

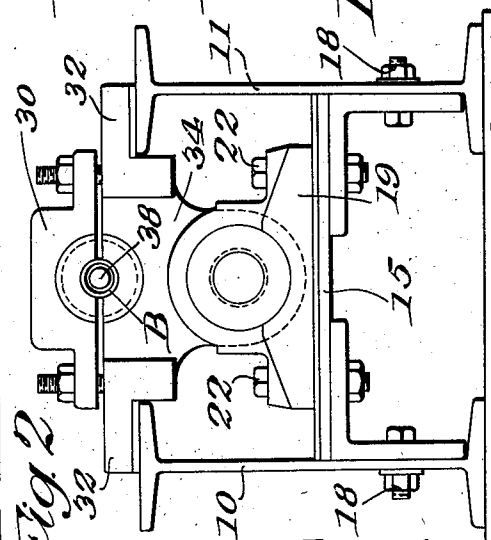
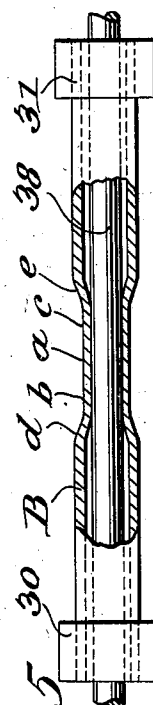
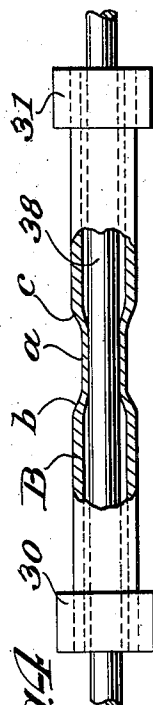
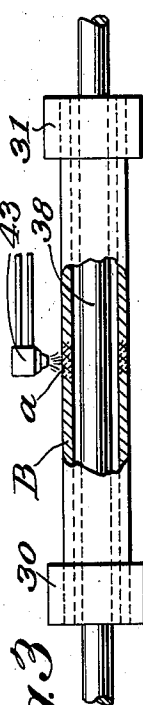
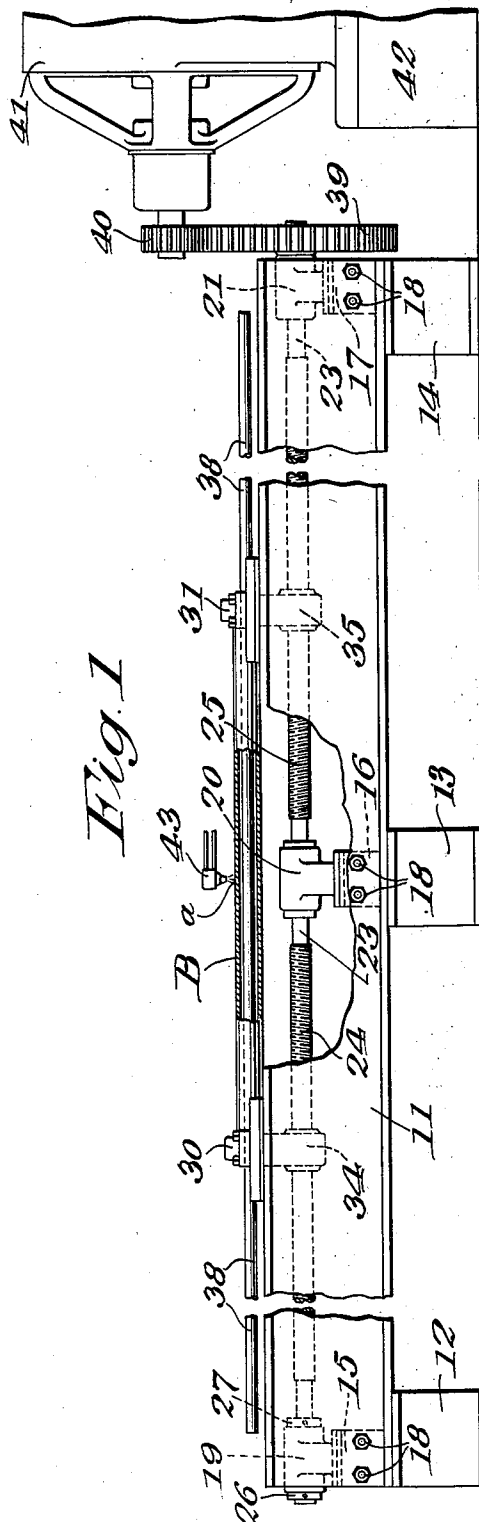
Aug. 25, 1936.

