Jan. 1, 1935. J. W. OFFUTT 1,986,745

METHOD AND APPARATUS FOR POLISHING CYLINDERS

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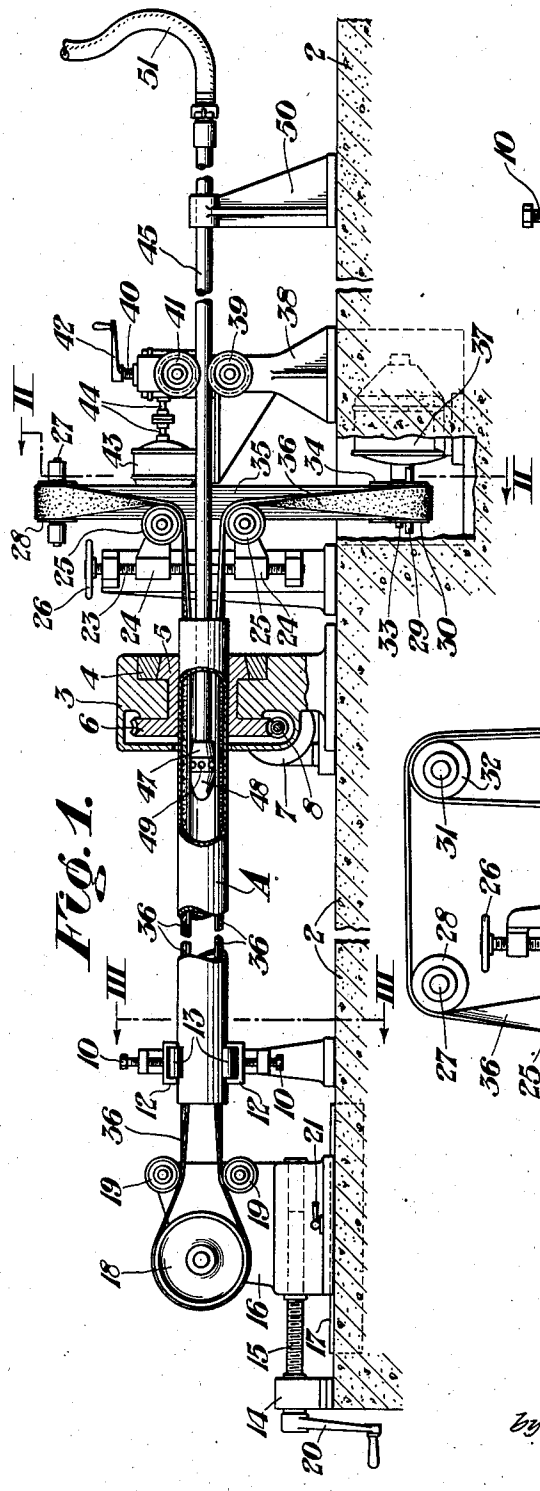


Fig. 1.

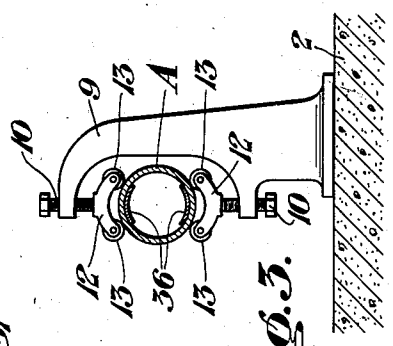


Fig. 3.

