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TUBE DRAWING APPARATUS

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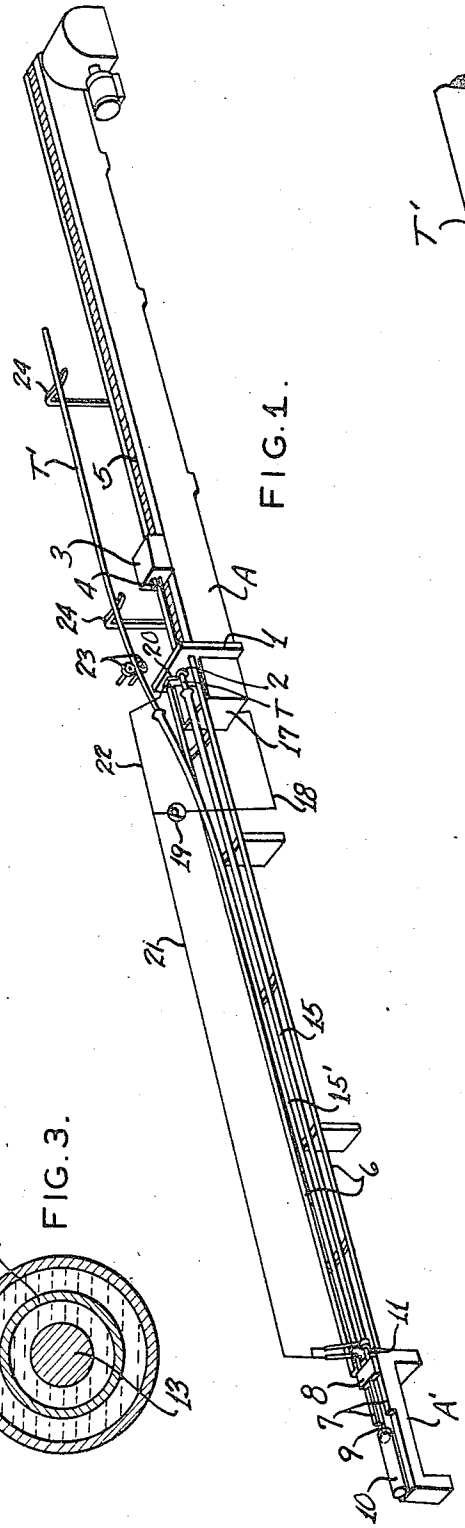


FIG. 1.

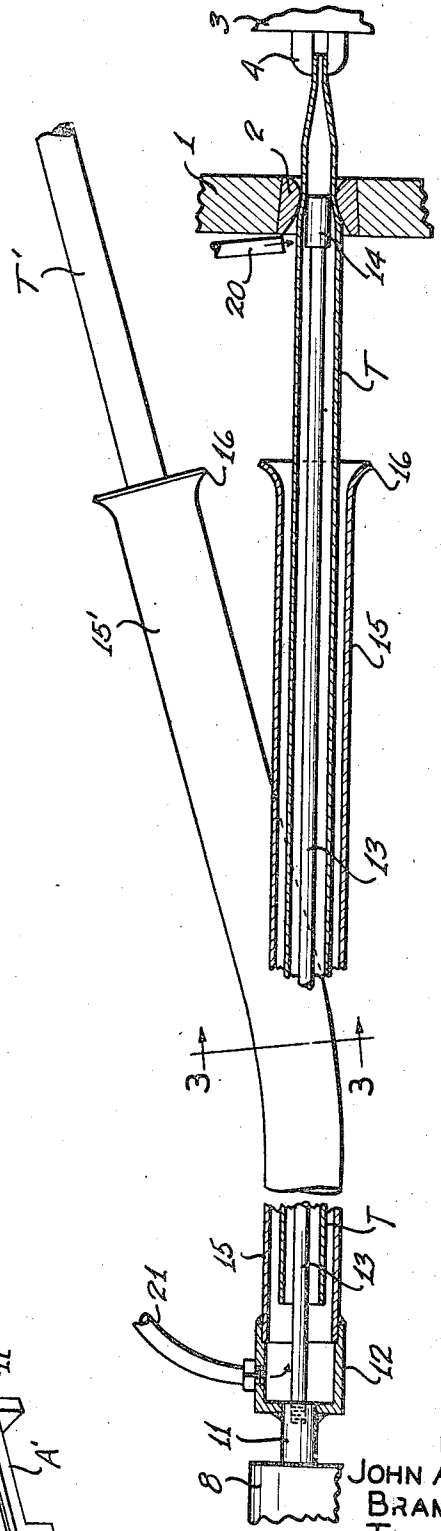


FIG. 2.

