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## LUBRICATING MIXTURES FOR COLD REDUCING MILLS

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5 Claims. (Cl. 80—60)

The present invention relates in general to improvements in the art of cold reducing metals such as exemplified in the patent granted to Edwin T. Lorig, Patent No. 1,973,684, issued September 11, 1934. In the said Lorig patent, there is disclosed a process for cold reducing metal, especially in rolling thin, wide strips of steel on a 4-high mill, the said patent disclosing the broad idea of dissipating the heat by the application of a water and oil mixture, which mixture also serves to lubricate the material being rolled in its pass through the apparatus.

The present invention is a further improvement of the invention claimed in my companion application, Serial No. 290,312, filed on even date herewith, and relates to certain specific improvements over the Lorig invention, as pointed out in detail in the following specification and in the subjoined claims.

In accordance with the present invention, instead of applying water alone, or a mixture of water and engine oil, I utilize, as a combined lubricant and coolant, a mixture of palm oil, soluble oil and water, which is preferably emulsified so that the mixture does not break down during the rolling operation. The present invention overcomes problems due to the entry of mineral oil into lubricant and coolant, this mineral oil coming from leakage of the mill lubricating system and also being carried by the material being rolled, which material is frequently coated with mineral oil for the prevention of rust or corrosion.

In practice it was found that the addition of mineral oil was detrimental as it did not readily enter into suspension with other oils, thus the mixture became unduly thick, causing clogging of the filter screens and other parts of the spraying system. In my research, to overcome the difficulties inherent in the use of solutions employing mineral oil, engine oil and the like, I discovered that by utilizing mixture of palm oil, soluble oil and water, totally unexpected and unobvious results were secured without the disadvantage of clogging the circulating system, even when the palm oil, soluble oil and water mixture became somewhat contaminated with the lubricating oil or other mineral oil.

I have determined that for most efficient results, the combined lubricant and coolant should contain from 1 to 39 per cent palm oil, from 1 to 39 per cent soluble oil, and the balance water to make 100 per cent. While any mixture within this range will give good results when the mixture does not attain a temperature below 40 degrees Fahrenheit or above 212 degrees Fahrenheit, I find that for most effective results, it is desirable to employ a mixture of approximately 10 per cent palm oil, 10 per cent soluble oil, and the balance water to make 100 per cent. The optimum temperature of the mixture for most rolling operations is approximately 125 degrees Fahrenheit.

In practice, the solution or liquid mixture is sprayed through nozzles against the surface of the working rolls and on the surface of the strip being rolled, pressure being applied by centrifugal or other pumps driven by variable speed motors. The solution, as it drips from the rolls and the work, is collected in a sump wherein the temperature is controlled as desired by a suitable heat exchanger, the solution or mixture being pumped from the sump into the circulating system, sprayed on the rolls and surface of the strip being reduced, and the excess mixture being returned again to the sump. Practice has shown that under the present invention, by utilizing a solution of palm oil, soluble oil and water, the following advantages accrue: The cost of the solution is reduced by approximately 95%; the individual mill loads are appreciably lowered; a definite roll contour can be maintained; the mill can be operated under a uniform screw pressure, regardless of the degree of hardness of the metal being reduced, by controlling the oil content of the rolling solution; a more desirable strip shape is obtained due to the fact that the reducing members are cooled and lubricated as desired; material reduced in the improved solution is more easily cleaned preparatory to annealing; due to the uniform pressures exerted on the working members, it is possible to maintain a materially better surface condition of the working rolls, thus prolonging their life; the material is more accurately rolled to the desired gage; strip breakage such as heretofore caused by non-uniformity of solution is practically eliminated, and other ingredients which seep in, such as lubricating oil and oil carried by the strip as a rust preventative, are readily carried into suspension with the solution without detrimentally affecting its ability to serve its intended functions as herein set forth.

In practice, the ingredients of the solution may be emulsified by the use of either a mechanical homogenizer or by the use of a chemical emulsifier. Alternatively, the emulsification can be obtained by mechanical agitation. The latter can be accomplished in a separate agitating step or the constant interaction of the rolls of the

mill with the strip being rolled can be relied upon for homogenization of the ingredients of the mixture.

Having above described the invention and the advantageous features which distinguish it from the prior art, what I claim is:

1. The method of cold reducing metals which comprises lubricating and controlling the temperature of the reducing members by applying to the working surface thereof a liquid medium composed of an emulsified mixture of from 1 to 39 per cent palm oil, from 1 to 39 per cent soluble oil and the balance water to make 100 per cent.

2. The method of cold reducing metals which comprises lubricating and controlling the temperature of the reducing members by applying to the working surface thereof a liquid medium composed of an emulsified mixture of approximately 10 per cent palm oil, 10 per cent soluble oil and 80 per cent water.

3. The method of cold reducing metals which comprises lubricating and controlling the temperature of the reducing members by applying to the working surface thereof a liquid medium composed of an emulsified mixture of approximately 10 per cent palm oil, 10 per cent soluble oil and 80 per cent water at a temperature of approximately 125 degrees F.

4. A solution for controlling the temperature of reducing members of a cold reduction apparatus and for lubricating the metal being reduced, comprising an emulsified mixture of approximately 1 to 39 per cent palm oil, 1 to 39 per cent soluble oil, and the balance water to make 100 per cent.

5. A solution for controlling the temperature of reducing members of a cold reduction apparatus and for lubricating the metal being reduced, comprising an emulsified mixture of approximately 10 per cent palm oil, 10 per cent soluble oil and 80 per cent water.

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