ROLLER APPARATUS FOR BEADING THIN WALL PIPE

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2 Sheets-Sheet 1

Fig. 1

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Fig. 2

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This invention relates to new and useful improvements in apparatuses for beading pipe.

One object of the invention is to provide an improved pipe beading apparatus of such construction that beads may be formed on thin wall pipe without deforming adjacent portions of the pipe.

Another object of the invention is to provide an improved pipe beading apparatus having rotating elements coacting with each other to form annular beads on pipe and means for confining the distortion of the pipe.

An important object of the invention is to provide an improved apparatus, of the character described, having an annular member encircling the pipe and confined between internal and external forming rollers for amplifying the surficial contact of the external roller with the pipe to prevent undesirable distortion of the latter.

A particular object of the invention is to provide an improved apparatus, of the character described, wherein the annular member is in the form of a back-up ring confined by the external roller and coacting with the internal roller to limit the deformation of the pipe, the ring being of a diameter sufficiently greater than the beaded portion of the pipe to permit removal of said ring of said beaded portion.

A construction designed to carry out the invention will be hereinafter described together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings, wherein an example of the invention is shown, and wherein:

Fig. 1 is a side elevation view of a pipe beading apparatus constructed in accordance with the invention.

Fig. 2 is a front end elevation view of the apparatus.

Fig. 3 is an enlarged, transverse, vertical, sectional view showing the coaction of the forming rollers and back-up ring, and

Fig. 4 is an enlarged view, similar to Fig. 3, showing the relationship of the pipe, rollers and ring prior to deforming of said pipe.

In the drawings, the numeral 10 designates a pipe beading apparatus embodying the principles of the invention and including an upright housing 11 mounted on a base 12 projecting beyond the housing. Substantially horizontal, parallel shafts 13 and 14 extend from the upper portion of the housing in overlying, spaced relation to the projecting portion of the base. The shafts are spaced from each other and have their axes disposed in a common vertical plane whereby the upper shaft 13 overlies the lower shaft 14. An extension 15 is formed on the housing 11 for supporting and enclosing the major portion of the upper shaft for vertical movement relative to the lower shaft so as to vary the spacing therebetween. Since this mounting is more or less conventional, its details are not shown; however, said mounting includes a crank-type adjusting screw 16 carried by the outer end portion of the housing extension 15 for imparting relative movement to the shaft 13.

Any suitable drive arrangement may be provided for the shafts and, as shown in Figs. 1 and 2, may include a belt and pulley drive 17, a chain and sprocket drive 18 and a gear transmissions 19. A guard 20 may be provided for the drive 19. Further description is believed unnecessary, since these drive elements are conventional and form no part of the present invention.

The outer end of the upper shaft 13 projects from the housing extension and is reduced in diameter to provide an axle 21, having a circular nut 22 screw-threaded on its extremity, for a cylindrical forming element or roller 23 (Fig. 3). Preferably, a counterbore or recess 24 is formed in the outer end of the roller to receive the nut and a conventional key 25 fastens said roller to the axle. The roller 23 is relatively wide and has an external, radial flange or annular rib 26 on its inner end adjacent an external, annular groove or recess 27 which is concave or substantially semi-circular in cross-section. An external, radial flange or annular shoulder 28 is provided intermediate the outer end of the roller and its annular recess.

As will be more fully explained, an annular trimming blade or die 29 is confined upon the inner end of the axle 21 and is spaced from the roller flange 26 by one or more shims 30.

A similar reduced axle 31 is formed on the outer end of the lower shaft 14, which is of less length than the upper shaft, for receiving a complementary forming element or roller 32, its recessed confining nut 33 and key 34. The inner or lower roller is relatively narrow and has an external, radial bead or crown 35 which is convex or substantially semi-circular in cross-section so as to be complementary to the annular recess 27 of the roller 23 and which is aligned with said recess. As shown by the numeral 36, the outer extremity of the roller 32 provides an axial flange or collar for receiving the nut 33 and terminates with the shaft 14 intermediate the recess 27 and shoulder 28 of the outer or upper roller. An annular trimming blade or die 37 for coaxing with the die 29 is confined upon the inner end of the axle 31 and is spaced from the crown 35 by one or more shims 38.

It is noted that the shims 30 and 38 permit variation of the spacing between the rollers and trimming dies and are in substantial alignment with the inner or lower die 37 and the flange 26 of the outer or upper forming roller, respectively. Use of shims 30 and 38 also allow for wall thickness differentials in the various diameters of pipe.

An annular member or back-up ring 39 is provided for coaxing with the rollers and may be in the form of a collar having an axial dimension greater than its radial dimension. The outer end of the ring is enlarged in diameter to provide an external, radial flange or shoulder 40 for reinforcing said ring. An external, annular groove or recess 41 is formed in the inner end portion of the ring 39 for coaxing engagement with the shoulder 28 of the roller 23, whereby said ring is confined between the cylindrical peripheries of the rollers including the axial collar 36 of the roller 32. For maintaining the ring in coaxing relation with the rollers, a pair of spaced thrust bearings or guide means 42 are mounted on the base 12 for engagement with the outer end surface of the shoulder 40 of said ring. Each thrust bearing may be in the form of a flanged roller journal in a stirrup 43 pivotally attached by laterally projecting lugs 44 to the base 12 for movement of the bearing roller into and out of engagement with the outer flanged end of the ring. Since the thrust bearing rollers are parallel to and spaced axially from the forming rollers, the ring is confined therewithin without displacement.

