United States Patent

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[54] **WIRE CLEANING MEANS AND METHOD**
6 Claims, 2 Drawing Figs.

[52] **U.S. Cl.** **72/39,** 72/274
[51] **Int. Cl.** **B21c 43/00,** B21c 1/00
[50] **Field of Search** 15/302, 303; 72/38, 39, 41, 274; 134/9, 15, 64, 122

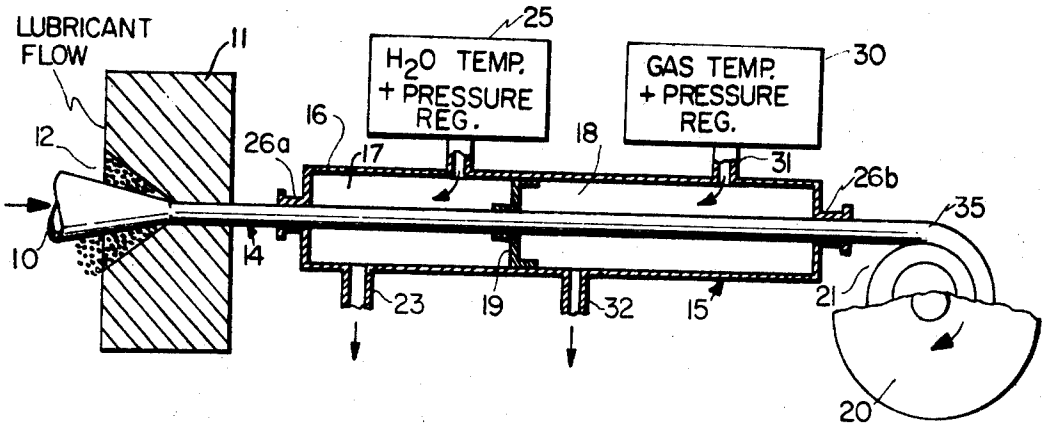
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ABSTRACT: A wire drawing process includes a liquid cleaner station and gas drier station on stream between a lubricating die and spooling reel. Liquid and gas are passed upstream in a tubing to a common outlet, and serve to cool and temper the wire by relative temperatures of the wire at the die, the liquid and the air stations. Concentric pipes with the inner one perforated and enveloping the wire are provided with a barrier between contiguous liquid and gas stations.



