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APPARATUS FOR DESCALING AND COATING WIRE

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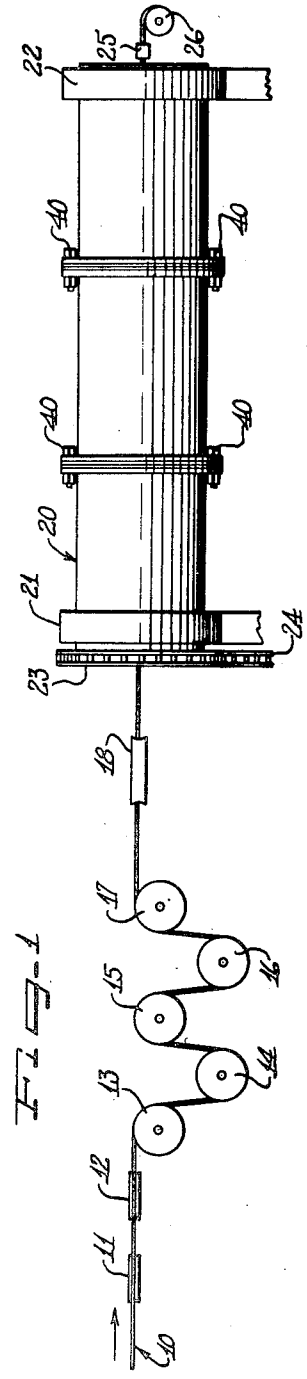


Fig. 1

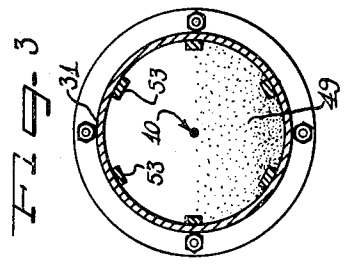


Fig. 3

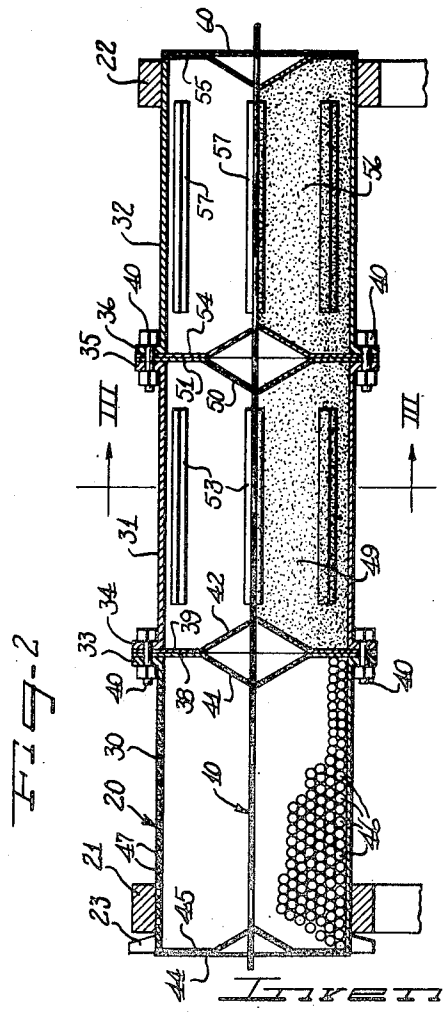


Fig. 2

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APPARATUS FOR DESCALING AND COATING WIRE

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The present invention relates to a method of and apparatus for removing scale deposits from elongated metal articles such as wire, rods, sheets and the like.

Wire, and other elongated metal articles as received from a rolling mill invariably contain surface deposits of tightly adhering scale. Unless the scale is removed from the articles prior to passage into subsequent metal working equipment such as wire drawing dies, the hard, brittle scale deposit abrades the dies thereby substantially decreasing the useful life of the dies.

Probably the most common method of removing scale from metal objects consists in passing the objects through a pickling bath containing strong acids. Pickling baths, however, have decided disadvantages in that they present definite problems of fume removal and waste acid disposal. It is generally recognized that the elimination of acid pickling baths in the treatment of steel wire would be definitely desirable, if some equivalent means could be provided for removing the scale.

An object of the present invention is to provide a mechanical means for descaling an elongated metal article without the use of acid pickling solutions.

Still another object of the present invention is to provide means for removing scale from a wire, and applying an adherent film of lubricant to the wire prior to passage of the wire through drawing dies.

Still another object of the present invention is to provide an improved metal treating apparatus including a stage where scale is liberated from the surface of the article being treated, and stages in which the scale-free article is treated with lime and a powdered lubricant.

Still another object of the present invention is to provide an improved method for cleansing wire and other metal articles to provide thereon a clean, lubricated surface.

