

June 3, 1952

B. OFFEN
CHILLING ROLL

2,599,346

Filed Nov. 5, 1947

2 SHEETS—SHEET 1

FIG. 1

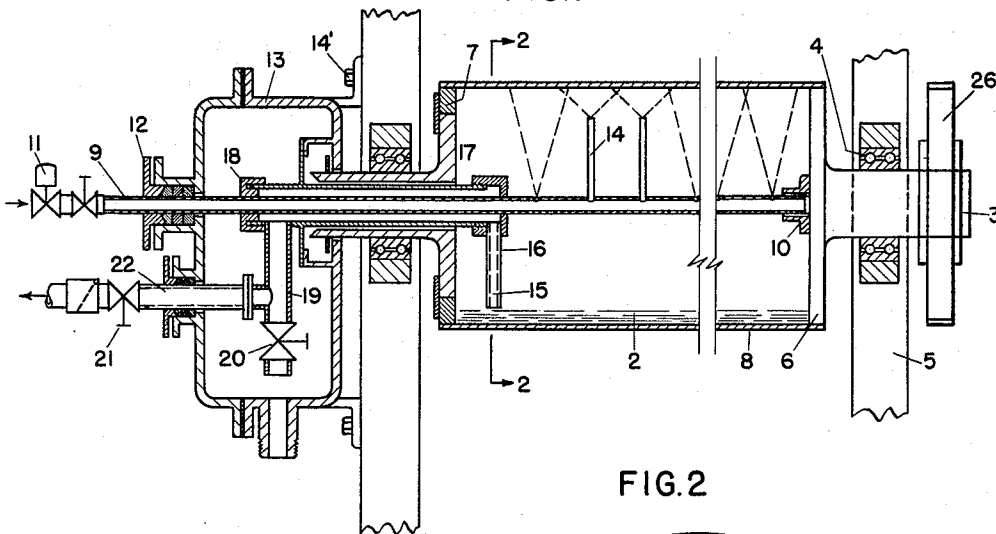


FIG. 2

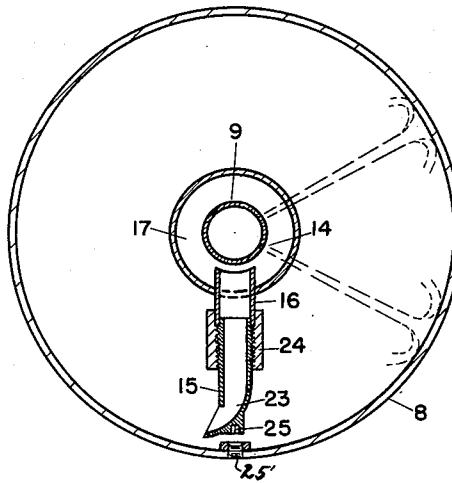
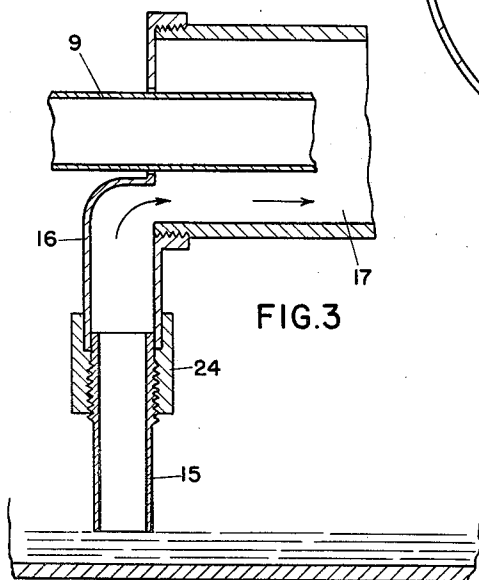
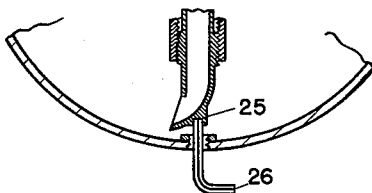


