Patented Oct. 7, 1941

2,258,242

UNITED STATES PATENT OFFICE

2,258,242

APPARATUS FOR DRAWING TUBES OF MULTIPLE WALL THICKNESS

Oscar Maroney Ditzel, Rahway, and Victor Petersen, Plainfield, N. J., assignors to Phelps Dodge Copper Products Corporation, Dover, Del., a corporation of Delaware

Application September 27, 1940, Serial No. 358,692

1 Claim. (Cl. 205—7)

This invention relates to the drawing of tubes of multiple wall thickness where the thickened wall is used as an armor or reinforcement either in places along the length of the tube between the ends thereof so that it may be bent at those points without reducing the gage at the outside of the bend thinner than the gage of the straight part, or at one or both ends to withstand flanging or expanding or at several points in the length of the tube to withstand the wear occasioned by supporting members. Furthermore this reinforcement may be on the outside or inside diameter of the tube as circumstances may require.

Many years ago it was proposed to draw tubes over a mandrel having reduced diameters in places along its length intermediate its ends and then by withdrawing the mandrel from the tube, those portions of the tube drawn into the reduced portions of the mandrel being thicker than the rest of the tube would be forced outwardly thereby forming a tube of multiple wall thickness with uniform inside diameter. While that looked to be perfect on paper it was found that the friction between the tube and mandrel where the length was over five feet was so great that it was impossible to draw the tube off the mandrel without spoiling the tube.

We therefore propose to draw long tubes over a comparatively short plug held on the end of the usual plug rod co-axial with a die and in fixed relations thereto with means to withdraw and/or advance the plug with respect to the die to regulate the wall thickness of the tube being drawn and automatically to control the operation of the plug in its fixed relation to the die so that multiple tubes of identical wall thickness can be made in commercial production.

With this method of drawing, using our improved apparatus, we can draw tubes of maximum commercial lengths as readily as short pieces and we can draw tubes of most any shape, some of which are shown in the drawings and designated as series A, B. C, D, E, and F.

The foregoing and other features of our invention will now be described in connection with the accompanying drawings forming part of this specification in which we have illustrated our apparatus in its preferred form after which we shall point out more particularly in the claim whose features which we believe to be new and of our own joint invention.

In the drawings:

Figure 1 is a side view of a draw bench on which our apparatus is assembled, said bench being provided with the usual reciprocating carriage and die block.

Figure 2 is a side view of a means for moving the plug rod drawn to a somewhat enlarged scale.

Figure 3 is a detail of our plug rod mounting at right angles to that shown in Figure 2.

Figure 4 is a top view of that part of our apparatus shown in Figure 2.

Figure 5 is a section through the die and plug showing their relative position in drawing tubes of the class A and B.

Figure 6 is a section through the die and plug showing their relatiye position in drawing tubes of the class C and D.

Figure 7 is a chart indicating some of the many tubes which can be drawn on our apparatus with the type of plug which may be used in the drawing operation.

In the drawings of tubes with our apparatus we follow the best practice in the drawing of standard tubes in which is used a draw bench 11 provided with the usual carriage 12 propelled back and forth on rails 13, said carriage is adapted to grip the end of the tube 14 which is in position over the rod 15 and extending through the die block 16. As the travel of the carriage is to the left, as illustrated in Figure 1, the tube is drawn through the die and receives its shape depending upon the operation of the rod 15 and the position and shape of the plug 22 as will now be described.

Mounted in the die block 16 is a die 21 and on the end of the rod 15 is a plug 22 which is held in predetermined relations to the die.

In Figure 5 the plug 22 is tapered with two diameters 23 and 24. The smaller diameter 23 is on the end of the plug away from the supporting plug rod 15; by moving this plug to and from the die, relatively thickened portions 41 of the tube can be formed. This tube may then be drawn to a shape corresponding to the "F" series, Figure 7, by simply drawing a standard plug through the tube and forcing the inwardly extending thickened portions of the wall 41 outwardly, or it may be produced in a single operation as shown in Figure 6 when the plug 22 has a double taper with three diameters 25, 26, 27. This method is the subject of our former application #291,288 allowed July 9, 1940.

In order to control the movement of these plugs and to hold them in fixed relation to the die, we provide a mounting 61 for the end of the rod away from the plug 22, pivotally hung in a rocking lever 62, mounted on a pin or stud 63