The assembly of the present invention includes a rotating drum through which the wire or other article to be descaled and lubricated may be continuously passed. The drum is preferably divided into three chambers or compartments, in the first of which the wire is subjected to the tumbling action of abrading elements, such as hard, metallic balls which rub the wire clean of adhering scale deposits. In the second stage, the wire is treated with an agitated supply of powdered lime preparatory to a treatment in a third stage in which a lubricant such as soap powder is applied to the wire. I have found that by treating the wire immediately after its descaling with powdered lime, the subsequently applied powdered soap adheres far better to the surface of the wire than if the application of lime were eliminated. As a result, the wire leaving the rotating drum has a relatively smooth, adherent coating of soap which greatly facilitates a subsequent wire drawing operation and materially increases the useful life of the drawing dies.

Other objects and features of the present invention will be apparent to those skilled in the art from the following description of the attached sheet of drawings, which, by way of preferred embodiment illustrate an apparatus which can be employed in the practice of the present invention.

In the drawings:

Figure 1 is a schematic view, with parts in elevation of the descaling assembly of the present invention;

Figure 2 is a cross-sectional view, with parts in elevation of the interior of the rotating drum illustrated in Figure 1; and

Figure 3 is a cross-sectional view taken substantially along the line III—III of Figure 2.

As shown on the drawings:

In Figure 1, reference numeral 10 denotes a wire as received from a rolling mill and having a surface coating of scale rigidly adhering thereto. Prior to treatment of the scale-covered wire in the rotating drum of the present invention, the wire is flexed to break up dense scale formations by passing the wire over a plurality of pulleys. In Figure 1, there is illustrated a pair of pulleys 11 and 12 having their axes in a generally vertical direction, the axes of the pulleys 11 and 12 being spaced from each other so that the wire 10 undergoes considerable flexing in passage from the pulley around the pulley 12. Next, the wire 10 is trained successively over a plurality of pulleys 13, 14, 15, 16, and 17 whose axes are substantially horizontal, the pulleys 13 thru 17 being disposed in a staggered arrangement so that as the wire passes from one pulley to the next succeeding pulley, the rapid change of direction and resulting sharp flexing which occurs in bending the wire around the peripheries of the pulleys causes scale formations to be loosened or broken off. After passage of the wire about the periphery of the pulley 17, the wire passes about a pulley 18 having a generally vertical axis and is then introduced into a rotary drum, generally indicated at numeral 20. As seen in Figure 1, the rotating drum 20 is journaled for rotation within a pair of spaced bearing support members 21 and 22. One end of the drum 20 is provided with a sprocket 23 having a drive chain 24 in engagement therewith to rotate the drum 20 at a suitable angular velocity. The wire 10, after leaving the drum, is pulled through a drawing die 25 and coiled about a driven spool 26 which tensions the wire 10 during its passage thru the drum.

The interior of the rotating drum 20 is best illustrated in the cross-sectional view of Figure 2. As seen in this figure, the cylinder 20 consists of a plurality of axially aligned flanged cylinders 30, 31 and 32 in end-to-end relationship, the cylinder 30 having an annular end flange portion 33, with similar annular flange portions 34 and 35 being provided on the cylinder 31. The cylinder 32 has an annular flange portion 36 abutting the flange portion 35. A pair of baffles 38 and 39 have their peripheral edges held firmly between the flanges 33 and 34 by means of a plurality of bolts 40, peripherally spaced. The baffles 38 and 39 are outwardly flared centrally as indicated at 41 and 42 as well as being centrally apertured to permit passage of the wire 10 therethrough. The inclinations of the baffles 41 and 42 into the chambers defined by the three cylinders 30, 31 and 32 prevent accumulation of the materials contained in the various compartments at the ends of the cylinders, as will hereinafter be explained.

The forward end of the cylinder 30 is also provided with an end plate 44 having a central aperture formed therein to permit passage of the wire 10 through the drum. An outwardly flared and centrally apertured baffle 45 is also provided at the forward end of the drum to prevent a plurality of steel balls 46 contained in the cylinder 30 from accumulating at the inlet end of the drum, and thereby prevent binding.

The steel balls 46 are representative of abrading elements which, upon tumbling by rotation of the drum 20 effectively dislodge remaining scale from the wire as it is received from the pulley 18. To permit the dislodged scale to be continuously removed, a portion of the cylinder 30 is perforated as indicated at 47 with apertures having a smaller dimension than the diameter of the balls 46. Thus, upon continued rotation of the drum 20, scale which is wiped from the wire by the tumbling action of the balls 46 sifts through the apertures 47 and may be collected in a collecting trough.

