Oct. 28, 1969 D. W. ROWELL 3,474,522

METHOD FOR CHANGING THE WIDTH OF A STRIP METAL AND FOR FORMING TUBES THEREFROM

Filed May 10, 1967

FIG. 1

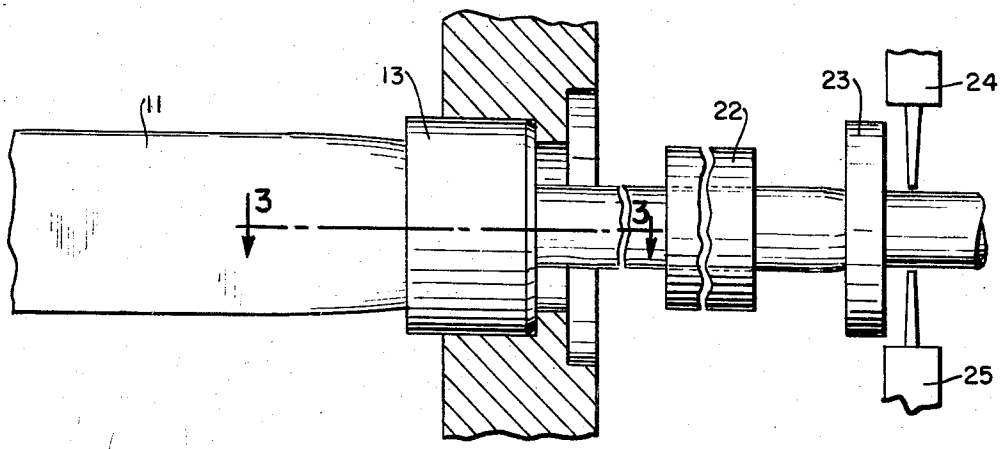


FIG. 2

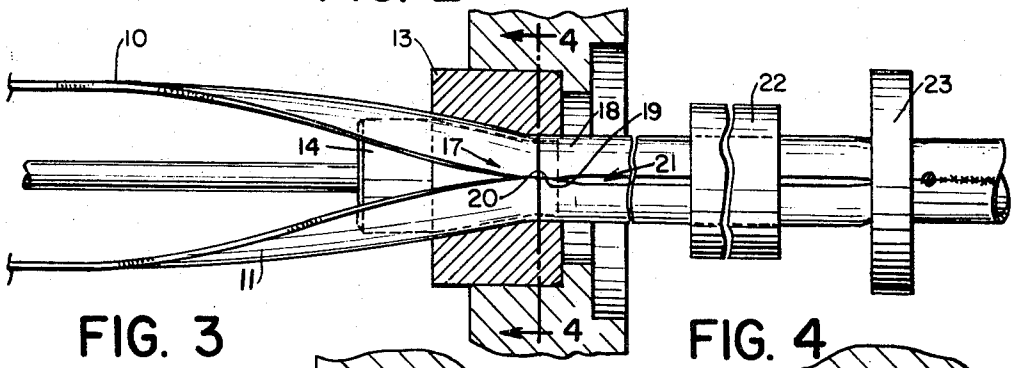


FIG. 3

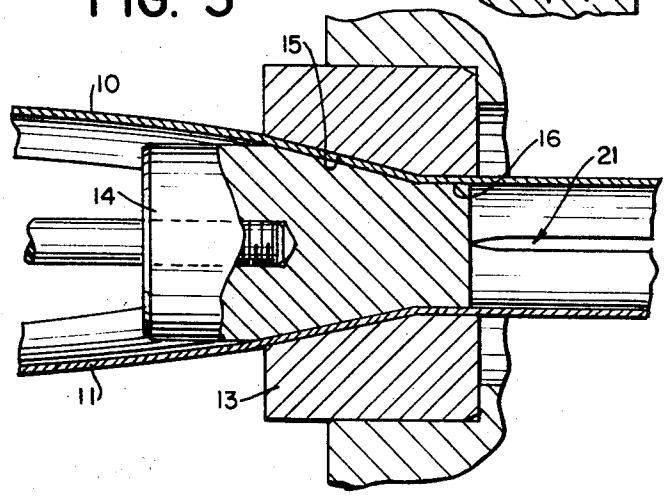
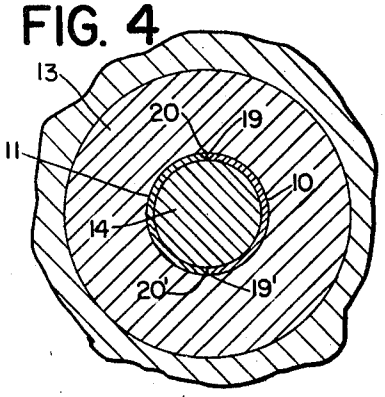