The end of a thin-wall pipe or tube P is adapted to be engaged between the forming rollers 23 and 32 with the ring 39 encircling the pipe for beading said pipe end.
Usually, one end of the pipe is of enlarged diameter to provide a bell or swaged portion 45 for coupling adjacent ends of pipes and to form an annular bead 46 is formed in the bell or swaged portion to provide an internal, annular groove or recess 47 for receiving a gasket (not shown) which seals off around the telescoped pipe end. It is noted that the internal diameter of the ring 39 is slightly greater than the diameter of the pipe bead 46 so that said ring may be removed over said bead; however, it is desirable for the internal diameter of the ring to be as small as possible so as to provide maximum surficial contact with the pipe.

In forming the bead, the ring 39 is placed on the enlarged end 45 of the pipe P and said pipe end and ring are inserted between the forming rollers 23 and 32 (Fig. 4). Although not illustrated, the remainder of the pipe is supported in a conventional manner. In order to prevent canting or tilting of the ring, the thrust bearings 42 are swung into engagement with the lower portion of the ring shoulder 48. Rotation is imparted to the pipe by its engagement with the inner or lower forming roller which supports the inserted end of said pipe.

The ring is driven by its engagement with the outer or upper roller upon lowering of said roller by manipulation of the adjusting screw 16. When the shoulder 28 of the roller 23 commences to enter the groove 41 of the ring, the trimming dies 29 and 38 cause to cut the extremity of the pipe end at a right angle to the longitudinal axis of the pipe. Frequently, the pipe extremity is not right angular due to the belling or swaging of the pipe end.

As shown by the numeral 48, the pipe extremity is flared outwardly by the coaction of the inner or lower die 37 with the radial flange 26 of the outer or upper roller to reinforce said pipe extremity. The flange is disposed between the lower die and the crown 35 of the inner or lower roller 32 in substantial alignment with the shim 36 and consists with the inner end of the ring 39 to confine or control the deformation of the pipe by the roller crown. Preferably, the diameter of the flange is substantially equal to the combined dimension of the roller 23 and the portion of the ring confined between said roller and the pipe whereby the portions of the pipe adjacent the bead are of substantially the same diameter.

As shown most clearly in Fig. 3, the pipe bead 46 is formed by the roller crown 35 in coaction with the flange and ring and the deformation of the pipe is accommodated by the groove 27 of the outer or upper roller. Due to the amplified surficial contact provided by the ring, the inner portion of the pipe adjacent the bead is undeformed and its diameter is retained for snug engagement by the telescoped end of an adjacent pipe. After formation of the pipe bead, the adjusting screw 16 is manipulated to retract the outer or upper roller to permit lifting and disengagement of the pipe from the inner or lower roller. Due to its diameter, the ring may be readily removed by slipping the same over the pipe head.

The foregoing description of the invention is explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction may be made, within the scope of the appended claims, without departing from the spirit of the invention.

What I claim and desire to secure by Letters Patent is:

1. A pipe beading apparatus including an inner and outer forming rollers in closely spaced parallel relation and adapted to receive the wall of a pipe therebetween, means for rotating the rollers, the inner roller having a radial convex portion and the outer roller having a radial complementary portion coating with the convex portion to form an annular bead on the pipe, and a ring enclosing the pipe and having a portion confiningly engaged between said outer roller and pipe to provide an amplified surficial contact therebetween for preventing distortion of the pipe.

2. A pipe beading apparatus as set forth in claim 1 wherein the outer roller is of greater width than and extends beyond the inner roller for engagement with the ring, said ring having its inner margin overlying the outer margin of said inner roller for coating with the convex portion thereof to confine the pipe bead.

3. A pipe beading apparatus as set forth in claim 1 wherein the outer roller includes a radial flange for engaging the pipe adjacent the convex portion of the inner roller and coating therewith to confine the bead of the pipe.

4. A pipe beading apparatus as set forth in claim 1 wherein one of the rollers is movable toward and away from the other roller to permit insertion and removal of the pipe therebetween and the forming of the pipe bead, the outer roller and ring having a coating groove and shoulder to prevent displacement of the ring.

5. A pipe beading apparatus as set forth in claim 1 including means bearing against the ring in spaced relation to the rollers to prevent displacement of said ring.

6. A pipe beading apparatus including a pair of rotating forming rollers for receiving the wall of a pipe therebetween the rollers having complementary radial portions coating to form an annular bead on the pipe, and an annular member encircling the pipe and having a portion confined between the pipe and one of said rollers for amplifying the surficial contact of the latter roller with the pipe to retain the diameter of the pipe and connecting with the radial portions of said rollers to confine the deformation of the pipe.

7. A pipe beading apparatus as set forth in claim 6 including means bearing against the annular member in spaced relation to the rollers to prevent displacement of said member.

8. A pipe beading apparatus as set forth in claim 6 wherein the outer roller is of greater width than and extends beyond the inner roller for engagement with the annular member, said member having its inner margin overlying the outer margin of said inner roller for coating with the radial portion thereof to confine the pipe bead.

9. A pipe beading apparatus as set forth in claim 6 wherein one of the rollers includes a radial flange for engaging the pipe adjacent the radial portion of the other roller and coating therewith to confine the pipe bead.

10. A pipe beading apparatus as set forth in claim 6 wherein one of the rollers is movable toward and away from the other roller to permit insertion and removal of the pipe therebetween and the forming of the pipe bead, the outer roller and annular member having a coating groove and shoulder to prevent displacement of the member.

11. A pipe beading apparatus as set forth in claim 6 wherein the annular member is of greater diameter than the pipe so as to have its major portion spaced from the pipe.

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