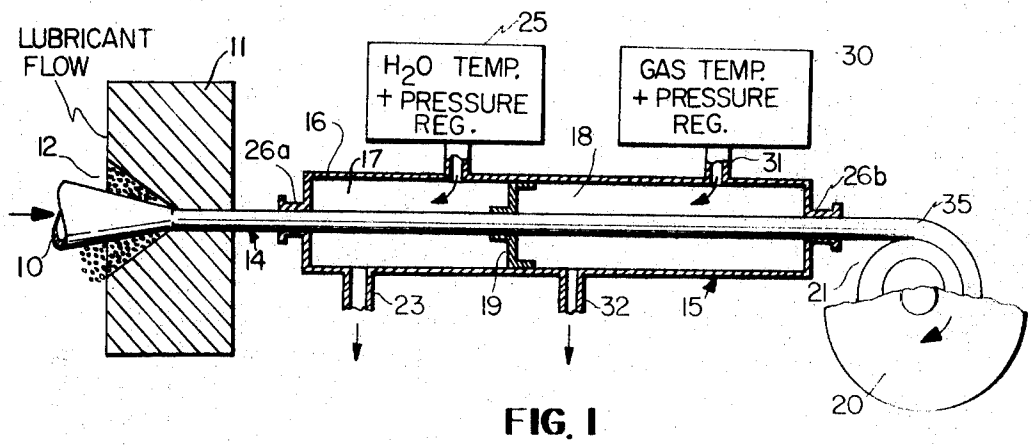


FIG. 1

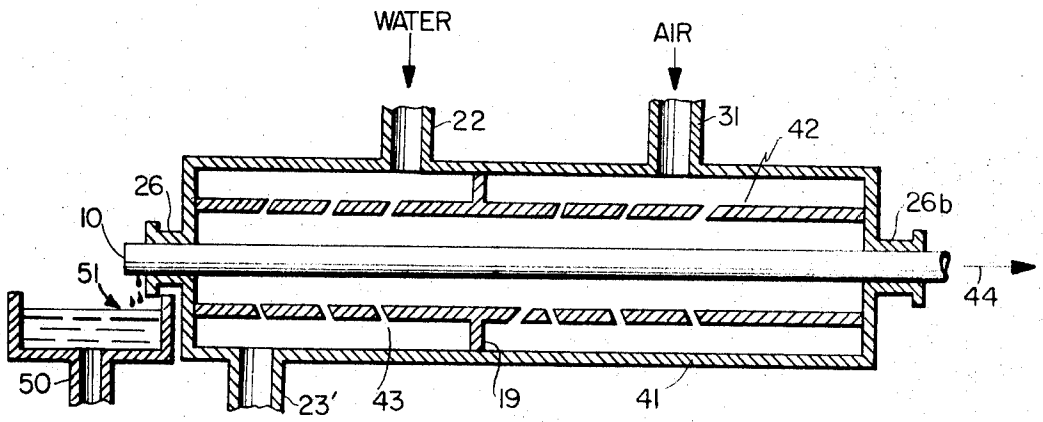


FIG. 2

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WIRE CLEANING MEANS AND METHOD

This invention relates to processes and apparatus for drawing wire, and more particularly, it relates to the die forming, cleaning, tempering and reeling of wire in a continuous on stream operation.

There are several requirements in the processing and drawing of wires, particularly those of hard metals such as nickel and tungsten. A lubricant is required to aid the drawing of such wires through dies, and when the wire is drawn, it is generally desirable to remove the lubricant by washing or processing. Also, the wire is heated by the drawing and the cooling process should be controlled to give proper temperature and crystalline structure to the wire. It has been customary in the art to process wire from the die onto a reel or spool and then to perform various cleaning, tempering and rewinding operations. If a reel or spool of wire is cleaned in bulk, it takes a long time and it is difficult to assure complete cleansing. The same is true of tempering. Rereeling processes are expensive and bulk processes are unsatisfactory.

A general object of the invention is to improve wire processing and eliminate the foregoing objections.

It is an object of the present invention to simplify the wire cleaning, tempering and winding process.

It is a further object of the invention to provide processes and apparatus for improving the cleaning of bare die formed wires of hard metals.

Another object of the invention is to provide on-stream controls for producing a finished wire, properly cleaned and tempered.

Thus, in accordance with the invention an on stream drawing, cleaning, tempering and reeling process is provided with introduction of contiguous cleaning and drying chambers about the wire as it is drawn from the die, with provisions for controlling the cooling rate of the wire.

The foregoing and additional features and objectives are found throughout the following description which refers to specific embodiments set forth in the accompanying drawings, wherein:

FIG. 1 is a schematic view, partly in section, of an on stream wire processing system, and

FIG. 2 is an elevation view in cross section of an embodiment of the invention for cleaning and tempering wire on stream as it emerges from a die.

As may be seen in FIG. 1, when a wire **10** is drawn through a reducing die **11**, some lubricant such as soap powder **12** is used. This leaves the surface of the wire as it emerges at **14** from the die with a lubricant film which should be removed to avoid contamination and discoloring. Also, the wire at this point is hot and is cooled off after emergence from the die.

In order to provide both cleaning and cooling, the apparatus **15** is provided comprising a jacket **16** divided into two sections **17** and **18** and separated by a barrier **19**. This apparatus **15** is located between die **11** and a takeup reel **20** upon which the wire is wound onto coil **21**.

In section **17** a cleaner such as water is forced through inlet pipe **22** to pass upstream against the movement of wire **10** to an outlet pipe **23**. This serves to wash and clean the lubricant from the surface of the wire, and the source **25** provides for proper control of temperature and pressure to permit the appropriate cleaning of the wire on stream. Generally, the water is heated to a predetermined temperature at this stage lower than the wire temperature. By processing the water upstream not only is the cleaner water effective on a partially cleaned wire at the inlet pipe **22**, but the water temperature may be raised at the outlet pipe **23** where he water is dirty and meets the uncleaned wire passing through entry bearing **26**, which might be carbide collar just passing the appropriate wire diameter, for example.

Similarly, source **30** may pass gas or air through inlet pipe **31** upstream against the travel of wire **10** and out outlet pipe **32** if the chamber **18** is closed, the air will pass through the

barrier collars. This is generally dried air to scavenge the moisture or liquid from the wire entering section **18** after passing through washing section **17**. Also, the temperature of the gas is preferably predetermined to provide adequate cooling and further drying so that the wire portion **35** emerging from apparatus **15** may be rolled on spool **20** without further processing, winding, or cleaning and without contamination or discoloring from the lubricant **12**.

