April 25, 1944. Y. A. BOUGET 2,347,392

STRAND HANDLING APPARATUS

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FIG. 1

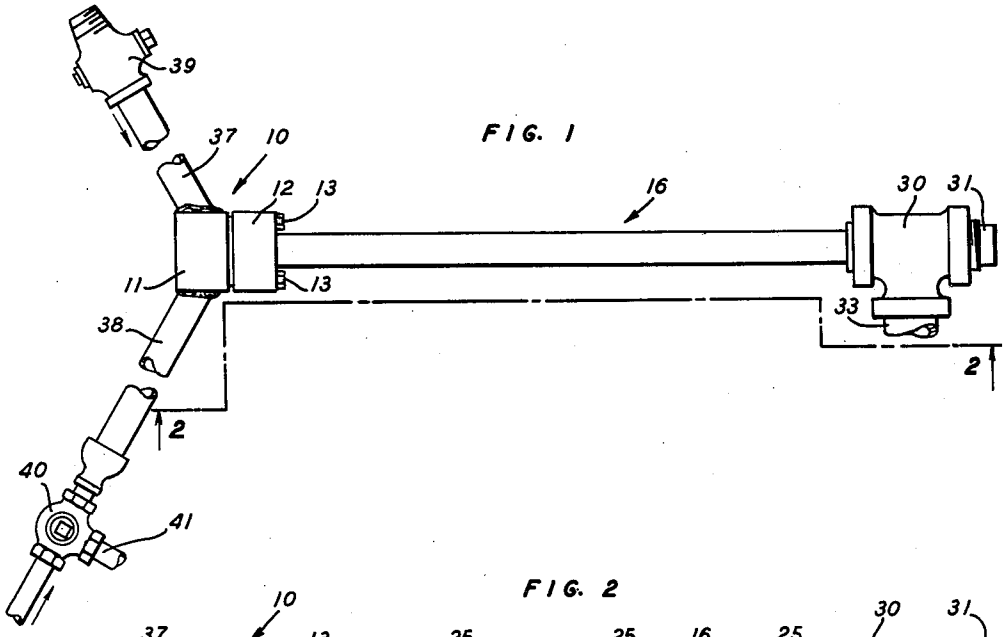


FIG. 2

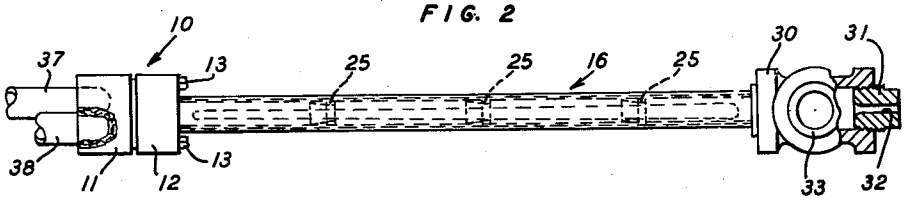
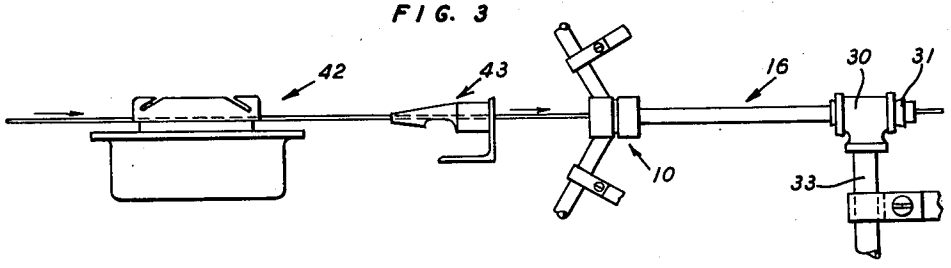


