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APPARATUS FOR CONTINUOUSLY PROCESSING WIRE

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Fig. 2

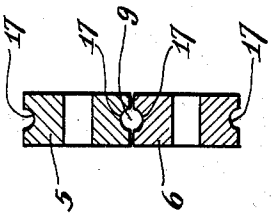


Fig. 1.

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APPARATUS FOR CONTINUOUSLY PROCESSING WIRE

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6 Claims. (Cl. 15—97)

This invention relates to the cleaning of wire, and more particularly to the removal from wire of lubricant and foreign matter deposited during manufacturing or treating operations.

Among the objects of the invention is the provision of a new and improved apparatus for this general purpose, which may be used apart from or in conjunction with a wire straightening machine. A further object is the provision of an improved machine for continuously cleaning and straightening or similarly processing wire. Another object is to provide in combination with a wire straightening machine or the like an apparatus adapted to simultaneously move a wire through said machine and clean said wire.

Another object of the invention is the provision of new and novel methods of cleaning lubricant coated wire.

It is generally necessary in straightening wire, and in similar processes where the wire is passed through dies, to apply to the wire a lubricant to ease movement of the wire through the dies and to reduce surface marking of the wire. For various well known reasons including wire inspection, it is desirable to thereafter remove the film of lubricant from the surface of the wire, and this has previously been accomplished by washing the wire with a suitable cleaning fluid. When wire is wound into coils after processing, the cleaning is accomplished either by immersing the whole coil in a cleaning solution or by unwinding the wire, cleaning and re-coiling the same. Apart from the additional time thus necessarily employed, such procedures are undesirable because of the type of apparatus which must be made available for this purpose.

This invention provides a machine whereby the wire may be drawn, straightened, or similarly processed, and at the same time effectively cleaned as it passes through the drawing, straightening, or processing machine.

Broadly, the invention contemplates a method of continuously cleaning a lubricant coated wire, which method consists in applying a cleaning fluid to the wire and thereafter moving it through rotating burnishing and feeding means which engage the wire throughout a substantial portion of its periphery and simultaneously advance it during the cleaning operation.

The invention also comprises a combination of means for continuously applying cleaning fluid to the wire, and means adapted to simultaneously move the wire through said machine, spread the applied cleaning fluid upon the surface of the moving wire, and mechanically break up or loosen the lubricant film thereon. More specifically, the latter-named means consists of a plurality of rollers having working faces adapted to engage a substantial portion of the periphery of the wire between said rollers. The invention also embodies means adapted to remove the dissolved or loosened lubricant film and cleaning fluid from the moving wire, and means for collecting the excess cleaning fluid for re-use.

The invention will be readily understood if one embodiment thereof be described in detail with reference to the accompanying drawing.

Fig. 1 of the drawing is an elevation of the machine, showing certain of the parts diagrammatically; and

Fig. 2 is a section taken on line II—II of Fig. 1, and shows the preferred peripheral construction of the rollers and their operative position in contact with the wire.

Referring to Fig. 1 of the drawing, 1 is a frame having disposed in its upper portion two recesses 2 and 3. Disposed within the recess 2 is a conventional wire straightening means consisting of a set of dies (not shown) in a rotatably mounted cylinder 4. Disposed within the recess 3 are two oppositely disposed rollers 5 and 6 driven in opposite directions by means not shown. The axes of rotation of these rollers are shown as being in a plane perpendicular to the path of travel of the wire 9. A wiping gland 7 is disposed at the rear or delivery side of the rollers 5 and 6 remote from the cylinder 4, and preferably within the recess 3, and attached to frame 1, as shown. In the gland is disposed a suitable wiping material which will not mar the surface of the wire passing therethrough but which will remove liquid from said wire. Examples of suitable materials for this purpose are rubber, rubber fabric, leather, and the like. A guide bushing 8 having a bore therein is attached to the frame 1 on the side adjacent cylinder 4. A cleaning fluid storage tank 10 is disposed above the frame 1. Attached to tank 10 is a conduit 11 having a valve controlling flow therethrough, the conduit terminating directly above wire 9 at a point ahead of rollers 5 and 6. A receptacle 12, open at its top, is disposed below the wire 9, rollers 5 and 6, and wiping gland 7, in the recess 3, and has connected thereto a conduit 13 extending downwardly and opening into a fluid-receiving tank 14. A suitable receiving table 15, supported on legs 16, only one of which is shown, is disposed at the exit end