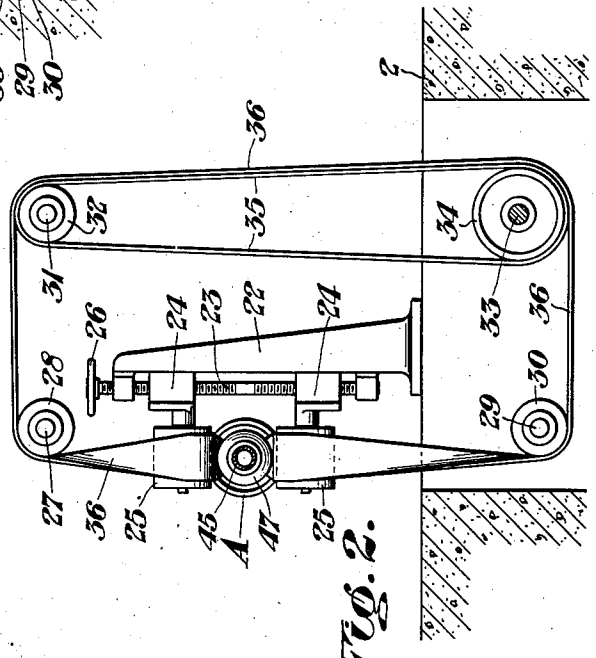


Fig. 2.

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Fig. 4.

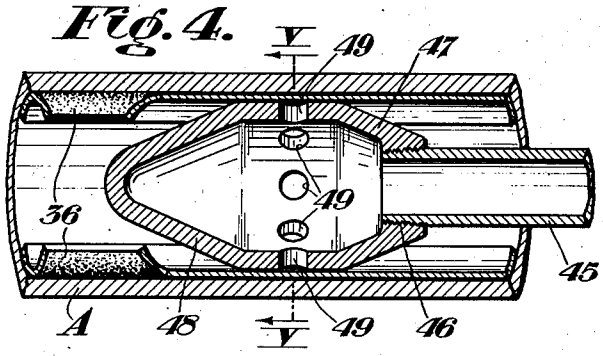


Fig. 5.

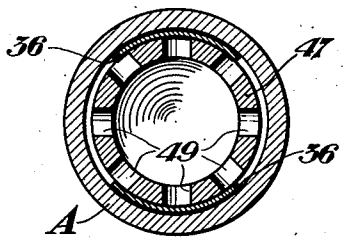


Fig. 6.

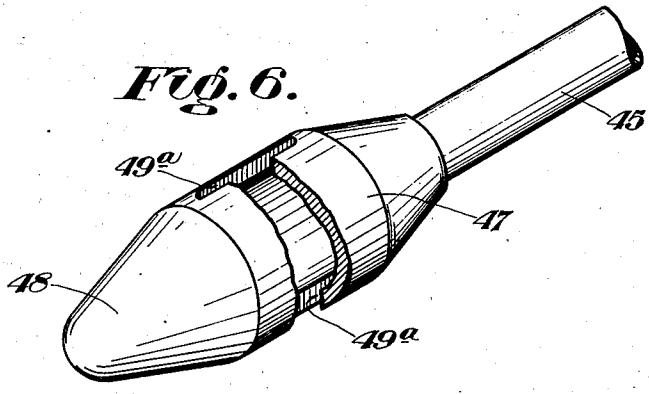
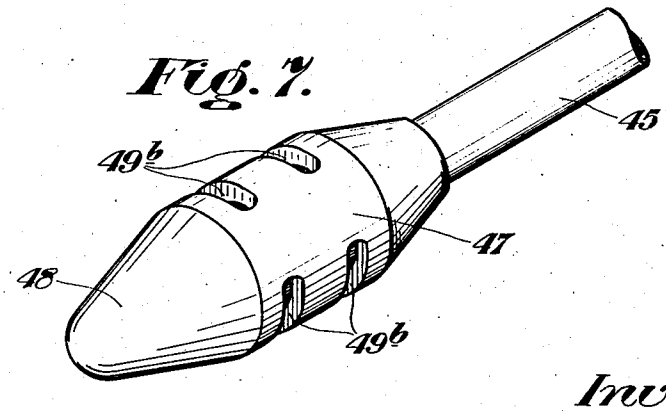


Fig. 7.