S. D. INSCHO

2,051,949

METHOD AND APPARATUS FOR REDUCING TUBING

Filed May 26, 1934



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UNITED STATES PATENT OFFICE

2,051,949

METHOD AND APPARATUS FOR
REDUCING TUBING

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Application May 26, 1934, Serial No. 727,647

14 Claims. (Cl. 205-7)

In my copending application Serial No. 703,821, filed December 23, 1933, I have described the making of tubular products by progressively weakening local portions of a tubular blank and progressively stretching the locally weakened portions to elongate and reduce the same permanently a predetermined amount. In accordance with the preferred practice described therein, a local portion of the blank is heated to weaken the same and the blank is subjected to a stretching action to elongate and reduce the weakened portion. Proceeding adjacent the initially weakened portion, other local portions of the blank are heated and weakened progressively throughout substantially the entire length of the blank and these weakened portions are elongated and reduced progressively by stretching.

The present application is a continuation in part of my said copending application and also contemplates the elongation and reduction of a blank by progressively weakening adjacent local portions and progressively elongating the weakened portions by stretching. In accordance with an important aspect of the present invention, a local portion of the blank first is rendered weaker than the remaining portions, preferably, by heating to a higher temperature. The blank then is subjected to a stretching action to elongate and reduce the weakened portion a predetermined amount and cause an adjacent portion to be weakened by being elongated and reduced to a lesser extent. The stretching action upon the blank is continued to cause the newly weakened portion to be elongated and reduced a predetermined amount and to cause a portion adjacent thereto to be weakened. This action is continued to cause adjacent local portions of the blank to be weakened progressively and to be elongated and reduced progressively a predetermined amount. In the manufacture of tubular metal products, the inner diameter of the finished product is limited by a mandrel positioned within the tubular blank.

The invention will be more clearly understood from the following description in conjunction with the accompanying drawing: in which,

Fig. 1 is a longitudinal elevational view, partly broken away, of an apparatus for the practice of the invention;

Fig. 2 is an end elevational view, as viewed from the left of Fig. 1; and

Figs. 3, 4, and 5 are diagrammatic views, partly in section, illustrating the action which takes place during the practice of the invention.

Before explaining in detail the present invention it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawing, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation, and it is not intended to limit the invention claimed herein beyond the requirements of the prior art.

A suitable apparatus for the practice of the invention as illustrated in the accompanying drawing comprises spaced parallel I-beams 10 and 11 suitably secured upon spaced supports 12, 13, and 14. Supports 15, 16 and 17 extend between and are secured to the I-beams 10 and 11 by bolts 18 at each end thereof and midway between the ends thereof. Bearings 19, 20, and 21 are secured upon the supports 15, 16, and 17 by bolts 22 and are adapted to rotatably support a screw shaft 23 having oppositely threaded sections 24 and 25. Collars 26 and 27 are suitably fixed upon the screw shaft 23 so as to engage opposite ends of the bearing 19 to prevent axial movement of the screw shaft. Pulling heads 30 and 31 are each provided with guides 32 extending laterally from opposite sides thereof so as to slidably engage the top surfaces of the I-beams 10 and 11. The pulling heads 30 and 31 are provided with depending portions 34 and 35 having threaded openings adapted to engage the threaded sections 24 and 25 respectively of the screw shaft 23. The pulling heads 30 and 31 are adapted to grip opposite ends of a tubular metal blank B to move the ends outwardly away from one another and to move relative to a mandrel 38 positioned within the blank B. A gear 39 is suitably fixed upon the screw shaft 23 and is adapted to engage a pinion 40 fixed upon the armature shaft of a motor 41 which is suitably secured upon a support 42. Means are also provided, such as a heating torch 43, for heating a local portion of the blank B initially, as indicated at a, to a temperature higher than the remaining portions of the blank.