of the machine. The table 15 is provided with an upper elongated wire guide 18 disposed in horizontal alignment with the wiper 7 for receiving and supporting the wire as it moves outwardly from the wiper. The table and associated guide are provided for handling wires of predetermined lengths.

Referring to Fig. 2, the rollers are there shown in their operating position with respect to the wire, that is, with their peripheral working faces adjacent one another. The construction of the peripheries of the rollers is such that when the rollers are in operating position, as shown in Fig. 2, the wire in the vertical plane of contact is substantially enclosed by the rollers. This is preferably accomplished by providing grooves 17 in the periphery of the rolls. Rolls having grooves of different sizes and shapes are used with different sizes and shapes of wire.

The rollers 5 and 6 are of material which will not mark the surface of the wire, but which will afford sufficient friction when in contact with the wire to prevent substantial slippage and provide sufficient rigidity to loosen the lubricant film. It has been found that rollers having a fiber periphery are suitable when handling wire up to approximately $\frac{5}{16}$ inch diameter; for wire of greater diameter, it is preferred to use rollers having steel peripheries for maximum wearing qualities.

In the operation of the above described embodiment of the invention, the wire to be cleaned, which has upon its surface a film of lubricant, may be tapered for a sufficient length at its end so that it will freely pass through the guide bushing 8, the dies in the cylinder 4, and between the rollers 5 and 6. Instead of tapering the wire, the straightening dies in cylinder 4 may be opened sufficiently to accommodate full size wire. Suitable lubricant cleaning fluid, for example, a lubricant solvent, is placed in storage tank 10 and is allowed to flow through conduit 11 onto the moving wire 9 as the latter moves between the rollers 5 and 6 for engagement therewith, the rate of flow being varied for wires of different diameters to supply the required amount of fluid thereto. Besides serving to pull the wire through the straightening dies, the rollers, by reason of their contact with the wire substantially entirely around its periphery, also function to spread the cleaning fluid uniformly on the wire and to effectively burnish the wire surface and thus loosen or break up the film of lubricant. The excess cleaning fluid draining from the wire falls into receptacle 12 and is conveyed through conduit 13 to receiving tank 14. After the wire has passed between the rollers 5 and 6, it passes through the wiping gland 7, which removes the loosened film of lubricant and remaining cleaning fluid. The clean wire then is advanced along the guide 18 where it may be passed on to a winding mechanism if desired, or cut off to a desired length and the severed piece suitably discharged onto the table 15 for inspection and bundling after a desired number of pieces have been collected. The feeding action of the rollers 5—6 preferably is interrupted during the severing operation. For cutting the wire a suitable wire cutter may be provided, as indicated at 19, adjacent the front end of the guide 18.

By use of the apparatus herein described, the wire is straightened and continuously and effectively cleaned in a single pass, and is left in such condition that further cleaning is not required before surface inspection and shipment.

It will be understood that the embodiment of the invention shown in the drawing is merely one form of the invention, and that various modifications thereof are possible without departure from the spirit of the invention.

The term "wire" as used in this specification and in the appended claims includes elongated products of similar nature, for example, those referred to in the art as "rod."

I claim:

1. In a wire cleaning apparatus, means for advancing a wire to be cleaned including peripherally opposed rotating means in frictional driving engagement with the wire therebetween, means for directing a stream of liquid cleaning fluid against said wire as it moves between said rotating means to the point of engagement therewith, said rotating means having peripheral grooves forming wire engaging surfaces in rolling contact with substantially the entire wire periphery, whereby to spread the cleaning fluid around the wire and force the fluid into intimate contact with the surface of the wire, and a wiping gland arranged behind said rotating means in alignment therewith.