FIG. 4



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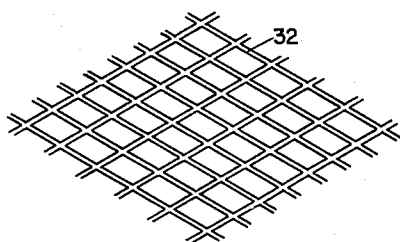
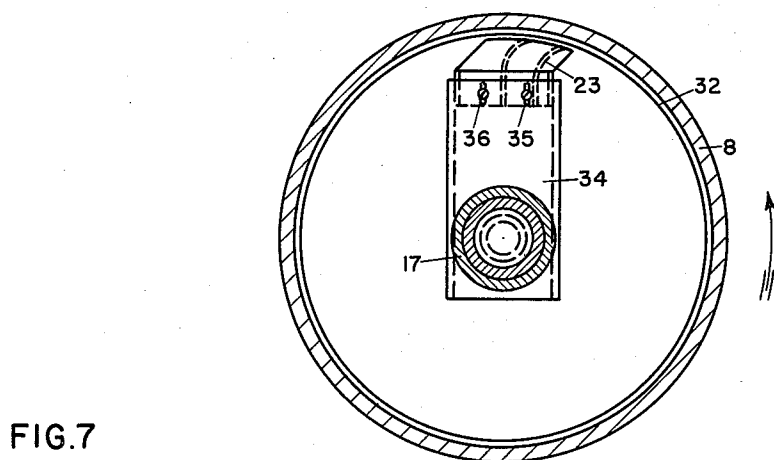
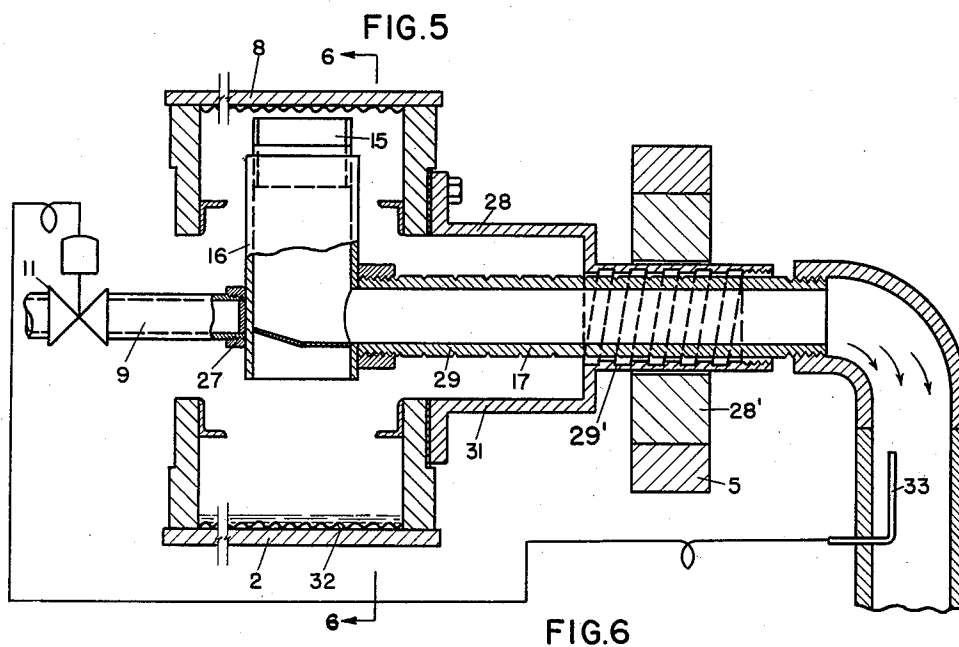
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2 SHEETS—SHEET 2



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CHILLING ROLL

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3 Claims. (Cl. 257—95)

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This invention relates to chilling or cooling rolls for drying equipment and, more particularly, to a chilling or cooling roll adapted to chill or cool a fibrous web after it has attained a predetermined temperature.

The chief object of the present invention is to provide a hollow chilling roll having a thin film of cooling medium therein permitting the mass of the roll to be greatly reduced thereby eliminating the necessity of driving the roll since the fibrous web passing thereover serves to rotate the roll and to discontinue its rotation.

An object of the present invention is to provide a chilling roll of novel design in which a predetermined film thickness of cooling medium such as water is maintained adjacent the interior wall of the roll.

A further object of the present invention is to provide a chilling roll having a scoop-like member adapted to remove cooling medium continuously from the interior of the wall to maintain a predetermined depth of continuously changing cooling medium adjacent the interior wall of the roll, and a member disposed adjacent such wall to agitate medium adjacent such surface thereby providing improved heat transfer.

A still further object is to provide a chilling roll in which means are provided to control the volume of cooling medium supplied to the roll in response to changes in temperature of medium leaving the roll.

A still further object is to provide a chilling roll including a scoop-like member adapted to remove cooling medium from the interior of the roll, such member being adjustable to vary the depth of cooling medium maintained adjacent the interior wall of the roll. Other objects of the invention will be readily perceived from the following description.

This invention relates to a chilling roll for cooling heated fibrous webs and comprises a rotatable hollow roll provided with means for supplying cooling medium within the interior thereof. A scoop-like member is disposed within the roll and serves to maintain a cooling medium film of predetermined depth adjacent the interior wall of the roll. The scoop-like member is connected to a discharge pipe to permit medium to be removed from the roll. Preferably, the scoop-like member is adjustable to permit the depth of the film to be varied. A turbolator member may be disposed adjacent the interior wall of the roll to overcome possible slippage of water thereagainst and to improve heat transfer. Control means may be provided to regulate the supply of cooling medium to the roll.

