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METHOD OF MAKING AND CONTROLLING A LUBRICATING COMPOUND

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FIG. 1

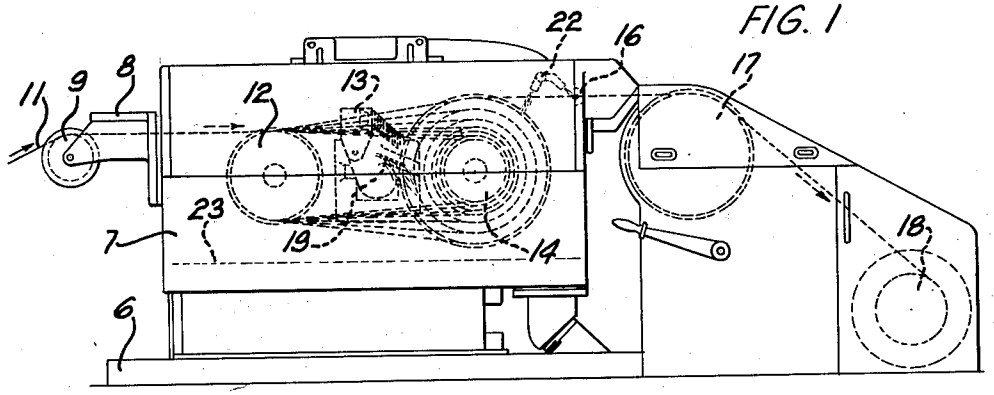
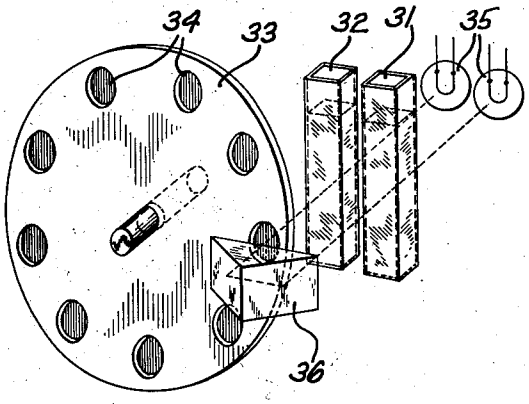


FIG. 2



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METHOD OF MAKING AND CONTROLLING A LUBRICATING COMPOUND

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4 Claims. (Cl. 87—9)

This invention relates to a method of making and controlling a lubricating compound and more particularly to a method of making and controlling a wire drawing compound.

In wire drawing machines in which the wire is drawn by capstans through a series of dies, all of the capstans, except the last one, are in some instances driven to have normally a peripheral speed slightly greater than the speed of the wire so as to insure that at all times the peripheral speed will be at least as great as that of the wire in order to avoid breakage of the wire. With the peripheral speed of the capstans greater than the speed of the wire, it is apparent that the friction between the capstans and the wire should have a value within definite limits to apply a predetermined tension to the wire at each capstan and for each die. Wire drawing compounds must, therefore, be of such a character as to provide the proper degree of friction between the capstans and the wire and at the same time they must provide lubrication for the capstans and dies and carry off the heat generated in the dies and on the capstans.

Objects of the invention are to provide an efficient and effective lubricating compound and method of controlling the compound.

In accordance with one embodiment of the invention, a wire drawing compound is made by compounding about 4.5 parts of fat consisting of tallow and rapeseed oil with about 0.5 parts of soap, and about 95 parts of water. This compound is passed through a colloid mill to assist in the dispersion of the fat. During the use of the compound, the character of the compound is maintained by making fat, soap and hydrogen ion or pH value determinations and correcting these factors when they vary from standard limits.

It is believed that a complete understanding of the invention may be had by reference to the following description taken in conjunction with the accompanying drawing, wherein

Fig. 1 is a schematic side elevation of a standard wire drawing machine, and

Fig. 2 is a schematic perspective view of a device for measuring the hydrogen ion concentration or pH value of a wire drawing compound.