FIG. 3.

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TUBE DRAWING APPARATUS

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13 Claims. (Cl. 205—7)

This invention relates generally to the production of seamless tubing, and, more particularly, to a certain new and useful improvement in apparatus for the cold drawing production of tubing.

Present methods of lubricating tubing for drawing, so far as we are aware, are either, briefly stated, (1) to dip the tubes, singly or collectively in loads, in a vat or tank of oil or lubricating compound and then successively string the lubricated tubes on the plug-rod, or (2) to supply the lubricant to the inside of the tube by a hollow plug-rod through which the lubricant is pumped and to the outside of the tube by a nozzle or pipe outlet located at or adjacent the die.

The first method is cumbersome and impractical when the tubes being drawn are over thirty feet long. The second method has the objections that the lubricant does not get up into the point satisfactorily, the amount of lubrication is limited by the hole or outlet in the rod, and the plug-rods have a tendency to plug up in use, causing considerable inconvenience and loss of time, and, in addition, as far as the plug-rods are concerned, high tensile steel is required and the manufacture and repair thereof are expensive.

Our invention has for its chief object the provision in the drawing apparatus of means for not only obviating and eliminating such mentioned methods, but also copiously lubricating the tubes for drawing both prior to, and during, drawing operations.

Our invention has for a further object the provision of means for the purpose stated, which may readily be employed and installed in connection with present drawing benches or other cold drawing equipment, which economically involves relatively low operating and maintenance costs, and which effects a material improvement in the drawn tubing, as well as substantially prolonging the useful life of the drawing dies and plugs.

And with the above and other objects in view, our invention resides in the novel features of form, construction, arrangement, and combination of parts presently described and pointed out in the claims.

In the accompanying drawing—

Figure 1 is a perspective view of a drawing-bench equipped with die and plug lubricating apparatus constructed in accordance with and embodying our present invention;

Figure 2 is an enlarged fragmental longitudinal sectional view of the lubricating apparatus; and

Figure 3 is a transverse sectional view of the lubricating apparatus taken approximately along the line 3—3, Figure 2.

Referring now in more detail and by reference characters to the drawing, which illustrates a preferred embodiment of the present invention, A designates a conventional drawing bench, suitably located upon which is a rigid mounting 1 for a removable or renewable drawing-die 2. Mounted for travel on bench A, is a draw-carriage 3 provided with suitable jaws 4 for gripping the tube T or other work and having means for engagement with an endless traveling draw-chain 5 for pulling movement of the carriage 3 and gripped tube T along the bench A and away from die 2 during drawing operations.

Forming substantially a part of the bench A and suitably spaced from, and registering with, the die-mounting 1, is a frame A', and supported upon and extending between the mounting 1 and frame A', is a pair of horizontal tie-rods 6.

Frame A' is provided on its upper face with a pair of spaced parallel slide-ways 7 for a shiftable block 8, which is, in turn, provided in its rear face with a rearwardly extending plunger 9 operatively working in a hydraulic cylinder 10 for reciprocating the block 8 toward and from the die-mounting 1, for purposes presently appearing.

Fixed in, and extending forwardly from, the mounting-block 8, is a pair of spaced parallel horizontally disposed stub-shafts 11, each rigidly provided with a diametrally enlarged preferably concentric tubular cap 12, as best seen in Figure 2.

Threaded into the free end of, or otherwise fixed to, each stub 11, is a mandrel or plug-bar 13 of a length to extend horizontally forwardly to adjacent the die 2, and threaded or otherwise suitably fixed on the forward end of the bar 13 for drawing co-operation with the die 2, is a conventional drawing plug 14.

Welded or otherwise suitably secured at an end in, and extending forwardly from, the respective caps 12 in encircling relation to the plug-bars 13, are lubricant tubes or shells 15, 15', each suitably elongated to extend forwardly to terminate approximately ten or twelve inches from the rearwardly presented face of the die-mounting 1, each shell 15, 15', being preferably of flaring or bell-shape contour at its free end or mouth, as at 16.