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The attached drawings illustrate preferred embodiments of my invention, in which

Figure 1 is a sectional view taken longitudinally of a chilling roll constructed in accordance with the present invention;

Figure 2 is a sectional view taken on the line 2—2 of Figure 1;

Figure 3 is a sectional view in exaggerated scale illustrating the scoop member;

Figure 4 is a diagrammatic view illustrating the manner in which the scoop member may be adjusted;

Figure 5 is a sectional view of a modification of the present invention;

Figure 6 is a sectional view taken on the line 6—6 of Figure 5; and

Figure 7 is a diagrammatic view illustrating the turbolator disposed adjacent the interior longitudinal wall of the roll.

Referring to the drawings, there is shown in Figure 1 the chilling roll 2 of the present invention having its spindles 3 mounted in suitable bearings 4 disposed in the frame 5 of the apparatus. Roll 2 is hollow and consists of end plates 6 and 7 connected by cylindrical wall 8 forming the cooling surface of the roll. As shown in Figure 1, end plate 7 is removable to permit the scoop member to be disposed within the interior of the roll.

A stationary supply pipe 9 for supply of cooling medium such as water to the interior of roll 2 extends through a spindle 3 into the interior of the roll and is supported in position at one end of the roll by a suitable bearing 10 mounted on end plate 6. The opposite end of pipe 9 may be supported by flanges 12 mounted on drain box 13 bolted as shown at 14 to the frame of the apparatus. A valve 11 is disposed in pipe 9 and may be actuated as hereinafter described to regulate the volume of water supplied to the interior of the roll. Nozzles 14 are provided in pipe 9 through which high velocity jets of water may be directed against the interior surface of wall 8.

Water is removed from the interior of the roll 2 through a scoop member 15 disposed in the interior of the roll adjacent wall 8 and supported by pipe 16 threadedly connected to discharge pipe 17. Discharge pipe 17 passes through spindle 3, surrounding pipe 9 so that leaving water flows within pipe 17 and exteriorly of pipe 9. Pipe 17 is capped at 18 to direct leaving water through pipe 19 to drain box 13 from which it may be discharged to a sump or sewer. It will be appreciated pipe 9 passes through the capped portion 18, the purpose of the capped portion being to close the end of

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discharge pipe 17. If desired, as shown in Figure 1, water in pipe 19 may be maintained under pressure by means of valve 20 disposed in pipe 19 and check valve 21 disposed in pipe 22 connected to pipe 19.

As shown in Figures 2 and 3 scoop member 15 is adjustable. Member 15 includes a scoop portion 23 threadedly connected to a collar 24 secured to pipe 16. Preferably, a set screw 25' is provided in wall 8 of roll 2 adjacent the position of the scoop portion 23. Thus, when it is desired to adjust the water thickness in the roll the scoop portion may be moved toward or from wall 8. As shown in Figures 2 and 4, scoop portion 23 may be provided with a socket 25 for the reception of a key 26. Removal of set screw 25 permits insertion of key 26 within socket 25 for desired adjustment of scoop portion 23. It will be appreciated other forms of scoops may be employed and other means may be provided if desired to render the scoop adjustable to vary the depth of the film of water maintained adjacent wall 8.

In operation, roll 2 is rotated by means of the heated fibrous web passing thereover at a speed within the range of 100 to 1200 feet per minute. At such speed, water discharged within the roll is thrown against the interior surface of wall 8 due to centrifugal forces. As the water is carried around on such surface, scoop 15 scrapes off the water from the surface and causes such leaving water to flow through pipe 16 into discharge pipe 17 and then into pipe 19 to drain box 13 thereby removing water from the roll. Scoop 15 may be adjusted as described above to regulate the thickness of film maintained within the roll. Preferably, such film so maintained may vary in depth between $\frac{1}{8}$ " to $\frac{1}{2}$ ".

Scoop 15 is shown in a vertical position. The scoop, if desired, may be placed in a horizontal position or in any desired intermediate position and satisfactory results may be achieved.

Supplemental means may be employed for driving the chilling roll if desired, and I have indicated such means by placing a gear 26' (shown in dotted outline) on the spindle 3 of roll 2. As stated above, such supplemental equipment is not necessary due to the light weight of the present construction, but it may be employed if desired.