Referring now more in particular to Fig. 1 of the drawing, a wire drawing machine is shown having a base 6 on which an enclosure or container 7 is mounted. The container 7 has a bracket 8 upon which a sheave 9 is mounted for guiding a wire 11 into the machine. The wire passes over a sheave 12 having a plurality of circumferential grooves and through one of the dies in a die housing 13. From the first die, the wire passes over the smallest sheave of a capstan 14 mounted upon a shaft on which a series of sheaves of graded sizes are mounted and interconnected. The wire may make one or more turns around each sheave. From the first sheave the wire passes to a second groove on sheave 12, through a second die, and to a larger sheave of the capstan 14. The second sheave of the capstan is larger than the first to compensate for the elongation of the wire as it is drawn through the die. In the same manner the wire passes through a plurality of dies and the size of the sheaves of the capstan 14 are so arranged that each sheave will have a slightly higher peripheral speed than the wire passing thereover, so that even though one of the dies should become enlarged from wear and, therefore, not produce the same elongation of the wire, the peripheral speed of the sheave will never be slower than the speed of the wire. From the last sheave of the group 14 the wire passes through a die 16 in the wall of the container 7 and over a capstan 17. The wire preferably makes several loops over the capstan 17 and a takeup reel 18 applies sufficient tension to the wire so that there will be no slippage of the wire on capstan 17.

In order to provide the proper amount of friction between the wire and the capstan 14, the sheaves are sprayed with the wire drawing compound. For this purpose the die housing 13 is provided with a plurality of nozzles 19, each of which directs a stream of the compound upon one of the sheaves of the capstan 14, and above the capstan 14 a tube 22 is provided axially of the capstan and having a plurality of nozzles for directing another stream of lubricant against each of the sheaves of the capstan. The die housing 13 is also provided with a plurality of nozzles (not shown) for directing a stream of the wire drawing compound against each of the dies to lubricate the wire and dies and to carry away the particles abraded from the wire and the heat generated in the die. The lubricant is pumped from a storage tank (not shown) into the die housing 13 and tube 22 and, after passing over the dies and capstan, accumulates in the bottom of the container 7 approximately to a level 23 from where it drains back to the storage tank.

Numerous attempts have been made to obtain uniform results from wire drawing compounds. It has been found that a large portion of the lubricating action of a wire drawing compound is due to the inactive or insoluble soap content of

the compound. However, unless the compound has a sufficiently high active or soluble soap content, the inactive or insoluble soap will collect on the capstans and in the dies, together with fat and metallic dust abraded from the wire, causing a clogging of the dies, which results in scoring of the wire or produces an effect known as "sucking" in the wire drawing art, and consists in forming an undersize wire. For this reason it is important to maintain the active soap content within certain limits. It has been found that the active soap content is proportional to the hydrogen ion concentration or pH value of the compound. When a wire drawing compound is first made up, practically all of the soap entering the compound is active or soluble soap. For this reason the soap content is made low in a new compound so that the fat of the compound will not be too highly dispersed to effectively lubricate the dies and capstans. After the compound has been used for a period of about three hours, the inactive or insoluble soap content increases. The inactive soap content may increase from a very low value when the compound is made up to a high value after it has been used from several months to a year. Experiments have shown that very uniform results may be obtained by maintaining the active soap content or hydrogen ion concentration of the compound within certain limits, provided that other factors which may be readily determined are kept under control.

In compounding a wire drawing compound in accordance with this invention, about 4.5 parts of fat, which may consist of approximately one-third rapeseed oil and two-thirds tallow, is mixed with about 0.5 parts of soap and 95 parts of water. The water is first heated and the soap is dissolved therein by the direct injection of live steam. The tallow and rapeseed oil are then added and the mixture is boiled until all the fat is melted and is then held at a temperature of 180° F. for about 12 hours. The mixture is then circulated through a colloid mill and the emulsified mixture is ready for use in the wire drawing machine.