2. In an apparatus for removing processing lubricant from a wire or the like, wherein the lubricant on the wire is subjected to the action of a lubricant solvent and wiped therefrom by a wiper, the combination with said wiper, of a pair of feed rollers disposed ahead of the wiper for gripping the wire therebetween and pushing it through the wiper, said rollers having complementally grooved peripheries for frictionally engaging the wire substantially entirely around its periphery, and means for discharging the solvent at a predetermined rate in a stream upon the wire as it moves between said rollers, said rollers serving to spread the solvent and forcibly commingle it with the lubricant on the wire during said engagement therewith, whereby the lubricant remaining on the wire is dissolved and loosened for removal during passage of the wire through the wiper.

3. In an apparatus for cleaning lubricant coated wire and the like, the combination with an elevated tank containing liquid cleaning fluid, and a support for the tank, of a pair of opposed feed rollers rotatably mounted on said support below said tank, for gripping and advancing a wire therebetween in substantially a horizontal path, a wiper disposed in said path behind said rollers, the peripheries of said rollers being complementally grooved and engaging the wire substantially entirely around its periphery, a conduit leading from said tank and terminating above the wire in front of said rollers, for gravity discharge of the said fluid in a stream upon the wire as it moves between said rollers, and a valve controlling flow through said conduit, said feed rollers serving to spread the applied cleaning fluid and forcibly commingle it with the lubricant during said engagement with the wire, whereby the lubricant is dissolved and loosened for removal by said wiper as the wire is moved therethrough.

4. In an apparatus for cleaning lubricant coated wire and the like, in combination, an elevated tank for receiving liquid cleaning fluid, a support for the tank, a conduit leading from said tank, a valve controlling flow through said conduit, a pair of grooved rollers journalled on said support below said tank in vertically opposed

relation for movement of a wire therebetween, said conduit terminating directly above the wire in front of said rollers for discharging the cleaning fluid upon the wire in a stream as it moves between said rollers, said rollers having rolling engagement with substantially the entire wire periphery, whereby the applied cleaning fluid is spread upon the wire and the lubricant thereon loosened for removal as the wire emerges from between said rollers, a wiping device disposed behind said rollers for wiping the emerging wire, a drip pan carried by said support and disposed under said rollers and said wiping device in position to receive the fluid and lubricant removed from the wire, a drain conduit extending downwardly from said drip pan, and a movable receptacle into which the fluid discharging from said drain conduit is collected for re-use in said elevated tank.

5. The combination with horizontal wire receiving means having a horizontal elongated wire guide associated therewith, of a pair of grooved feed rollers rotatably mounted in vertically opposed relation adjacent one end of said guide for moving a wire therebetween onto said guide for discharge therefrom onto said receiving means, means for applying a lubricant solvent by gravity to said wire as it moves between said rollers, the grooves of said rollers substantially completely encircling said wire and having frictional engagement therewith so as to spread the applied solvent around the wire and loosen the lubricant on the wire during said engagement with the rollers, and a wiping device interposed between said guide and said rollers in alignment therewith to wipe solvent and lubricant from the wire before it is received by said guide.

6. In an apparatus for removing processing lubricant from a wire or the like, wherein the lubricant on the wire is subjected to the action of a lubricant solvent and wiped therefrom by a wiper, the combination with said wiper, of a pair of feed rollers disposed ahead of the wiper for gripping the wire therebetween and pushing it through the wiper, said rollers having complementally grooved peripheries for frictionally engaging the wire substantially entirely around its periphery, and means for discharging the solvent at a predetermined rate in a stream upon the wire as it moves between said rollers, said rollers serving to spread the solvent and forcibly commingle it with the lubricant on the wire during said engagement therewith, whereby the lubricant remaining on the wire is dissolved and loosened for removal during passage of the wire through the wiper, said feed rollers being provided with fiber peripheries for engaging the wire when wire of approximately $\frac{5}{8}$'' diameter or less is being cleaned, to eliminate marking of the surface of the wire.

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