FIG. 4



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METHOD FOR CHANGING THE WIDTH OF A STRIP METAL AND FOR FORMING TUBES THEREFROM

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U.S. Cl. 29—477.7 7 Claims

ABSTRACT OF THE DISCLOSURE

Strip metal is shaped into a tube-shaped member with its longitudinal edges in abutment and drawn to a smaller outside diameter with the longitudinal edges under compression thereby reducing the width of the strip metal; welding the abutting edges after drawing forms the strip metal into a permanent tube shape.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to a method of changing the width of strip metal by first forming the strip metal into a tube shape and then drawing the tube-shaped member to a reduced diameter. It also relates to a method of forming tubes by welding together longitudinal edges of the strip metal which had been in abutment during drawing.

Description of the prior art

In the ordinary rolling of strip metal the strip metal is progressively reduced in thickness and increased in length as it is passed through successive rolling operations. In these rolling operations, there is no provision for making narrower but longer strip. Thus, the pounds per inch of width of an original cake cannot be increased to make greater pounds per inch of width in the strip. Furthermore, if the final strip or a multiple thereof is not evenly divisible into the width of the cake the remainder of the strip becomes surplus material or scrap. According to the method of the invention it will be possible to reduce the width of strip metal while increasing its length and changing its thickness, if desired, with many attendant advantages.

SUMMARY OF THE INVENTION

Broadly stated, the invention is in a method of reducing a width of strip metal wherein at least one metal strip is longitudinally advanced and progressively formed into a tube-shaped member with the longitudinal edges in abutment to form a tube-shaped member having a first diameter. The longitudinal edges are placed under compression and drawn to a second smaller outside diameter than the first outside diameter to simultaneously elongate the strip and reduce its width, and the drawn tube-shaped member is thereafter progressively removed for further fabricating operations.

Some of the advantages realized with the method of the invention are the ability to eliminate scrap from an uneven match of strip width to cake, to minimize stock widths for given applications, and to give improved edge formation of the resulting strip for welding by keeping the longitudinal edges under compression during the drawing opeartion and thereby reducing their tendency to edge crack.

This compression of the edges offers another possibility which this invention also utilizes; since the edges are under compression and drawn together, the resulting edges form a perfect surface-to-surface match and are accurately aligned as they emerge from the drawing operation. Thus, the invention contemplates welding these edges immediately after drawing to form the tube-shaped strip into a permanent tube.

With the method of the invention, it is also possible to reduce the thickness of the strip or even slightly increase it, but there are some advantages to reducing the cross-section of the strip while it is being drawn so as to assure that there will be no thickness variation along the length or width of the strip.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation of apparatus for forming strip metal into a tube form and welding the tube shape together,

FIG. 2 is a top elevation of the apparatus shown in FIG. 1 partly in section,

FIG. 3 is a section taken along lines 3—3 of FIG. 1, and

FIG. 4 is a section taken along lines 4—4 of FIG. 2.

