

June 29 , 1926.

1,590,638

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CONTROLLING THE TEMPERATURE OF RUBBER WORKING ROLLS

Filed May 8 , 1924

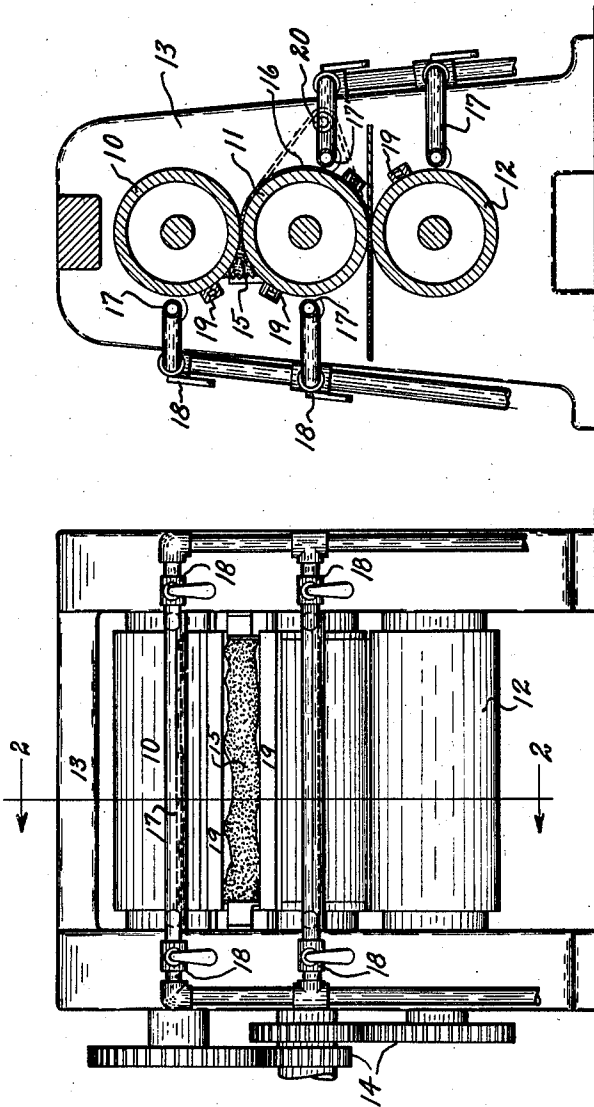


Fig. 2.

Fig. 1.

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Patented June 29, 1926.

1,590,638

UNITED STATES PATENT OFFICE.

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CONTROLLING THE TEMPERATURE OF RUBBER-WORKING ROLLS.

Application filed May 8, 1924. Serial No. 711,938.

This invention relates to the working or rolling of plastic material such as rubber, and has for its object the control by rapidly responsive means of the temperature of the rolls by which the rubber is worked or sheeted.

Referring now to the drawings, in which the invention is shown as applied to a calender for sheeting rubber stock,

Fig. 1 is a front elevation of a calender embodying the invention; and

Fig. 2 is a section thereof on line 2—2 of Fig. 1.

In the working of plastic material such as rubber, and particularly in the calendering of rubber to produce either sheeted rubber or rubber-coated fabric, it has been customary to regulate the temperature of the rolls by admitting hot or cold water into their hollow interior. Due to the heavy pressure to which these rolls are subjected in use, it is necessary that they be made strong and the thickness of the roll walls thus required slows down the transmission of heat from the interior to the exterior of the rolls. Especially when it is desired to control the temperature of the rolls by automatic devices, this time lag causes wide variations in the actual temperature of the working surfaces of the rolls. For example, suppose that due to a temporary cause the rolls become overheated on their surfaces. To correct this cooling water is admitted to their interiors. In rolls of the usual thickness the effect of this water may not appear at the roll surface for several minutes, by which time the temporary cause of heating may have disappeared. As soon as the roll surfaces have dropped to the proper temperature the supply of cooling water is shut off or decreased, but the cooled interiors of the rolls continue to exert a cooling action on the exteriors for some time, thereby reducing the temperature of the working surfaces below what is desired.

In hand controlled machinery of this type it is possible for a skilled operator to judge the cause of the original fluctuation and vary the time of application of the internal water accordingly. This reduces the fluctuations to some extent. This difficulty has, however, practically prevented the use of automatic temperature controlling devices. By my invention control of the working sur-

faces of the rolls is made practically instantaneous, and the use of automatic control devices is made practical for the first time. The principle of my invention is the use of a spray of water or other cooling medium against the roll surfaces before they come into contact with the rubber. The water first cools the surface of the roll, the body of which is kept at a temperature slightly higher than that desired on its operative surface, by its lower temperature and then by the heat required to vaporize it. On account of the normal working temperature of the rolls being relatively high the water will evaporate so rapidly that the rubber will not be wet. This method of cooling may be used without any other temperature control, reliance being placed upon the heat generated by the working of the rubber to keep the rolls warm; but preferably it is used in conjunction with the usual internal circulation of water, the internal water being used to control the temperature roughly and the spray to keep the temperature of the roll surfaces constant.

In the drawings I have illustrated the application of the invention to a rubber working calender of the usual type, having three stacked rolls 10, 11 and 12, carried by a frame 13 and connected by suitable gearing 14. Between the rolls 10 and 11 is placed the feed 15 of rubber which, by the action of the rolls, is formed into a sheet 16 which passes between rolls 11 and 12 to a suitable delivery point. Adjacent each roll is placed a pipe 17, perforated to eject a spray of water against its respective calender roll under the control of valves 18. Instead of spraying devices of this type the water may be directed against the rolls by atomizing devices of any usual type. As a precaution against the water on the roll not being vaporized entirely before reaching the rubber, wipers 19 may be placed against each roll at points beyond the spray.

The middle roll 11 is shown as being cooled by a spray located at the left in Fig. 2, acting to cool the roll before it contacts with the feed of rubber 15. If desired, in order to further regulate the roll temperature before nearing the lower roll, and as a substitute for or an addition to the first mentioned spray, a second spray pipe 17' may be placed at the right of the roll. The spray from

this pipe may act directly on the rubber itself, or may act on the roll surface, the rubber sheet being carried around it by passing over a roller 20.

- 5 A similar system of cooling may be applied to the mixing mills commonly used for breaking down or compounding rubber. In this case the water spray would be applied to the back roll—the one around which
10 the rubber stock does not pass during the mixing.

Having thus described my invention, I claim:—

- 15 1. A method of controlling the temperature of a roll for working plastic material, consisting in subjecting the surface of the roll to the action of a heat conducting medium in controlled amounts, and drying the roll prior to contact with the material.

- 20 2. A method of controlling the temperature of a roll for working plastic material, consisting in maintaining the roll at a temperature slightly higher than that desired, and locally cooling the surface of the roll to the desired degree prior to the contact

of the roll surface with the material to be worked.

3. A method of controlling the temperature of a roll for working plastic material, consisting in causing particles of water in
20 controlled quantities to contact with the roll during its rotation, and drying the roll prior to contact with the material.

4. A cooling device for a rubber working calender consisting of water spraying de-
35 vices located adjacent the calender rolls and directed against the surface of the rolls, means for controlling the quantity of water to be thus sprayed, and means for drying the rolls prior to contact with the material.
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5. In the manufacture of sheet like articles from a hot plastic material, the method of controlling the temperature of the sheeting rolls which consists in subjecting a
45 portion of the outside surfaces of the sheeting rolls to the action in controlled amounts of an agent adapted to absorb heat rapidly from the sheeting rolls.

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