FIG. 3

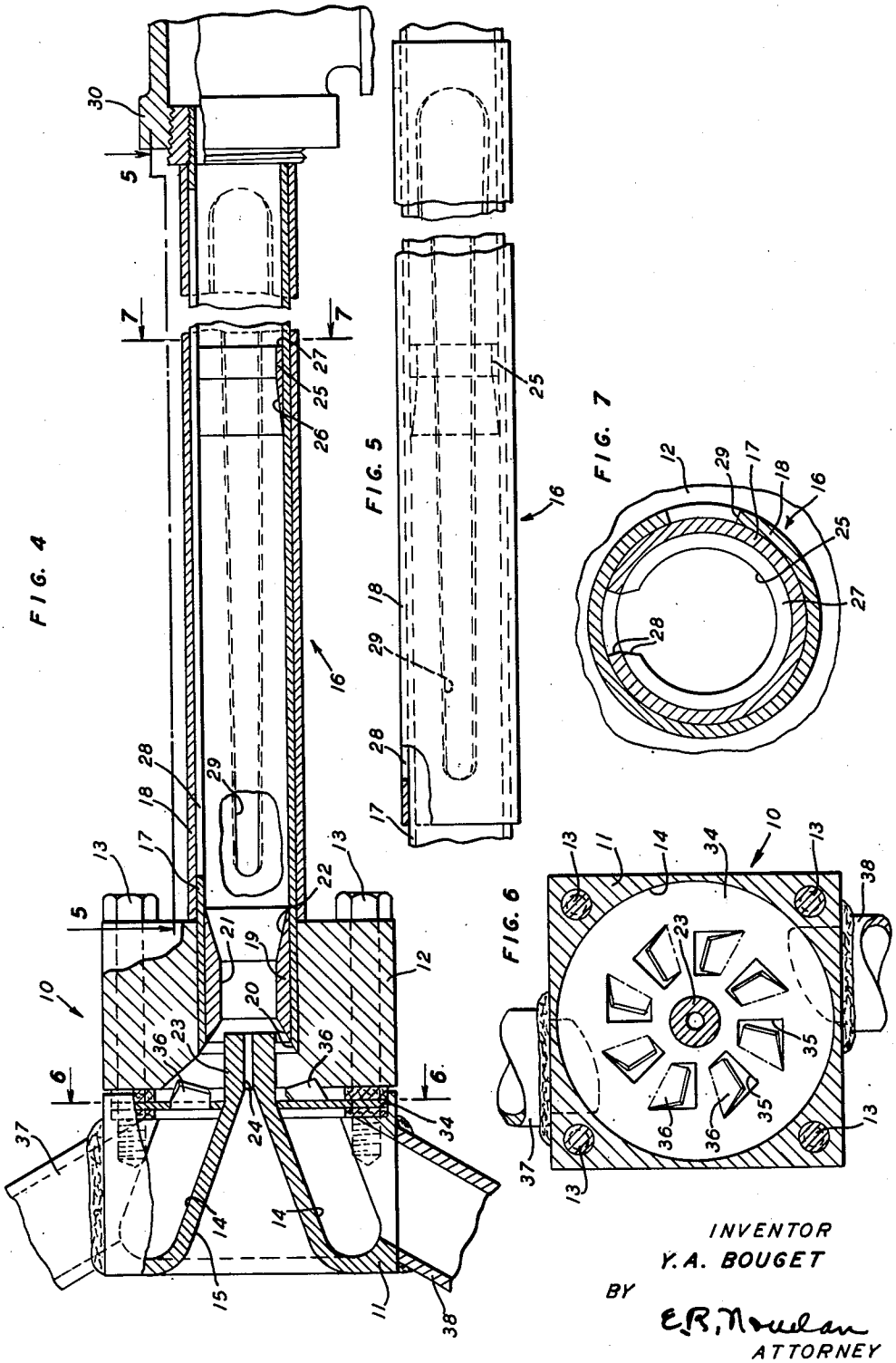


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STRAND HANDLING APPARATUS

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UNITED STATES PATENT OFFICE

2,347,392

STRAND HANDLING APPARATUS

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6 Claims. (Cl. 91—59.1)

This invention relates to strand handling apparatus, and more particularly to apparatus for cooling, washing or otherwise treating the surface of a wire or other strand with a liquid medium.