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METHOD AND APPARATUS FOR POLISHING CYLINDERS

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Application November 21, 1933, Serial No. 699,080

6 Claims. (Cl. 51—145)

This invention relates to a novel method and apparatus for polishing cylinders, and more particularly to abrading the interior surfaces of pipes and tubes, although not limited thereto.

There have been numerous devices of the prior art for interiorly polishing cylinders, requiring considerable expense to manufacture and install, and occasioning a great deal of difficulty in placing them in operative relationship with respect to the work-piece. In addition, most devices of this sort require a great deal of time to thoroughly process the work-piece, and it is often found that even afterwards the most satisfactory results have not been obtained.

One object of the present invention is the provision of a novel abrasive element comprising an endless belt which is adapted to move through the work-piece in two directions, and thus procure two areas of contact.

Another object is to enable the use of an endless abrasive belt which may be repeatedly used on the interiors of successive cylinders without disconnecting and splicing its ends.

These and further objects will be apparent after referring to the drawings, in which:

Figure 1 is an elevation of the apparatus of the invention, shown partly in section.

Figure 2 is an end view on the line II—II of Figure 1.

Figure 3 is a view on the line III—III of Figure 1.

Figure 4 is a fragmentary sectional elevation of part of the novel apparatus with respect to a work-piece being processed.

Figure 5 is a sectional view on the line V—V of Figure 4.

Figures 6 and 7 are perspective views of modified forms of a part of the apparatus.

Referring more particularly to the drawings, the numeral 2 designates a foundation on which there is mounted a housing 3. A bearing 4 is carried by the housing 3 and supports a rotary chuck 5, having on one of its ends a worm gear 6. A motor 7 is mounted on the foundation 2 and carries on its shaft a worm 8 for cooperation with the worm gear 6 of the rotary chuck 5.

A support 9 is mounted on the foundation 2 adjacent the housing 3 and carries a pair of adjustable screws 10, each of which, in turn, supports a frame 12 carrying a pair of rollers 13.

The work-piece to be processed, which in this instance is a tube, indicated at A, is mounted in the rotary chuck 5 adjacent one of its ends, and between the rollers 13 on the frames 12 adjacent the other of its ends.

A threaded block 14 is secured to the foundation 2 adjacent the support 9 and carries a screw 15 which is adapted, upon rotation, to move a frame 16 which is mounted on a bed-plate 17 in the foundation 2. The frame 16 supports a large pulley 18 on an axis at right-angles to the axis of the work-piece A, and a pair of similarly mounted smaller rollers 19 in spaced relationship. The screw 15 is adapted to move the frame 16 by means of a crank 20, and is locked in adjusted position on the bed-plate 17 by means of a lock-nut 21.

A stanchion 22 is secured to the foundation 2 closely adjacent the housing 3, and supports a vertical screw 23, the latter carrying a pair of blocks 24. A roller, or pulley, 25, which is preferably rubber-coated, is rotatably disposed on each of the blocks 24, and adjusted vertically with respect to each other by means of a hand-wheel 26 on one end of the screw 23.

A shaft 27 is suitably mounted adjacent the upper end of the screw 23 and at right-angles with respect to the axis of rotation of the rubber-coated rolls or pulleys 25, and carries a pulley 28. A correspondingly mounted shaft 29 is disposed adjacent the lower end of the screw 23 in a pit of the foundation 2, and carries a roll or pulley 30. A shaft 31 is disposed relatively adjacent the shaft 27 with its axis in horizontal parallelism therewith, and carries a pulley 32. A shaft 33 is suitably mounted in the pit in the foundation 2 adjacent the shaft 29 and relatively parallel with respect thereto, and carries an enlarged pulley 34 with its axis occupying a common vertical plane with respect to the axis of the shaft 31. The pulleys 32 and 34 are provided with an endless belt 35 for enabling their rotation in unison.

An endless belt 36, having on at least one of its continuous surfaces an abrasive substance, is disposed around the rolls 28 and 30 and also the rolls 32 and 34 carrying the belt 35. As the endless abrasive belt 36 leaves the rolls 28 and 30 it is passed between the rubber-coated rolls 25, around the pulley 18, and between the spaced rolls 19.

