Aug. 29, 1933. R. G. BROWN 1,924,734

METHOD OF MAKING TUBULAR MATERIALS

Filed March 11, 1931

Fig. 2.

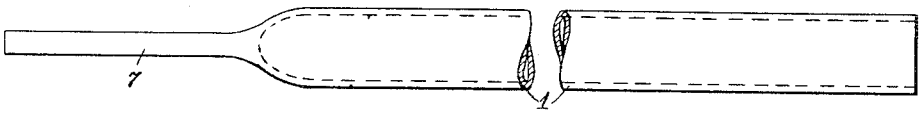


Fig. 1.



Fig. 4.

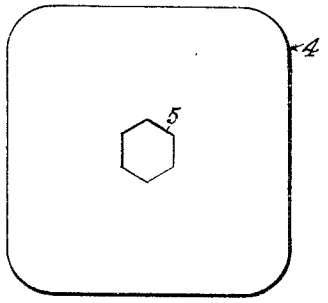


Fig. 3.

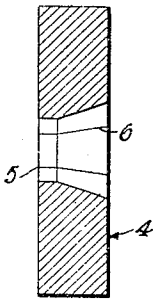


Fig. 5.

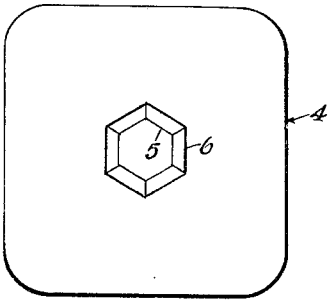


Fig. 6.

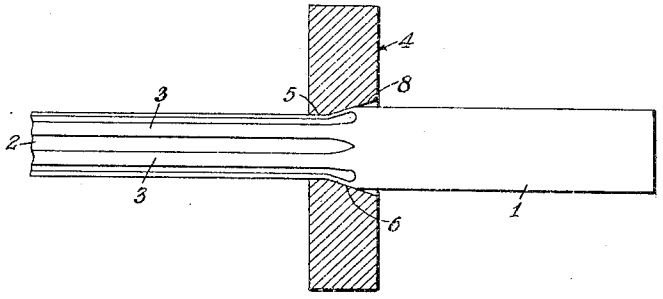


Fig. 7.

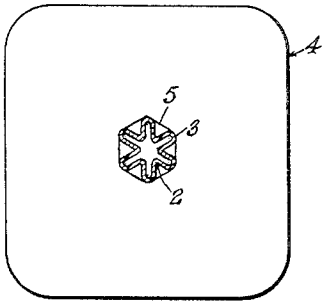
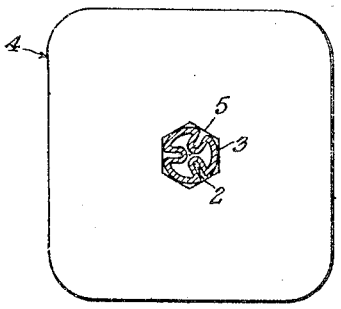


Fig. 8.



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METHOD OF MAKING TUBULAR MATERIALS

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Application March 11, 1931. Serial No. 521,717

11 Claims. (Cl. 153—70)

This invention relates to a method of producing tubular materials having re-entrant portions and cross-sections of various shapes.

According to this invention, a tubular material having re-entrant portions separated by longitudinally extending ribs or the like is produced, without the aid of a mandrel, by passing a tube, preferably substantially cylindrical in shape, through a die having a non-circular aperture, such as a polygonally and specifically a hexagonally shaped aperture. In the actual carrying out of the process, it is essential for successful operation that the perimeter or circumference of the tube be greater than the perimeter of the smallest portion of the die aperture. As the tubing passes through the die, it is compressed or distorted around substantially its entire periphery, whereby a portion of the material is forced inwardly toward the center or longitudinal axis of the same, which results in the formation of the re-entrant portions. The cross-section of the product is a function of the shape of the die aperture and the perimeters of the tube and the die aperture at its smallest point, as hereinafter more fully explained.

To more clearly explain one form of the process, it will be described in connection with the accompanying drawing forming a part of this specification and wherein:

Figure 1 illustrates an end view of the tube to be processed according to this invention;

Figure 2 illustrates the tube after the pointing operation;

Figure 3 is a cross-section of one form of a die employed in the process;

Figures 4 and 5 are front and rear views respectively of the die;

Figure 6 illustrates the passage of the tube through the die; and

Figures 7 and 8 illustrate two of the numerous cross-sections of the product in the course of formation within the die.

Referring now to the drawing, wherein like reference numerals designate like parts, the reference numeral 1 designates a tube, substantially cylindrical in shape, which is to be processed by the method constituting this invention into a tubular material of predetermined cross-section having convolutions, or more particularly re-entrant or inwardly extending portions 2, separated by rib-like members 3 extending longitudinally of the product.

The tube 1, in accordance with the principles of this invention, is passed through a die 4, without the aid of a mandrel, having a non-circular aperture 5 at the point of egress, the perimeter of which is less than the circumference of the tube. In order to facilitate the introduction of the tube 1 into the die 4, the latter is provided with a flaring entrance 6, and the tube 1 at one end thereof is pointed, as designated by the reference numeral 7, prior to the passage of the tube through the die. The pointing is accomplished by securing the end of the tube together so as to tightly fold and compress the wall or walls into a compact form as illustrated.

