

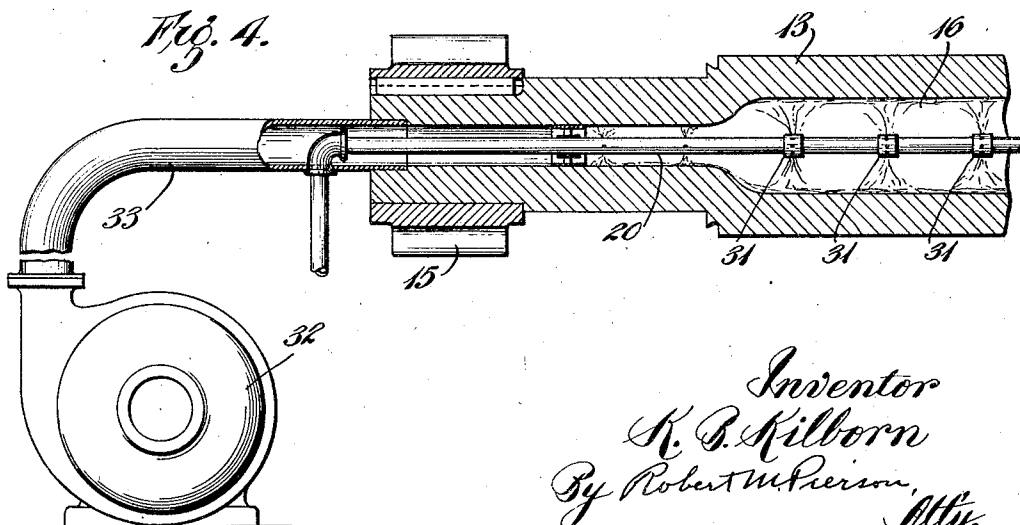
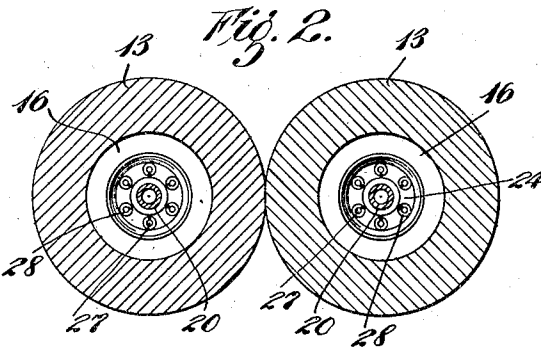
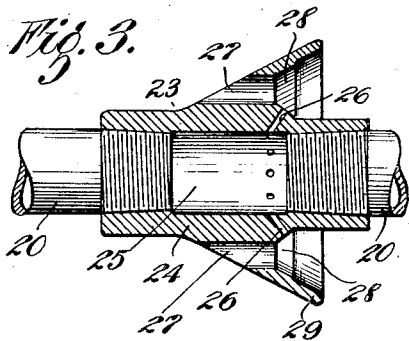
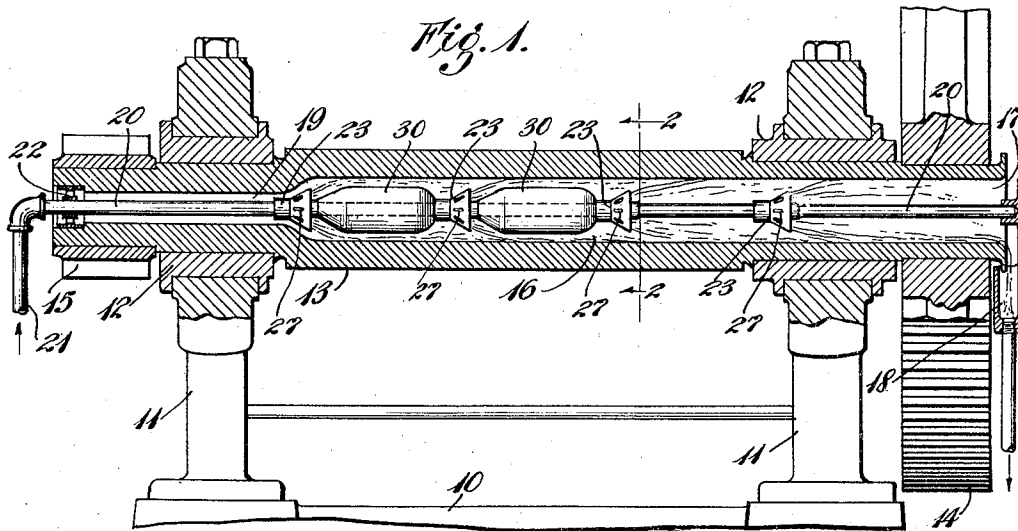
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MEANS FOR COOLING MILL ROLLS