The shaft 33, on which the roll 34 is mounted, is driven by a motor 37 which is disposed adjacently in the pit in the foundation 2.

A stanchion 38 is mounted on the other side of the pit with respect to the position of the stanchion 22, and is provided with a grooved roll 39, while a screw 40 is vertically disposed on its upper extremity and adapted to support a roll 41 which is grooved and otherwise similar to the roll 39. The roll 41 may be adjusted vertically

with respect to the roll 39 by rotating the screw 40 through a crank 42. A motor 43 is mounted adjacent the upper portion of the stanchion 38 for enabling the rotation of the upper roll 41 through a shaft 44.

A pipe 45 is disposed between the rollers 39 and 41 and adapted to be reciprocated by the latter, and is threaded on one of its ends, as at 46. A plug or mandrel 47 is connected on one of its ends to the threaded end 46 of the pipe 45, and has its other end tapered, as at 48. The plug or mandrel 47 is radially apertured, as at 49.

The other extremity of the pipe 45 is supported in a guide 50 and has connected thereto a hose 51, which is associated with a suitable fluid supply, such as, for example, compressed air.

In operation, a tubular work-piece A is secured in the chuck 5 and made to extend between the rollers 13. The endless abrasive belt 36 is looped around the pulleys 34, 32, 29, 28, and 25 in the manner previously described. The belt 36 is threaded through the work-piece A as, for instance, by pushing it through with the pipe 45, which is reciprocated by the roll 41. In passing from the pulleys 28 and 30, the abrasive belt 36 must be turned at right-angles in order to enter the work-piece, and in so doing passes between the rubber-coated pulleys 25.

The position of the sliding frame 16 is suitably adjusted by means of the crank 20, which in turn rotates the screw 15, and the rubber-coated rolls 25 are brought together sufficiently to draw the endless belt 36 taut at all its points of contact.

The motor 7 is operated to rotate the chuck 5 at a relatively low speed. The motor 37, in the pit of the foundation 2, rotates the shaft 33, roll 34, belt 35, and roll 32. The movement imparted to the belt 35 enables it, in turn, to impart movement to the endless belt 36 continuously from the top of the roll 32 down to the bottom of the larger roll 34, and functions in such manner as to very effectively move the endless belt through the work-piece A in both directions.

A suitable fluid supply, such as compressed air, is fed through the hose 51 and into the pipe 45, from whence it escapes through the apertures 49 in the mandrel 47. This escape of the fluid medium serves to influence the endless belt 36 into intimate contact, on its abrasive surfaces, with the inner surfaces of the work-piece, and has an additional function of serving to dispel and remove the grinding residues displaced from the abrasive surfaces.

The motor 43 is operated in such manner as to drive the roll 41, at a slow rate of speed, and serves in this manner to reciprocate the pipe 45 with respect to the work-piece A, which permits the mandrel and the effect of its fluid apertures to influence the endless belt 36 into contact with the work-piece at all points throughout its length.

After the work-piece has been thoroughly polished on its inner surfaces, the frame 16 may be so adjusted as to permit the removal of the endless belt 36 from the pulley 18 and rolls 19, and the removal of the work-piece A from the chuck 5 and rollers 13. Another work-piece is then inserted in the chuck 15 and between the rollers 13, and the endless belt 36 inserted therein at a point adjacent the rubber-coated rolls 25, from whence it is assisted therethrough by means of the pipe 45, and the operation repeated.

Referring to Figure 6 of the drawings, a modified form of mandrel 47 is disclosed as comprising a series of elongated slots 49^a extending in the direction of its axis, for permitting the influence of a more substantial area of the endless abrasive belt 36 against the work-piece.

A further modification is disclosed in Figure 7 as comprising a plurality of slots 49^b arranged in the circumference of the mandrel 47 and extending at substantial right-angles to its axis, for a like purpose.