The flaring entrance 6 of the die 4 is so designed that the taper thereof is such that the wall or sides thereof tangentially engage the tube 1, as illustrated by the reference numeral 8, and thereafter exert a compressing action on the tube prior to its ingress in the smallest portion of the aperture adjacent the point of exit. Preferably the entrance 6 is complemental or similar in shape to that of the aperture 5 at the exit point, though this is not essential to the successful operation of the process.

Though the specific and preferred form of the die aperture 5 at the exit point, illustrated in the drawing, is hexagonal in shape, the invention is not limited thereto. When employed to operate on cylindrical tubes, it may be of any non-circular shape, such as four-sided or polygonal, and in the preferred form, the sides of the aperture are flat and have no re-entrant portions.

The essential of the invention is that no matter what shape the die aperture is, the perimeter thereof at its smallest point must be less than the perimeter or circumference of the tube passed therethrough. By virtue of this, the re-entrant portions in the tube are formed by collapsing away from the die aperture.

The tube 1, pointed as hereinbefore described, is introduced into the die 4 and caused to be passed therethrough by any convenient and suitable mechanism. As the tube 1 passes through the die 4, the inclined sides of the flaring entrance 6 tangentially engage the tube 1 as indicated at 8 in Figure 6, and thereafter the sides exert a compressing or distorting action on the tube 1. Specifically, the tube 1 after it tangentially engages the inclined walls is reduced in size and distorted so that it can enter the smaller hexagonal aperture 5, wherein the tube is converted into its final shape.

It is apparent that numerous and practically unlimited numbers of shapes and configurations may be produced. The specific form produced depends largely upon the perimeter of the tube and particularly how much greater it is than the

perimeter of the die aperture at its smallest point. Two of the many forms which may be produced are illustrated in Figures 7 and 8. Referring to these figures, it will be observed that the form shown in Figure 7 is substantially star-shaped and that shown in Figure 8 substantially clover-shaped. These configurations can be produced at will by employing the principles of this invention. To prepare the clover-shaped construction, a slightly smaller size of tube is employed than in the manufacture of the star-shaped form.

Though the invention has been described with specific reference to the die-drawing process, it is obvious that the principles of the invention are also applicable to the die-rolling procedures.

Since various changes and forms may be made by any one skilled in the art, this invention is not restricted to the specific details hereinabove set forth except as set forth in the appended claims.

I claim:

1. The method of preparing tubular materials having longitudinal re-entrant portions which comprises passing a tube longitudinally through a die aperture having no re-entrant portions and having a perimeter suitably less than the perimeter of the tube to cause the re-entrant portions to form by collapsing away from the die aperture.

2. The method of preparing tubular materials having longitudinal re-entrant portions which comprises passing a substantially cylindrical tube longitudinally through a non-circular die aperture having no re-entrant portions and having a perimeter suitably less than the circumference of the tube to cause the re-entrant portions to form by collapsing away from the die aperture.

3. The method of preparing tubular materials having longitudinal re-entrant portions which comprises passing a substantially cylindrical tube longitudinally through a non-circular flat-sided die aperture having no re-entrant portions and having a perimeter suitably less than the circumference of the tube to cause the re-entrant portions to form by collapsing away from the die aperture.

4. The method of preparing tubular materials having longitudinal re-entrant portions which comprises passing a substantially cylindrical tube longitudinally through a polygonal shaped die aperture having no re-entrant portions and having a perimeter suitably less than the circumference of the tube to cause the re-entrant portions to form by collapsing away from the die aperture.

5. The method of preparing tubular materials having longitudinal re-entrant portions which comprises passing a substantially cylindrical tube longitudinally through a polygonal shaped flat-sided die aperture having no re-entrant portions and having a perimeter suitably less than the circumference of the tube to cause the re-entrant portions to form by collapsing away from the die aperture.

6. The method of preparing tubular materials having longitudinal re-entrant portions which comprises passing a substantially cylindrical tube longitudinally through a hexagonal shaped die aperture having no re-entrant portions and having a perimeter suitably less than the circumference of the tube to cause the re-entrant portions to form by collapsing away from the die aperture.

7. The method of preparing tubing which consists in reshaping a piece of tubing by passing it longitudinally through a polygonal shaped die aperture having no re-entrant portions and having a perimeter suitably less than the circumference of the tube to cause re-entrant rib-like portions to form longitudinally of said tube by collapsing away from the die aperture.

8. The method of preparing tubing which consists in reshaping a piece of tubing by passing it longitudinally through a polygonal shaped die aperture having no re-entrant portions and having a perimeter suitably less than the circumference of the tube to cause rib-like projections with re-entrant rib-like portions between said projections to form longitudinally of said tube by the re-entrant rib-like portions collapsing away from the die aperture.

9. The method of reshaping a tube to form a longitudinal re-entrant portion which comprises passing the tube longitudinally through a die aperture having a substantially flat portion and no re-entrant portions and having a perimeter suitably less than the circumference of the tube to cause a re-entrant portion to form by collapsing away from the die aperture.

10. The method of preparing tubular materials having longitudinal re-entrant portions which comprises passing a substantially cylindrical tube longitudinally through a regular hexagonal shaped die aperture having a perimeter suitably less than the circumference of the tube to cause the re-entrant portions to form by collapsing away from the die aperture.

11. The method of preparing tubular materials having longitudinal re-entrant portions which comprises passing a substantially cylindrical tube longitudinally through a regular polygonal shaped die aperture having a perimeter suitably less than the circumference of the tube to cause the re-entrant portions to form by collapsing away from the die aperture.

RUSSELL G. BROWN.