Referring to the drawings, two flat metal strips **10** and **11** having a width of 3 inches and a thickness of .063 inch are shown being longitudinally advanced into a die **13** and mandrel **14** assembly. The die and mandrel assembly as shown in FIG. 3 define a generally frustro-conically shaped die opening **15** therebetween with a generally cylindrical shaped bearing surface **16** therebetween at the outlet thereof, and as the flat metal strips **10** and **11** are longitudinally fed through the die opening **15**, they are first curled into a semi-cylindrical shape to form a tube-shaped member with the respective longitudinal edges of the strips **10** and **11** coming into abutment at point **17**. After the longitudinal edges have been brought into abutment the tube-shaped member **18** thus formed is further drawn through the die and mandrel configuration to a smaller outside diameter than the initial outside diameter of the tube-shaped member formed when the edges are first placed into abutment. The result is that abutting longitudinal side edges **19** and **20** are placed under substantial compression and the tube-shaped member being reduced in outside diameter thereby reduces the width of the individual metal strips **10** and **11**. The thickness of the annular opening will determine whether the thickness of the strip is to be reduced or slightly increased. In the example illustrated in the drawings, the metal strip was changed to a width of 2⅛ inch and a thickness of .065 inch, thus making the section about 33 percent less and the length of the tube about 50 percent greater.

Upon emerging from the die and mandrel assembly, the semi-cylindrical drawn metal strips as tube-shaped member **18**, can then be passed to a separate operation for flattening the strips out so that they can be processed into coilers or utilized in some other way as flat strip.

As shown in the drawings, it is also advantageous to weld the abutting longitudinal edges of the strip together as they emerge from the die and mandrel assembly. Since the edges were under compression during the drawing operation, the edges will form a perfect match and insure the formation of a good welded longitudinal seam. As shown, the strips have a tendency to return to their former shape after leaving the die and mandrel and thus a separation **21** is formed between longitudinal edges of the strips. The separated strips are then passed through a vapor degreaser **22** to remove lubricant used in the drawing operation from the strips. If a soapy solution was used as the lubricant, the degreaser could be a steam chamber. The degreaser can be preceeded by a separator if the particular size strip has a tendency to remain closed; however, the residual stresses in the strip after drawing will usually separate the edges sufficiently for the degreasing operation. Upon leaving the degreaser the strips are then fed through a ring die **23** which brings opposed longitudinal edges back into the same matching

surface-to-surface abutting relationship they had when drawn through the die and mandrel. Immediately upon leaving the ring die the abutting longitudinal edges **19** and **20** and **19'** and **20'** are welded together by welders **24** and **25** which preferably is a conventional TIG or a high frequency welder which effects a continuous weld longitudinally along the abutting edges of the two strips to provide a continuous weld seam therealong.

The welders in this embodiment are positioned above and below the drawn two-piece tubular member to simultaneously weld both longitudinal seams.

While the invention has been illustrated with two flat strips, it is of course intended that a single strip formed into a tube with its own edges in abutment in the same manner described above could also be reduced in width and if desired subsequently welded in the same fashion.

I claim:

1. A method of reducing a width of metal strip comprising:

(a) longitudinally advancing and progressively forming at least one metal strip into a tube shaped member and pressing the longitudinal edges of the strip into abutment to form a tube member having a first diameter,

(b) placing the longitudinal edges under compression and drawing the tube-shaped member through a die and mandrel assembly to a second smaller outside diameter than said first outside diameter to simultaneously elongate the strip and reduce its width, and

(c) thereafter progressively removing the drawn tube-shaped member for further fabricating operations.

2. A method according to claim **1** wherein the tube-shaped member is simultaneously drawn through a reduced cross-sectional area to reduce tthe thickness of the strip as its width is being reduced.

3. A method according to claim **1** wherein the drawn tube-shaped member is formed back into a flat strip of a reduced width.

4. A method according to claim **1** wherein the longitudinal edges of the drawn tube-shaped member are positioned in substantially the same surface-to-surface abutting relationship they had during the drawing operation and the longitudinal abutting edges are welded together to form a tube with a longitudinal seam welded therein.

5. A method according to claim **2** wherein the longitudinal edges of the drawn tube-shaped member are maintained in abutment and the longitudinal abutting edges are welded together to form a tube with a longitudinal seam welded therein.

6. A method according to claim **1** wherein plural metal strips are formed into a single tube-shaped member with their respective longitudinal edges in abutment.

7. A method according to claim **4** wherein plural metal strips are formed into a single tube-shaped member with their respective longitudinal edges in abutment.

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