A different embodiment is shown in Figure 2 where outer and inner concentric jackets **41**, **42** are provided to permit gas and water to pass through apertures **43** in the inner jacket **42**, which apertures **43** are disposed at an angle to provide a force component upstream toward the die as represented by arrow **44** showing the movement direction of wire **10**.

In this embodiment the gas may travel upstream and be discharged from a common pipe **23'**. The apertures **43** serve to direct forced streams of water and air against wire **10** to provide a knifelike scrubbing or scraping action. The input bearing **26A** need not be watertight and an auxiliary drainage pipe **50** serves to remove any escaping water **51**.

It is evident from the foregoing that novel and useful process and apparatus for processing wire is provided, and those features of novelty believed descriptive of the spirit and nature of the invention are defined with particularity in the appended claims.

What I claim is:

1. The method of drawing wire comprising in combination the steps of, moving wire through a die for reducing wire diameter and including the introduction of a lubricant about the wire, washing the lubricant from the moving wire by passing a liquid of controlled temperature and pressure into a downstream location at such an angle that it passes upstream along a length of wire through a washing chamber positioned to receive the wire as it emerges from the die in heated and lubricated condition, removing the liquid moving alongside the wire at an upstream location far enough away from the inlet to cause the liquid to pass along the wire and carry the lubricant therefrom upstream, drying the wire by forcing a drying gas into a position downstream along a length of the wire under controlled inlet pressure and temperature through a drying chamber positioned contiguous to said washing chamber to receive the wet wire therefrom, removing he gas and liquid absorbed thereby from the wire at an upstream location far enough away to cause the gas to remove substantially all the moisture on the wire, and locating the discharge port for said liquid and gas from said chambers at an upstream position near the entrance of the wire into said chambers thereby causing the wire to enter the chamber in heated condition from the die so that the liquid is heated by said wire as it passes along the length of the wire.

2. A wire drawing system producing cleaned and reeled wire of reduced diameter after it is drawn through a die which deposits on the wire a lubricant film, comprising in combination, a jacket surrounding the wire and containing two contiguous portions each encompassing a length of the wire, said jacket being located to receive the wire in heated condition as it emerges from the die, cleansing means for passing liquid alongside the wire in the upstream portion of said jacket from an inlet position downstream through a discharge position upstream after the liquid has flowed alongside the wire far enough to become dirty with the lubricants removed from the wire and to become heated from the wire, drying means for passing a drying gas into the downstream portion of said jacket at a downstream inlet so that the gas passes alongside the wire and removes substantially all the liquid therefrom remaining from said upstream liquid flow before discharging at an upstream outlet in said jacket, and means for reeling the dried and cleaned reduced wire as it emerges from the jacket without further cleansing or drying.

3. Cleansing apparatus for locating about a wire emerging from a die as it is being reduced to cleanse therefrom the lubricant adhering to the wire, comprising in combination, a jacket having two contiguous compartments and apertures at op-

posite ends thereof to receive the reduced wire and pass it through the jacket in a single downstream direction, an inlet in the upstream compartment of said jacket at a downstream position of the jacket compartment adapted to receive cleansing liquid for removing said lubricant and retaining the liquid about said wire throughout a substantial length of the wire within the compartment, an outlet for discharge of said liquid at the upstream end of said jacket compartment far enough removed from the inlet to cause the liquid to flow upstream alongside the wire for a substantial distance to thereby gather lubricant from said wire at different locations along the wire, an inlet in the downstream end of the jacket adapted to receive and confine about said wire a drying gas and an outlet for removing said gas at an upstream location far enough removed from the gas inlet to cause the gas to flow alongside

the wire a substantial distance to thereby substantially clean all liquid residues from said wire remaining after passing through the upstream compartment of the jacket.

4. Cleansing apparatus as defined in claim 3, wherein said two contiguous compartments have a common discharge outlet near the upstream terminal of said jacket.

5. Cleansing apparatus as defined in claim 3, wherein said jacket has an outer chamber and an inner chamber each concentrically surrounding the path of movement of the wire and slanted apertures communicating between said outer and inner chambers.

6. Cleansing apparatus as defined in claim 5, including a common discharge outlet near the upstream terminal of said jacket.