While I have shown and described several specific embodiments of my invention, it will be understood that I do not wish to be limited exactly thereto, since various modifications may be made without departing from the scope of my invention, as defined in the following claims.

I claim:

1. The method of polishing the interior of a cylinder which includes rotating the cylinder, directing a traveling endless abrasive belt therethrough in opposite directions, and causing the endless abrasive belt from inside said cylinder to make contact with successive portions of the same.

2. Apparatus for polishing the interior of a cylinder comprising a chuck in which the work-piece is adapted to be disposed, an endless belt extending through said cylinder and having an abrasive surface adapted to make contact therewith, means for causing said endless belt to move with respect to said work-piece, means for rotating said chuck, and means adapted to be disposed between the inner surfaces of those portions of said endless belt which are in said work-piece for causing the abrasive surfaces of the same to make contact with successive portions of the work-piece.

3. Apparatus for polishing the interior of a cylinder comprising a chuck in which the work-piece is adapted to be disposed, an endless belt extending through said cylinder and having an abrasive surface adapted to make contact herewith, means disposed internally of said cylinder for causing said endless belt to move with respect to said work-piece, means for rotating said chuck, means adapted to be disposed between the inner surfaces of said endless belt for causing the abrasive surfaces of the same to make contact with successive portions of the work-piece, said means comprising a pipe, a mandrel supported by said pipe and having apertures adjacent the inner surfaces of said endless belt, and means for delivering a fluid through said pipe and said apertures.

4. Apparatus for polishing the interior of a cylinder comprising a chuck in which the work-piece is adapted to be disposed, an endless belt extending through said cylinder and having an abrasive surface adapted to make contact therewith, means for causing said endless belt to move with respect to said work-piece, means for rotating said chuck, means adapted to be disposed between the inner surfaces of said endless belt for causing the abrasive surfaces of the same to make contact with successive portions of the work-piece, said means comprising a pipe, a mandrel supported by said pipe and having apertures adjacent the inner surfaces of said endless belt, means for delivering a fluid through said pipe and said apertures, and means for reciprocating said pipe.

5. Apparatus for polishing the inner surfaces of a cylinder comprising a housing, a rotatable chuck disposed in said housing, means for rotating said chuck, a secondary idle chuck in alinement with said first named chuck and adapted to support a cylindrical work-piece in conjunction with said first named chuck, a frame adjacent said last named chuck and having a plurality of rolls rotating on axes at substantial right-angles

with respect to the longitudinal axis of the work-piece, means for moving said frame with respect to said last named chuck, a second frame adjacent said first named chuck, rolls mounted on said last named frame and adapted to rotate on axes at right-angles with respect to the axis of the work-piece, a plurality of rolls which are adapted to rotate on axes at right-angles to the axes of said last named rolls, an endless belt strung between all of said rolls and adapted to extend through the interior of said work-piece, said endless belt being characterized by having at least one continuous surface coated with abrasive, a support adjacent said last named rolls and adapted to support a pair of rolls, means for adjusting at least one of said last named rolls, means for rotating at least one of said rolls, a secondary support adjacent said last named support, a pipe extending through said last named support and between said last named rolls, a plug on the end of said pipe, said plug being of such size as to freely fit within said work-piece and to internally support said endless abrasive belt, a fluid supply hose connected to said pipe, means inherent in said plug for permitting the release of fluid in such manner as to influence said endless belt into contact with the interior of said work-piece, and means for imparting rotation to said first named chuck.

6. Apparatus for polishing the inner surfaces of a cylinder comprising, in combination, means for supporting said cylinder, an endless abrasive belt extending through said cylinder, means for supporting said endless abrasive belt at either end of said cylinder, means disposed internally of said cylinder for influencing said endless belt against the inner opposed surfaces of said cylinder, means for adjusting said supporting means, means for adjusting said influencing means, means for rotating the supporting means for said cylinder, and means for imparting movement to said endless abrasive belt.

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