In the production of a seamless metal tube, the tubular blank B is placed over the mandrel 38 and one end of the blank is gripped by the pulling head 30 and the other end is gripped by the pulling head 31. Preferably, the entire blank is heated to reduce its tensile strength and this may be accomplished by heating either before or after the blank has been placed in the pulling heads 30

and 31. The local portion *a* is now heated by the torch 42, as indicated in Figs. 1 and 3, to a higher temperature to render it weaker than the remaining portions of the blank and the torch is removed. Power is supplied to the motor 41 to rotate the screw shaft 23 and move the pulling heads 30 and 31 outwardly away from one another to subject the blank to a stretching action and cause the weakened portion *a* to elongate and reduce in diameter until it comes in contact with the mandrel 32 and to elongate and reduce to a lesser extent the adjacent portions *b* and *c* adjacent thereto as indicated in Fig. 4. After contact with the mandrel stretching of the previously weakened portion ceases and it is held stationary with the mandrel. By elongating and reducing portions *b* and *c* in this manner, they are rendered weaker than the remaining unextended portions of the blank. As the pulling heads 30 and 31 continue to move away from one another, the portions *b* and *c* are elongated and reduced until they are brought into contact with the mandrel 32 and at the same time the portions *d* and *e* are elongated and reduced to a lesser extent, as indicated in Fig. 5, thereby rendering the portions *d* and *e* weaker than the remaining unextended portions of the blank. By continuing movement of the pulling heads 30 and 31 outwardly away from each other in this manner, the local portions of the blank are weakened and elongated progressively toward the opposite ends of the blank. After the stretching operation has been completed, the unextended end portions where the blank has been gripped by the pulling heads 30 and 31 are cut off. The tube may be expanded in any well known manner to relieve it so that the mandrel can be withdrawn as by running through cross rolls.

It will be understood that in the preferred practice, as illustrated, the pulling heads move outwardly away from one another at substantially equal rates and each will travel a distance equal to the final distance between the first and last local portions of the blank elongated and reduced minus the initial distance between the first and last local portions of the blank elongated and reduced. In other words, disregarding the portions of the blank which are gripped by the pulling heads 30 and 31 and which are not elongated and reduced by stretching, the pulling heads will move a distance equal to half the length of the finished tubular product minus half the length of the original blank. The mandrel controls the amount of reduction and elongation and, consequently, the wall thickness and inner diameter of the finished tubular product.

What I claim is:

1. The method which comprises heating a tubular blank, heating an intermediate portion of the blank to a higher temperature to render the same weaker than the remaining portions, subjecting said blank to a stretching action to cause said weaker portion to neck down and be elongated permanently and cause adjacent portions at opposite sides thereof to be weakened progressively and to draw down and be elongated progressively and permanently, and controlling the amount of necking and drawing down and elongation of said portions by means of a mandrel within the blank.

2. The method which comprises the steps of heating a tubular metal blank to render one portion thereof weaker than the remaining portions, and applying opposed forces to opposite ends of the blank to move one end relative to the other

end to cause said weaker portion to be elongated permanently and cause adjacent portions of the blank at opposite sides of said weaker portion to be weakened progressively and elongated progressively and permanently, and internally controlling the amount of elongation of said portions.

3. The method which comprises the steps of heating a tubular blank to render one portion thereof weaker than the remaining portions, and moving each end of the blank outwardly away from said weaker portion to elongate said portion and cause adjacent portions of the blank to be weakened progressively and elongated progressively and permanently, and controlling the amount of elongation of said portions by means of a mandrel within the blank.

4. The method which comprises the steps of heating a tubular metal blank to render one portion thereof weaker than the remaining portions, and moving each end of the blank outwardly away from said weaker portion at substantially equal rates to elongate said portion and cause adjacent portions of the blank to be weakened progressively and elongated progressively and permanently, and internally controlling the amount of elongation of said portions.