After removal of the scale by the action of the tumbling abrading elements, the wire 10 passes into the centrally disposed chamber or compartment defined by the cylinder 31. This cylinder 31 contains a supply of powdered lime 49 which readily adheres to the smooth-surfaced wire leaving the tumbling chamber. The outwardly flared portion 42 of the baffle 39 as well as a similarly outwardly flared portion 50 on a baffle 51 prevent the powdered lime 49 from accumulating at the

inlet and outlet of the cylinder 31. A plurality of circumferentially spaced agitator elements 53 are secured to the inner wall of the cylinder 31 to keep the supply of lime 49 in a constantly agitated condition.

A relatively thin film of lime adheres to the wire 10 as it passes through the agitated supply of lime 49, and the thus lime coated wire next passes into the hollow cylinder 32 in which a lubricant is applied to the lime treated surface. The cylinder 32 has its inner end provided with an outwardly flared baffle 54 and its outer end has a similar baffle 55. The baffles 54 and 51 are contained between the annular peripheral flanges 35 and 36 and are held in fixed relation by means of the bolts 40. The lubricating chamber defined by the cylinder 32 contains a supply of powdered lubricant such as powdered soap 56, as well as circumferentially spaced agitators 57. The powdered soap 56 readily adheres to the lime coated wire and forms a more or less continuous film of soap over the wire. The soap coated wire then leaves the rotating drum through a centrally apertured end plate 60 secured to the cylinder 32 and then may be passed to the other metal working apparatus such as drawing dies, cutters, and the like.

While not shown in the drawings, it will be appreciated that each of the compartments making up the rotary drum 20 may be provided with access doors to replenish the supplies of powdered lime and powdered soap contained in the lime and lubricating compartments, respectively.

From the foregoing, it will be appreciated that the present invention provides a simple, yet highly effective mechanical system for the removal of scale and for the lubrication of metal articles prior to subsequent metal working operations. The cleaning and lubricating operations can be carried out at high speeds, considerably higher than those involved in passing a wire through a pickling bath followed by separate application of a lubricant. For example, a steel wire having a diameter of 0.207 inch was passed through a rotating drum such as described, at a speed of 2700 to 2800 feet per minute while achieving effective cleaning and lubricating. The size of the balls was about 1¼" in diameter. This range of speeds is significantly higher than those speeds attainable when drawing a similar wire through an acid pickling bath followed by a separate stage of lubricant application.

It will be understood that various modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

I claim as my invention:

1. A descaling assembly comprising a rotary drum, means dividing said drum into a plurality of chambers including a tumbling chamber, a lime applicator chamber, and a lubricant applicator chamber, means for passing an article to be descaled successively through said tumbling chamber, said lime applicator chamber, and said lubricant applying chamber, a plurality of hard metallic balls in said tumbling chamber for abrading said article upon rotation of said drum, and agitator elements in said lubricant applying chamber for agitating lubricant disposed in said chamber.

2. A descaling assembly comprising a rotary drum, spaced partitions in said drum dividing said drum into a plurality of axially spaced compartments, said drum having inlet and outlet means at opposed ends thereof for guiding an article to be descaled successively through each of said compartments, and said partitions having centrally apertured flared portions extending into said compartments.

3. A descaling assembly comprising a rotary drum, spaced partitions in said drum dividing said drum into a plurality of axially spaced compartments, including a tumbling compartment, a lime applicator compartment, and a soap applicator compartment, inlet and outlet means at opposed ends of said drum for guiding an article to be descaled successively through said tumbling compartment, said lime applicator compartment, and said soap applicator compartment, a plurality of hard metallic balls disposed in said tumbling compartment, and a plurality of circumferentially spaced agitator elements in both said lime applicator compartment and said soap applicator compartment.

4. A descaling apparatus comprising a rotary drum having an inlet and outlet for guiding an article to be descaled through said drum, partitions dividing said drum into a plurality of axially spaced compartments including a tumbling compartment at the inlet end of said drum, said drum having a plurality of apertures therein at said tumbling compartment for removing scale liberated from said article during passage of said article through said tumbling compartment, and a plurality of relatively hard metallic balls of a diameter greater than the smallest dimension of said apertures disposed in said tumbling compartment.

5. A descaling assembly for wire and the like comprising a rotary drum, a partition in said drum dividing said drum into a plurality of axially spaced compartments including an abrading compartment and a lime applicator compartment, said drum having inlet and outlet means at opposite ends thereof and said partition having an apertured portion in alignment with said inlet and outlet means and leading from one compartment to the other for guiding the wire to be descaled successively through each of said compartments, abrading means in said abrading compartment for abrading the wire as it travels therethrough, and a plurality of agitator elements extending inwardly from the wall of said lime applicator compartment for agitating and cascading lime onto the abraded wire.

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