Suitably mounted upon the die-mounting 1 and sized to extend rearwardly under the mouths 16 of the tubes 15, 15', is a catch-basin or so-called sump-box 17, and connected on its intake

side by means of a suitable pipe-section 18 to the bottom of the sump-box 17, is a pump 19, which is, in turn, connected on its discharge side by suitable pipe-sections 21, 22, respectively, to the caps 12 and to a nozzle 20, the latter being so shaped and positioned on the die-mounting 1 relatively to the die 2, it may here be stated, to discharge a substantial flow of lubricant on to the exterior surface or outer periphery of the particular tube T being drawn just as the tube T enters the die 2, all as best seen in Figures 1 and 2.

Accordingly, in use and practice, the tubes to be drawn or reduced are telescopically fed by means of rolls 23 from the bench-racks or brackets 24 alternately into the shells 15, 15', and about the respective plug-bars or mandrels 13 housed therein, a tube T' being fed into and housed within one of the shells, as, for instance, shell 15', while another tube T is being drawn or pulled by means of the carriage 3 from the other shell, or, in such instance, shell 15, and reducingly between the co-operable die 2 and plug 14.

It will be understood, of course, that, when a tube T has been telescopically housed within a shell, the assembly, including the block 8, is forwardly shifted to locate the plug 14 properly within, and for tube-reducing co-operation with, the die 2, the assembly being reciprocated for similarly effecting successive tube reductions.

It will also be appreciated that the relatively extreme length of the respective shells 15, 15', readily presents freedom of movement thereof at their free ends, as indicated in Figure 2, for facilitating tube feeding and drawing.

For and during such tube-drawing operations, the sump-box 17 is filled to a suitable level with the lubricating fluid, and the pump 19 caused to operate to drive the lubricating fluid both into the lubricating tubes or shells 15, 15', and into the nozzle 20.

The pumped lubricant thus fills, or substantially fills, the shell 15', and as the tube T' is fed into the lubricant-filled shell 15' and strung over the plug rod 13, and the raised end of shell 15' lowered to horizontal position, the lubricant will flow both into and about the strung tube T', some of the displaced lubricant escaping through the tube-mouth 16 into the sump 17 for recirculation. Substantially, it might thus be said, the tube T' is thereby immersed in a lubricant bath and so thoroughly lubricated both upon its inner and outer periphery that, when subsequently the tube is worked, as, for instance, when the tube, now designated T, is pulled by the carriage from the particular shell, the drawing of the tube both through the die 2 and over the plug 14 is exceedingly facilitated and smoothed.

If desired, additional lubricant may be discharged from the nozzle 20 upon the outer periphery of the tube adjacent the die 2, excess lubricant from nozzle 20 likewise flowing into the sump-box 17 for recirculation.

Thus our apparatus retains all of the advantages, and eliminates all of the disadvantages, of present methods and means of tubing lubrication.

The apparatus is simple in structure, readily installed, economical in lubricant-supply, and exceedingly efficient in the performance of its intended functions, and it should be understood that changes and modifications in the form, construction, arrangement, and combination of the several parts of the apparatus may be made and substituted for those herein shown and described without departing from the nature and principle of our invention.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

1. Tube-drawing apparatus including, in combination, a die-mounting, an elongated tubular shell for temporarily housing the tube to be drawn, means for supplying lubricant to the shell for flow into and about the housed tube, the shell having an open end in spaced relation to said mounting for discharge during a drawing operation of contained lubricant, and means for drawing said tube from the shell through the open end thereof and between the co-operable die and plug.

2. Tube-drawing apparatus including, in combination, an elongated tubular shell open at an end, a mandrel partially disposed within the shell, a reducing plug supported by the mandrel, means for feeding an open-end tube into the shell through its said end and about the mandrel and plug, means for supplying lubricant to the shell for flow into and about the fed tube, and means for reversely drawing the tube from the shell through its said open end and between said plug and a co-operable die.

3. Tube-drawing apparatus including, in combination, a die-mounting and a die supported thereby, a frame spaced from and registering with said mounting, an elongated tubular shell upon the frame, the shell having a mouth disposed in spaced relation to the die-mounting, a mandrel partially disposed within the shell, a reducing plug supported by the mandrel, means for feeding an open-end tube into the shell through its said mouth and about the mandrel and plug, means for supplying lubricant to the shell and about and within the fed tube, and means for reversely drawing the tube from the shell through its said mouth and between the plug and die.

4. Tube-drawing apparatus including, in combination, a die-mounting and a die supported thereby, a frame spaced from and registering with said mounting, an elongated tubular shell upon the frame, the shell having a mouth disposed in spaced relation to the die-mounting, a mandrel partially disposed within the shell, a reducing plug supported by the mandrel, means for feeding an open-end tube into the shell through its said mouth and about the mandrel and plug, pump means for supplying lubricating fluid under pressure to the shell for flow into and about the fed tube, and means for reversely drawing the tube from the shell through its said mouth and between the plug and die.