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UNITED STATES PATENT OFFICE

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MEANS FOR COOLING MILL ROLLS

Application filed December 3, 1928. Serial No. 323,537.

This invention relates to means for cooling the hollow rolls of rubber-masticating and other mills by the action of water applied in a suitable manner, as by spraying it against the inner side of the roll walls. An example of such apparatus is shown in my co-pending application, Serial No. 313,239, filed Oct. 18, 1928. The object of my present invention is to assist in the evaporation of the water and its absorption of heat from the roll by the action of an air current, thereby enhancing the cooling effect and increasing the efficiency of the cooling system.

Of the accompanying drawings, Fig. 1 is a longitudinal section of a rubber mill having rolls provided with my improved cooling means.

Fig. 2 is a cross-section thereof on the line 2—2 of Fig. 1, on a larger scale.

Fig. 3 is a longitudinal section on a still larger scale showing one of the ejector-spray devices.

Fig. 4 is a longitudinal section and elevation showing a modification.

In the preferred mode of carrying my invention into effect, as shown in Figs. 1 to 3, I employ for each mill-roll one or more ejectors for spraying the water against the inner side of the roll walls, for mixing the spray with air, and for forcing an air current longitudinally through the roll to assist in evaporating the water. 10 is the mill frame having standards 11, 11 provided with bearings 12, 12 for supporting the masticating rolls 13, 13. The roll shown in Fig. 1 has affixed to its mouth end the large driven gear 14 for rotating the rolls, and to its other end a smaller gear 15 for mating with a complementary gear on the shaft of the other roll.

Each roll is hollowed out on its interior to form a central chamber 16 which has a discharge-mouth or outlet 17 of approximately the same diameter as the body of said chamber in order to avoid accumulation of a pool of water of any substantial depth on the floor of said chamber, whereby substantially the entire inner periphery of the roll walls is available for exposing a film of water to evaporation thereon, as set forth in my prior application, Serial No. 313,239, previously

referred to. Thus the roll walls are cooled by conduction of sensible heat to the water film which collects thereon, and also to a large extent by the latent heat of evaporation of said film and of the water spray fed thereto by the jet devices. The small stream of excess water discharged from the outlet 17 of the roll-chamber falls into a stationary trough 18 provided below said outlet and connected with a suitable drain-pipe. The roll-trunnion at the end opposite the outlet 17 is formed with a prolongation 19 of the chamber 16 which forms an air-inlet passage leading to said chamber. Axially mounted within and extending through the roll 13 is a water-spray pipe 20 having an inlet or supply portion 21 at its outer end and supported at its opposite end on the lip of the discharge trough 18. Said pipe may be supported in the air inlet 19 by a spider 22.

At suitable intervals along the pipe 20 are mounted ejector devices 23, the construction of one of which is shown in detail in Fig. 3 as consisting of a casting 24 which is centrally formed with a longitudinal through-aperture 25 into which sections of the pipe 20 are screwed, and is diagonally drilled from the bore 25 outwardly with a number of small water-spraying jet orifices 26 arranged in a circular series. Said casting is also longitudinally formed with a corresponding number of air-induction passages 27 having flared outlets 28 into which the jet openings 26 discharge, and is further provided with a splash-hood or baffle 29 against which a portion of the spreading water-jet from each of the outlets 26 may impinge to assist in the spraying action.