Due to the fact that some of the soluble soap is converted to insoluble soap and some of the ingredients are carried out with the wire being drawn or deposited as a sludge with fine particles of metallic dust abraded from the wire being drawn, it is evident that the mixture will undergo changes. The fat content of the compound should be determined at intervals by taking a sample of the compound and adding sulphuric acid and water thereto. The fat content of the sample may then be determined by means of a Babcock centrifugal testing apparatus. Since the sulphuric acid breaks down the fat of the soap, this test is supplemented by subtracting the soap content from this value to obtain the true fat content. The soap content may be determined by taking a sample of the compound and adding a small quantity of methyl orange indicator. The sample with the indicator is then titrated with a standard hydrochloric acid solution to determine the soap content of the solution by the quantity of acid necessary to affect the indicator. If the true fat content is found to be deficient, additional fat is added to the compound.

In order to maintain the hydrogen ion concentration or pH value of the compound, about five cubic centimeters of the compound are taken at the wire drawing apparatus and due to the fact that this compound has a high degree of turbidity, it is mixed with 100 cubic centimeters of distilled water to clarify the mixture. After a thorough mixing, about 10 cubic centimeters of the diluted compound are poured into a tube **31** and about 0.5 cubic centimeters of thymol blue indicator are added for a pH range of 8.0 to 9.6, or phenol red indicator for a range of 6.8 to 8.4. A similar quantity of the diluted compound is then poured into a container **32** without any indicator. The tubes **31** and **32** are placed behind a rotatably mounted disc **33**, which has a plurality of colored lenses **34** mounted therein arranged in graduated colors. Behind the tubes **31** and **32** is a pair of lamps **35**, the light of each of which passes through one of the tubes **31** and **32** and the light through the tube **32** then passes through one of the lenses in the disc onto a prism **36**. The light through the tube **31** falls directly on the prism **36** and the prism brings the color fields into juxtaposition so that they may be readily compared. The disc **33** is rotated until a lens is in alignment with the prism, which gives a color which is similar to the color from the tube **31** falling directly on the prism. Each of the lenses in the disc is given a number corresponding to a given pH value so that this value may be read directly from the lens, which gives the correct color in the prism. It has been found that the pH value of approximately 8 to 9 is best suited for wire drawing compounds for drawing copper wire. When the pH value falls below 8, the active soap content is too low and additional soap is added to correct this factor. The addition of the water to the lubricant decreases the pH value of the reading by about 0.2 of a point. This error may be corrected by recalibrating a standard instrument of the type disclosed or the correction of 0.2 may be added to the reading of a standard instrument.

Instruments of the type described and other types for the same purpose may be purchased on the market and a more detailed description thereof is not believed to be necessary.

By reason of the discovery that the active soap content of the wire drawing compound is an extremely important factor in maintaining the operating characteristics of the compound, it has become possible to effectively control the compound.

It will be understood that the nature and embodiment of the invention herein described and illustrated is merely illustrative of the invention and that many changes and modifications may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. A method of drawing wire which comprises compounding a soap, fat and water emulsion to produce a lubricating compound having a pH value within definite predetermined limits for drawing wire through a die lubricated by said compound, at intervals withdrawing a sample of the compound, adding water to the sample to clarify the compound, dividing the clarified compound into two portions, adding an indicator to one of the portions, and making a color test to determine the pH content of the compound.

2. A method of drawing wire which comprises compounding an emulsion containing fat, soap, and water drawing wire through a die lubricated by said compound, determining the true fat content of the compound and adding fat accordingly, and determining the pH value of the compound

and adding soap to maintain said value within predetermined limits.

3. A method of drawing wire, which comprises compounding a soap, fat and water emulsion to produce a lubricating compound having a pH value within definite predetermined limits, drawing wire through a die lubricated by said compound, at intervals measuring the pH value of said compound and adding soap to maintain the pH value thereof within said limits.

4. A method of drawing wire, which comprises compounding a soap, fat and water emulsion to produce a lubricating compound having a pH value between about 8 and 9, drawing wire through a die lubricated by said compound, at intervals measuring the pH value of said compound and adding soap to maintain the pH value thereof within said limits.

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