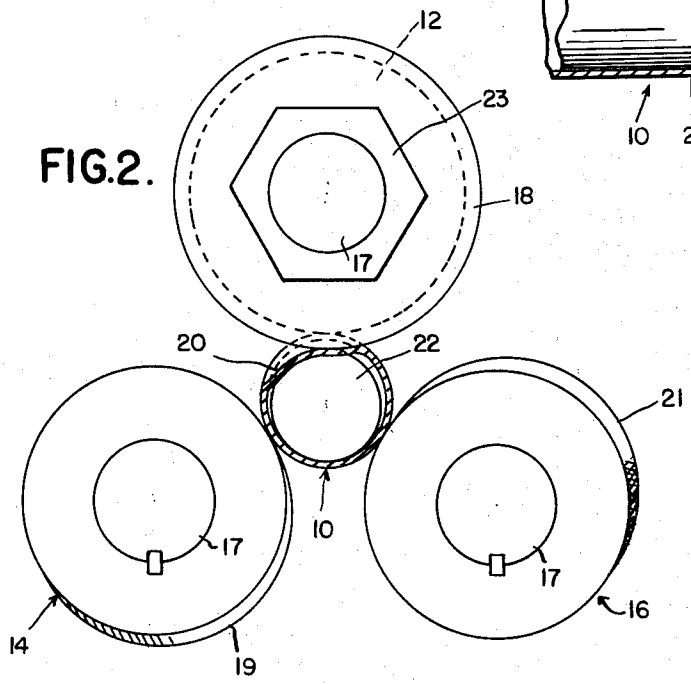


FIG.3.

FIG.2.



INVENTORS
RAYMOND H. GREENE
ELMER A. WITT
BY
Whittemore, Hulbert & Belknap
ATTORNEYS

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METHOD OF AND APPARATUS FOR PRODUCING CORRUGATED TUBING

Raymond H. Greene and Elmer A. Witt, Detroit, Mich., assignors to Calumet & Hecla, Inc., Calumet, Mich., a corporation of Michigan

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1 Claim. (Cl. 153—72)

This invention relates to corrugated tubing and refers more particularly to a method of and apparatus for producing corrugated tubing.

One object of this invention is to provide an improved method of producing corrugated tubing.

Another object of the invention is to provide apparatus for producing corrugated tubing by the improved method which is composed of a relatively few simple parts and yet which is capable of producing high quality corrugated tubing at a relatively high rate of speed.

The tube formed by the method and apparatus of this invention may, for example, be employed in a heat exchange installation, the corrugation improving the heat exchange characteristics of the tube.

Other objects of the invention will become more apparent as the following description proceeds, especially when taken in consideration with the accompanying drawings, wherein:

Figure 1 is a top plan view of apparatus embodying the invention, showing a tube in operative relationship therewith.

Figure 2 is a front elevational view.

Figure 3 is a fragmentary view, partly in section, showing the cooperation between the corrugating member or disc and the pin within the tube.

Referring now more particularly to the drawing, a tube is indicated generally by the reference numeral **10**. The rolls **12**, **14** and **16** are mounted upon arbors **17** and are distributed about the axis of the tube **10**, the tube being supported upon the cylindrical surfaces **19** and **21** of the two lower rolls **14** and **16**. The axes of the arbors **17**, and hence of the rolls, extend obliquely relative to the axis of the tube at the same angle, and at such an angle to the tube axis as to travel a helical path thereabout.

The roll **12** is provided with a relatively narrow disc **18** clamped to the front end by a nut **23**. The disc extends substantially radially outwardly beyond the cylindrical surface of the roll **12** and its annular periphery is rounded as illustrated. The periphery of disc **18** is adapted to engage the outer surface of the tube and, when rotated, to apply a rolling pressure against the wall of the tube to press it radially inwardly along the helical path that the disc makes upon the surface of the tube. The periphery of the disc **18** is concentric with the axis of rotation of roll **12**, and the helix angle of the corrugation or fold **20** in the tube produced by the action of the disc thereon is the same as the angle that the axis of rotation of roll **12** makes with the axis of the tube.

The tube **10** is rotated and advanced by the cooperative action of the cylindrical surfaces of the rolls **14** and **16** and the periphery of the disc **18** which frictionally engage the tube. The cylindrical surfaces of rolls **14** and **16** engage the uncorrugated portion of the tube. The cylindrical surface **25** of the roll **12** does not contact the tube to advance it as do the cylindrical surfaces of the other rolls. The cylindrical surface **21** of roll **16** is knurled, as shown, to provide a better frictional engagement and hence a more positive rotation and feed of the tube.

Extending within the tube at the rear of the corrugating disc **18**, is an elongated cylindrical pin **22**. The rear end of the pin extends beyond the rear end of the tube and is connected to a suitable anchorage (not shown). The front end of the pin has a transverse end surface at right angles to the axially extending cylindrical surface thereof and connected to the latter surface by a convex or rounded annular surface **24**, as shown in Figure 3. This rounded surface **24** is disposed slightly to the rear of the corrugating disc **18** and cooperates with the corrugating disc in the formation of the corrugation **20**.

In operation, the three rolls **12**, **14** and **16** are rotated at the same rate of speed by suitable means (not shown). The cylindrical surfaces of the rolls **14** and **16** cooperate with the periphery of the corrugating disc **18** to frictionally engage and thereby rotate and axially advance the tube **10** in a forward direction. The disc **18** applies a rolling pressure to the outer surface of the tube along a helical path to form a helical radially inward corrugation or fold **20** along the helical path. The pin **22** cooperates with the disc in the formation of the corrugation. The pin rests upon the bottom interior surface of the tube, and the rounded annular surface **24** supports the convex portion **26** of the corrugation connecting the apex and rear wall of the corrugation at approximately the point of engagement of the disc **18** with the tube. The remaining interior portions of the tube at the front and rear sides of the point of engagement remain unsupported. Thus, the disc, in effect, folds or bends the material of the tube over and around the rounded end **24** of the pin to form the corrugation, and due to the fact that the remaining interior portions of the tube are unsupported, the corrugation is enabled to develop naturally in response to the rolling pressure applied by the corrugating disc. As a result, a very smooth regular corrugation is developed without undue wear or working of the material of the tube.

The knurling on the cylindrical surface of roll **16** provides a more positive rotation and feed of the tube due to the better frictional engagement therewith. It has been found that if the knurling is omitted, there is a tendency for the tube to slip in rotation with the result that fewer convolutions per inch of the corrugation are developed on the tube.

The drawings and the foregoing specification constitute a description of the improved method of and apparatus for producing corrugated tubing 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 claim.

What we claim as our invention is:

Apparatus for forming a helical corrugation in a length of tubing, comprising a plurality of rolls angularly arranged to support and frictionally grip the length of tubing at spaced points about its circumference, said rolls being disposed with their axes oblique to the axis of the length of tubing and at an angle to the latter axis corresponding generally to the helix angle of the corrugation to be formed in the length of tubing, at least one of said rolls being driven to rotate and longitudinally advance the length of tubing frictionally gripped by said rolls, one of said rolls being in the form of an annular disc disposed to engage the length of tubing to apply a rolling pressure and form a helical corrugation in the length of tubing during the rotation and longitudinal advance thereof, a mandrel extending within the length of tubing in position to support the corrugation at approximately the point of engagement of said annular disc with the length of tubing, the end of said mandrel

being rounded and supporting the convex portion of the corrugation connecting the apex and rear wall thereof, the remaining interior portions of the corrugation being unsupported to enable the corrugation to develop naturally in response to the rolling pressure.

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