5. Tube-drawing apparatus including, in combination, a die-mounting and a die supported thereby, a frame spaced from and registering with said mounting, an elongated tubular shell disposed upon the frame, the shell having a mouth disposed in spaced relation to the die-mounting, a mandrel partially disposed within the shell, a reducing plug supported by the mandrel, means for feeding an open-end tube into the shell through its said mouth and about the mandrel and plug, pump means for supplying lubricating fluid under pressure to the shell for flow into and about the fed tube, means for shifting the plug into reducing relation with said die, and means for reversely drawing the tube from the shell through its said mouth and between the die and plug.

6. Apparatus for cold-drawing seamless tubing including, in combination with a stationary die,

a tubular shell of larger diametral size than the tubing for telescopically receiving the tubing, means for maintaining a quantity of lubricating fluid within the shell and tubing, the shell having an open end in spaced relation to the die for the escape of excess lubricating fluid, a sump-box disposed beneath said end of the shell for receiving excess lubricating fluid flowing from the shell, and means for recirculating the lubricating fluid from the sump-box to the shell.

7. Apparatus for cold-drawing seamless tubing including, in combination with a die, a tubular shell having an open mouth spaced rearwardly of the die for receiving the tubing, means for maintaining a quantity of lubricating fluid within the shell and in and about the tubing, a nozzle positioned above the entrant end of the die for flowing lubricant fluid over the outer periphery of the tubing as the tubing passes through the die, a sump-box disposed beneath the open end of the shell and the nozzle for receiving excess lubricating fluid flowing from the shell-mouth and the nozzle, and means for recirculating the lubricating fluid from the sump-box to the shell and nozzle for maintaining a continuous flow of lubricating fluid during a drawing operation.

8. Apparatus for cold-drawing tubing including a die and a co-operable plug, an open end tubular shell for telescopically housing tubing to be drawn, the shell being elongated for flexible disposition out of alignment with the die for receiving the tubing to be drawn, means for maintaining a quantity of lubricating fluid within the shell and in and about the housed tubing, and means for reversely drawing the tubing from the shell over the plug and through the die.

9. Apparatus for cold-drawing tubing including a die and a co-operable plug, an open end tubular shell for telescopically housing tubing to be drawn, the shell being elongated for flexible disposition out of alignment with the die for receiving the tubing to be drawn, means for maintaining a quantity of lubricating fluid within the shell and in and about the housed tubing for lubricating the tubing for movement over the plug, means for reversely drawing the tubing from the shell over the plug and through the die, and means for lubricating the tubing for movement through the die.

10. Tube-drawing apparatus including, in combination, a die-mounting and a die supported thereby, a frame spaced from and registering with said mounting, an elongated tubular shell disposed upon the frame, the shell having a mouth disposed in spaced relation to the die-mounting, a mandrel partially disposed within the shell, a reducing plug supported by the mandrel, means for feeding an open-end tube into the shell through the mouth thereof and about the mandrel and plug, a lubricant-discharge nozzle adjacent the die-mounting, pump means for supplying lubricating fluid under pressure to said nozzle and to the shell for flow into and about the fed tube, means for shifting the plug into reducing relation to the die, and means for reversely drawing the tube from the shell through the mouth thereof and between the die and plug.

11. Apparatus for cold-drawing tubing including a die and a tubular shell for temporarily housing tubing to be drawn, the shell being of larger diametrical size than, and having an opening for telescopically receiving, the tubing to be drawn, said shell being elongated for alternate flexible disposition into and out of drawing alignment with the die.

12. Apparatus for cold-drawing tubing including a die, a tubular shell for temporarily housing tubing to be drawn, the shell being of larger diametrical size than, and having an opening for telescopically receiving, the tubing to be drawn, said shell being elongated for alternate flexible disposition into and out of drawing alignment with the die, and means for maintaining a quantity of lubricating fluid within the shell for flow into and about the housed tubing.

13. Apparatus for cold-drawing tubing including a die and a co-operable plug, an open end tubular shell for telescopically housing tubing to be drawn, means for maintaining a quantity of lubricating fluid within the shell and in and about the housed tubing for lubricating the tubing for movement over the plug, means for reversely drawing the tubing from the shell over the plug and through the die, and means for lubricating the tubing for movement through the die, the shell at its open end permitting discharge of contained lubricant during a drawing operation.

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