5. A method of elongating a tubular metal blank and reducing its diameter which comprises slightly lowering the strength of the metal in a short section of the blank, stretching the blank to cause that section to neck down and elongate, applying internal pressure to the center of that section as soon as its bore is reduced to a predetermined diameter to prevent its further necking down and elongation, continuing to stretch the blank to cause the weakened tapered sections at the ends of the neck at each side of the short section supported by internal pressure to draw down and elongate, applying internal pressure to those sections as soon as their bore is reduced to a predetermined diameter, and continuing to stretch the blank to cause successive sections to draw down and elongate, the drawing down and elongation of each section being stopped by the application of internal pressure when its bore reaches a predetermined diameter.

6. A method of elongating a tubular metal blank and reducing its diameter which comprises heating the entire blank to a uniform high temperature, heating a short section to a slightly higher temperature, stretching the blank to cause that section to neck down and elongate, applying internal pressure to the center of that section as soon as its bore is reduced to a predetermined diameter to prevent its further necking down and elongation, continuing to stretch the blank to cause the weakened tapered sections at the ends of the neck at each side of the short section supported by internal pressure to draw down and elongate, applying internal pressure to those sections as soon as their bore is reduced to a predetermined diameter, and continuing to stretch the blank to cause successive sections to draw down and elongate, the drawing down and elongation of each section being stopped by the application of internal pressure when its bore reaches a predetermined diameter.

7. An apparatus for making a tubular metal product which comprises heating means adapted to subject a tubular blank to heat for a sufficient time to render one portion thereof weaker than the remaining portions and thereafter be moved away from the blank, means for subjecting the

blank to a stretching action to cause said weaker portion to be elongated permanently and cause adjacent portions to be weakened progressively and elongated progressively and permanently, and means for internally controlling the elongation of said portions.

8. An apparatus for making a tubular product which comprises heating means adapted to subject a tubular blank to heat for a sufficient time to render one portion thereof weaker than the remaining portions and thereafter be moved away from the blank, means for subjecting the blank to a stretching action to cause said weaker portion to be elongated permanently and cause adjacent portions to be weakened progressively and elongated progressively and permanently, and means for limiting the inner diameter of said product.

9. An apparatus for making a tubular product which comprises heating means adapted to subject a tubular blank to heat for a sufficient time to render one portion thereof weaker than the remaining portions and thereafter be moved away from the blank, means for subjecting the blank to a stretching action to cause said weaker portion to be elongated permanently and cause adjacent portions to be weakened progressively and elongated progressively and permanently, and means for controlling the elongation of said portions and limiting the inner diameter of said product.

10. An apparatus for making a tubular product which comprises means adapted to act upon a portion of a tubular blank to render the same weaker than the remaining portions, means for moving the ends of said blank in opposite directions, and a mandrel for controlling the inner diameter of said product.

11. An apparatus for making a tubular product which comprises means adapted to act upon a portion of a tubular blank to render the same

weaker than the remaining portions, and means for moving the ends of said blank at substantially equal rates in opposite directions, and a mandrel for controlling the inner diameter of said tubular product.

12. An apparatus for making a tubular product which comprises means adapted to act upon a portion of a tubular blank to render the same weaker than the remaining portions, a rotatable screw shaft held against axial movement and having left and right hand threads, means operatively associated with said left hand threads adapted to grip one outer end of the blank, means operatively associated with said right hand threads adapted to grip the other outer end of the blank, and a mandrel for controlling the inner diameter of said tubular product.

13. An apparatus for reducing the diameter of and elongating tubes, comprising a mandrel smaller in cross-section than the bore of the tube and over which the tube is adapted to be placed, means for grasping the tube at two points spaced along the length of the tube, removable means for making a short section of tube between the grasping means hotter than the rest of the tube between the grasping means, and means for moving one of the grasping means away from said section.

14. An apparatus for reducing the diameter of and elongating tubes, comprising a mandrel smaller in cross-section than the bore of the tube and over which the tube is adapted to be placed, means for grasping the tube at two points spaced along the length of the tube, means for making a short section of tube between and spaced from both grasping means hotter than the rest of the tube between the grasping means, and means for moving both grasping means away from said section.

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