Where a hot wire is to be cooled rapidly and thoroughly, or where the surface of a strand is to be thoroughly and rapidly washed or rinsed or pickled or otherwise subjected to some action of a liquid medium, it is desirable to cause as much as possible of a given quantity of the liquid in question to come into contact with the strand in order that the liquid may be efficiently effective for its purpose and not be wasted itself or require wasted energy to circulate unused liquid. For example, in the manufacture of tinned copper wire, the wire is coated with tin by being drawn through a bath of molten tin and emerges therefrom hot and with a hot coating. To cool both the coating and the wire inside of it for further manufacturing procedures or to harden the coating sufficiently to permit the coated wire to be wound on a spool or reel for storage, requires the intimate contact of a relatively considerable quantity of cold water with the surface of the hot, coated wire.

An object of the present invention is to provide a simple, reliable and efficiently operating apparatus or device for applying to a strand passing longitudinally therethrough a liquid in such fashion as to effectively assure contact of the surface of the strand with a maximum proportion of liquid also passing through the device.

With the above and other objects in view, the invention may be embodied in a device for treating a longitudinally advancing strand with a liquid and comprising a head formed with an annular chamber, an elongated body having a laterally closed channel coaxial with and communicating from the chamber, and liquid supply means to direct a liquid under pressure tangentially into the chamber to whirl around therein and to enter the channel with both rotary and axial motion, the inner wall of the chamber being formed with a coaxial bore to pass a strand moving axially through the channel to be subjected to the action of the helically turbulently moving liquid therein.

Other objects and features of the invention will appear from the following detailed description of one embodiment thereof taken in connection with the accompanying drawings, in which the same reference numerals are applied to identical parts in the several figures and in which

Fig. 1 is a broken view in side elevation of an apparatus constructed in accordance with the invention;

Fig. 2 is a view partly in section, on the line 2—2 of Fig. 1;

Fig. 3 is a diagrammatic view in side elevation on a reduced scale showing the apparatus applied in the cooling of tinned wire;

Fig. 4 is a view in side elevation and partly in vertical central section of the head and body of the device;

Fig. 5 is a corresponding view on the line 5—5 of Fig. 4;

Fig. 6 is a transverse section on the line 6—6 of Fig. 4; and

Fig. 7 is an enlarged section on the line 7—7 of Fig. 4.

As herein disclosed, the illustrative embodiment of the invention comprises an elongated tubular body and a parallelopipedal head joined thereto. The head, generally indicated at 10, for convenience of manufacture consists of two rectangular blocks 11 and 12, held together by screws 13, and is formed with an annularly conoidal chamber 14, the inner wall of which forms on its outer surface a conical entrance 15. The tubular body, generally indicated at 16, comprises a main body tube 17 inset at one end into the block 12 coaxially with the chamber 14. Telescoped snugly over the tube 17 is a rotatably adjustable cover tube 18. A short tube 19 is telescoped and secured in the left end of the tube 17. The left ends of this tube 19 and of the tube 17 are chamfered as at 20 to continue the taper of the outer wall of the chamber 14 to the diameter of the inside tube 19. After a short, parallel-sided throat 21 the tube 19 is chamfered out as at 22 to the diameter of the tube 17. The inner wall of the chamber 14 extends as a cylindrical stem 23 into the chamfer cone 20 and is formed with a coaxial bore 24 communicating between the conical entrance 15 and the chamfer cone 20. The chamber 14, the entrance 15, the bore 24, the cone 20, the throat 21 and the chamfer cone 22 are all coaxial with each other and with the tubes 17 and 18. A plurality of choke tubes 25 (three in the particular device illustrated) is mounted inside the tube 17 at intervals along the length thereof. Such a choke tube 25 is a short length of tubing telescoped snugly with the tube 17 and secured in place, e. g. by sweating with solder. The end toward the head is chamfered out on a relatively long taper as at 26, best shown in Fig. 4, and the other end is squared off as at 27. The tube 17 and the tubes 25 are formed with a long slot