I have further shown sleeves 30 with tapered ends mounted upon the water-pipe 20 posterior to each of the first and second ejector devices 23, and extending between it and the next ejector device, to act as partial fillers or stream guides for reducing the free space within the chamber 16 and forming a relatively narrow channel adjacent the walls of said chamber for the passage of the mixture of air, water-spray, and water-vapor. Any suitable number of these sleeves could be employed adjacent the successive ejector de-

vices and they could be made to act as the water-pipe sections between said devices or could be omitted.

In the operation of this apparatus, the water jets from the openings 26 are slantingly discharged in spray form upon the walls of the chamber 16, and the water partially collects in a thin film which bathes said walls and abstracts the heat therefrom by conduction and evaporation, thus serving to keep the temperature of the roll at a point suitable for the working of the stock which is subjected to the action of the rolls. The evaporation and refrigerating effect is considerably enhanced by the intimate intermixture of the finely-divided water particles with the air supplied through the passages 27 of each ejector 23 and with the air passing around said ejector devices, as well as by the passage of the air current, induced by the action of these ejectors, over the film of water collecting on the walls of the chamber 16, said air current being thus forced through the roll and constantly renewed as fast as it becomes saturated with water-vapor. I am thus enabled to dispense with artificial pre-cooling of the water supply for the mill-rolls, which has heretofore been an item of considerable expense, to reduce the quantity of water employed for a given cooling effect and to dispense with any power for the cooling apparatus other than the head of a gravity supply or a pumped supply of water.

In the modification shown in Fig. 4, the inner side of the walls of a mill-roll 13 having an interior chamber 16 are cooled with a film of water from a series of radial-spraying jet devices 31 mounted on an axial water-pipe 20, and an air current is forced longitudinally through said chamber, with substantially the same evaporation effect as above described, by means of a fan blower 32 whose outlet-pipe 33 telescopes within the air-inlet passage 19 of said roll.

Various other modifications could be made without departing from the spirit of my invention as defined in the appended claims. For example, the air-current could be employed as described for evaporating a spray or film of water in the interior of an ordinary mill-roll having a free outlet of smaller diameter than the interior chamber, which retains a pool of water in the lower part of said chamber; in which case there would be an enhanced cooling effect as compared with the ordinary water injection employed with such rolls, though not as great an improvement as where the entire inner surface is exposed for evaporation as herein described.

I claim:

1. The method of cooling a heated, hollow mill-roll which comprises spraying water into the interior of said roll and forcing a current of slightly compressed air there-

through to assist in the evaporation of the water.

2. The method of cooling a heated, hollow mill-roll which comprises spraying water into the interior of said roll and propelling a current of air therethrough by means of the spraying action, to assist in the evaporation of the water.

3. The method of cooling a heated, hollow mill-roll which comprises supplying water in the form of a film to substantially the entire inner periphery of the roll walls, in relatively small excess over the evaporative capacity of said walls, and forcing a current of slightly compressed air longitudinally through the roll to assist the evaporation of said water film.

4. A mill-roll cooling apparatus comprising, in combination, a mill-roll formed with an interior chamber having a free outlet substantially as large in diameter as the chamber, means for spraying water into said chamber against the walls thereof, and an air inlet at the end of said chamber opposite said outlet.

5. A mill-roll cooling apparatus comprising, in combination, a hollow mill-roll, an air ejector on the interior of said roll having its outlet slantingly directed against the inner side of the roll-walls, a water-spray outlet included in said ejector, an air inlet to the ejector, a water pipe for supplying the ejector, and an air, water and vapor outlet from the roll.

In witness whereof I have hereunto set my hand this 30th day of November, 1928.

KARL B. KILBORN.