28 along its top, and the cover tube 18 is formed with a matchingly shaped and dimensioned slot 29, ordinarily not coincident with the slot 28. The right hand end of the tube 17 is secured in a T fitting 30 having a plug 31 with a small central bore 32 therein coaxial with the tube 17. The downwardly directed stem 33 of the T may be connected to any suitable waste means or liquid recovery means (not shown). Within the head 19, a diaphragm 34 extends across the chamber 14 and is provided with a ring of apertures 35, each formed by cutting free and bending out to the right flaps 36. These flaps are rigid and stand out at about a half right angle to the right (Fig. 4) from the diaphragm, all facing the same way as shown best in Fig. 6. Two liquid inlet pipes, 37 and 38 respectively, enter the chamber 14 from opposite sides, preferably from above and below as shown. The upper pipe 37 is provided with a shut off valve 39, while the lower pipe 38 has a three-way valve 40. These valves are connected to suitable liquid supply means (not shown). The valve 40 also has a waste outlet 41 by means of which the whole device may be drained when desired. The pipes 37 and 38 not only enter the chamber 14 at opposite sides but also enter it tangentially as shown in Fig. 6.

In the particular case of tin coated wire, now under consideration, it is desired to have the coldest liquid, water in this case, meet the hot wire first to chill and set the soft tin at once. Hence the water and the wire are not run in counter-current directions. The hot wire is led into the device from a tinning means 42 and a wiping means 43, into the entrance 15 and the bore 24, axially through the tube 17 and the chokes 19 and 25, and out through the bore 32 in the plug 31 to some advancing means (not shown). Water under pressure enters the chamber 14 through the tangential pipes 37 and 38, whirls around and passes through the openings 35 and along the spirally directed flaps 36 to continue in a helically whirling course through the cone 20 and into contact with the hot wire in the throat 21 in a state of turbulence which causes a major portion at least of the water to make actual contact with the wire while passing through the throat 21 and over the enlarging ramp of the chamfer cone 22 and on through the tube 17. The whirling effect may die out as the water and wire pass along; but at the first of the choke tubes 25 the flow of water is speeded up by the constriction and then in breaking out over the abrupt enlargement at the face 27 of the choke, is again made turbulent. This effect recurs at each of the chokes 25. By the time the wire passes out through the bore 32 in the plug 31, it has been effectively and thoroughly bathed and chilled by the ever changing portions of water brought into direct contact with it.

The slot 28 through the wall of the tube 17 is preferably formed, as shown, with its width increasing from left to right along the direction of liquid flow. This feature increases the cross-sectional area of the liquid passage from left to right and so helps to slow down the velocity of the liquid flow as it approaches the outlet 33. However, the primary purpose of the slot 28 is to render it easily and conveniently possible to thread a strand through the apparatus. By turning the outer tube or sleeve 18 until the slot 29 coincides with the slot 28, the interior of the tube 17 is made accessible for threading a strand.

As described, the tinned wire to be chilled is run through the apparatus in the same direction that the water flows. In another case, e. g. were the wire to be pickled, for example, it might be preferred to run the strand in the opposite direction in order to have the flow counter-current to the motion of the strand. Again, if the case were of a porous strand, e. g. a textile strand, or a wire sheathed in paper pulp or served with textile threads and to be impregnated with some liquid material, the strand might be run from left to right, i. e. with the liquid flow, to lessen the scrubbing effect of the liquid on its surface; while if the strand were to have a coating dissolved from its surface, the strand would be run against the current flow to increase the mechanical effectiveness of the liquid.

While the apparatus is shown with two liquid supply pipes 37 and 38, it is not necessarily so limited. The pipe 37, for example, might be omitted, or there could be more than two entering the chamber 14 tangentially.

The embodiment of the invention disclosed and described is illustrative and may be variously modified and departed from without departing from the spirit and scope of the invention as particularly described and pointed out in the appended claims.

What is claimed is:

1. A device for treating a longitudinally advancing strand with a liquid and comprising a head formed with an annular chamber, an elongated body having a laterally closed channel coaxial with and communicating from the chamber, and liquid supply means to direct a liquid under pressure tangentially into the chamber to whirl around therein and to enter the channel with both rotary and axial motion, the inner wall of the chamber being formed with a coaxial bore to pass a strand moving axially through the channel to be subjected to the action of the helically turbulently moving liquid therein.

2. A device for treating a longitudinally advancing strand with a liquid and comprising a head formed with an annular chamber, an elongated body having a laterally closed channel coaxial with and communicating from the chamber, liquid supply means to direct a liquid under pressure tangentially into the chamber to whirl around therein and to enter the channel with both rotary and axial motion, and means to constrict the channel at spaced intervals along the same to create turbulence in the liquid flowing therethrough, the inner wall of the chamber being formed with a coaxial bore to pass a strand moving axially through the channel to be subjected to the action of the helically turbulently moving liquid therein.

3. A device for treating a longitudinally advancing strand with a liquid and comprising a head formed with a conoidally annular chamber, an elongated body having a laterally closed channel coaxial with and communicating from the small end of the chamber, and liquid supply means to direct a liquid under pressure tangentially into the large end of the chamber to whirl around therein and to enter the channel with both rotary and axial motion, the inner wall of the chamber being formed with a coaxial bore to pass a strand moving axially through the channel to be subjected to the action of the helically turbulently moving liquid therein.

4. A device for treating a longitudinally advancing strand with a liquid and comprising a

head formed with a conoidally annular chamber, an elongated body having a laterally closed channel coaxial with and communicating from the small end of the chamber, liquid supply means to direct a liquid under pressure tangentially into the large end of the chamber to whirl around therein and to enter the channel with both rotary and axial motion, and means to constrict the channel at spaced intervals along the same to create turbulence in the liquid flowing therethrough, the inner wall of the chamber being formed with a coaxial bore to pass a strand moving axially through the channel to be subjected to the action of the helically turbulently moving liquid therein.

5. A device for treating a longitudinally advancing strand with a liquid and comprising a head formed with a conoidally annular chamber, an elongated body having a laterally closed channel coaxial with and communicating from the small end of the chamber, liquid supply means to direct a liquid under pressure tangentially into the large end of the chamber to whirl around therein and to enter the channel with both rotary and axial motion, and a diaphragm transversely across the chamber and formed with an annular plurality of openings each having a rigid flap extending outwardly from one radial edge of the opening along the whirlingly advancing direction of motion of the liquid therethrough, the inner wall of the chamber being formed with a coaxial bore to pass a strand moving axially through the channel to be subjected to the action of the helically turbulently moving liquid therein.

6. A device for treating a longitudinally advancing strand with a liquid and comprising a head formed with a conoidally annular chamber, an elongated body having a laterally closed channel coaxial with and communicating from the small end of the chamber, liquid supply means to direct a liquid under pressure tangentially into the large end of the chamber to whirl around therein and to enter the channel with both rotary and axial motion, a diaphragm transversely across the chamber and formed with an annular plurality of openings each having a rigid flap extending outwardly from one radial edge of the opening along the whirlingly advancing direction of motion of the liquid therethrough, means to constrict the channel at spaced intervals along the same to create turbulence in the liquid flowing therethrough, the inner wall of the chamber being formed with a coaxial bore to pass a strand moving axially through the channel to be subjected to the action of the helically turbulently moving liquid therein.

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