In Figure 5, I have shown a modified form of my invention. Supply pipe 9 extends through an open end of roll 2 into the interior thereof, the end of pipe 9 within the roll being mounted in a coupling 27 forming a portion of duct or pipe 16. A removable member 28 is provided on the opposite end of the roll to permit installation of scoop 15 within the interior of the roll. Discharge pipe 17 extends from the opposite end of the roll through member 28, member 28 being mounted in suitable bearings 28' in the frame 5 of the apparatus. It will be noted pipe 17 is not in contact with the member 28 permitting open ends in the roll. Grooves 29 may be formed in the exterior wall of pipe 17 to entrap any water which may attempt to drain along such surface. Water collecting in grooves 29 drops into recess 31 and returns to the interior of the roll. If desired, a continuous groove or inside thread 29' may be formed in the wall of member 28 as shown in Figure 5 to direct water to the interior of the roll when it is in operation. Thus, if any water creeps along such surface, it is continually diverted toward the interior of the roll. No difficulty has been experienced in practice

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due to the open ends of the rolls for the water is maintained against wall 8 by centrifugal forces when the roll is employed in operation at the high speeds customarily used.

5 An additional feature of this modification resides in the turbulator 32 disposed adjacent the interior surface of wall 8. Turbulator 32 may consist of expanded metal, screening, or other suitable material. As pointed out above, water is thrown against the interior surface of wall 8 by centrifugal forces during rotation of the roll. In order to prevent possible slippage of water against such surface, turbulator 32 may be employed to provide additional friction to the surface; in addition, turbulator 32 serves as a mechanical means for carrying water around the interior of the roll. Centrifugal forces and the turbulator 32 assures that the water will be maintained about the periphery of the roll when the roll is in use. A further advantage of member 32 resides in the fact that it permits more efficient heat transfer for it breaks up or agitates water adjacent the surface of wall 8 and assures that water does not remain in a stagnant condition adjacent such surface.

It will be noted a thermostat 33 is provided responsive to changes in temperature of leaving water. Thermostat 33 serves to regulate valve 11 to increase or decrease the supply of cooling water to roll 2 in accordance with the requirements of the operation. At reduced speeds, water requirements are less so that the decrease in temperature of leaving water is reflected by thermostat 33 which actuates valve 11 to decrease supply of water to the roll. Likewise, at higher speeds water requirements are greater so that the increase in temperature of the leaving water is reflected by thermostat 33 which then actuates valve 11 to increase the supply of cooling water to the roll.

Scoop 15 in the modified form of my invention is somewhat different from that shown in Figure 1. As shown in Figure 6, scoop 15 may be more in the form of a duct-like member 34 welded to discharge pipe 17. Rotation of pipe 17 may rotate member 34 to any desired angle; I have found that satisfactory results may be achieved regardless whether such portion is in vertical, horizontal or any intermediate position. The scoop portion 23 may be adjusted within member 34 as shown in Figure 6 by means of slots 35 and screws 36 as well known in the art.

It will be understood a plurality of scoops may be employed if desired but generally in the practice of my invention it is not necessary to employ more than one such member.

The present invention provides a chilling roll sufficiently light in weight to permit rotation by the web to be cooled passing thereover. A desired film thickness of continuously changing water is maintained adjacent the interior surface of the roll and serves to remove the heat from the web passing over the roll. Turbulator means provided agitate such film or layer thereby assuring that no portion of the cooling medium stagnates adjacent such surface.

My invention provides a simple and efficient means of removing water from the interior of the roll, such means being adjustable to assure that a film of predetermined thickness is maintained adjacent the wall of the roll. Regulating members are provided responsive to changes in temperature of leaving water to assure that a desired volume of water is supplied to the interior

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of the roll, such water supply being a definite factor in load requirements.

While I have described certain preferred embodiments of my invention, it will be understood my invention is not limited thereto since it may be otherwise embodied within the scope of the following claims.

I claim:

1. In apparatus of the character described, the combination of a rotatable, hollow roll terminating in support members, at least one support member being hollow, means for continuously supplying cooling medium to the interior of the roll, centrifugal forces created by rotation of said roll urging the cooling medium against the interior wall of the roll, a stationary discharge pipe extending through an end wall of the roll and through the hollow support member, a scoop member connected to said pipe, said scoop member extending adjacent the interior longitudinal wall of the roll to maintain a desired depth of continuously changing cooling medium adjacent the interior longitudinal wall of the roll, said scoop member being adjustable to vary the depth of said medium, said pipe having a plurality of grooves formed in its exterior surface to entrap medium leaking from the roll and means on the interior of the hollow support member to return medium to the interior of the roll.

2. In apparatus of the character described, the combination of a rotatable, hollow roll, a stationary supply pipe for cooling medium extending through one end of the roll, said pipe having a plurality of nozzles through which high velocity jets of cooling medium are impinged continuously against the interior longitudinal wall of the roll, centrifugal forces created by rotation of said roll urging the cooling medium against the interior wall of the roll, turbolator means disposed against the interior wall of the roll to create agitation

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in the film of medium maintained adjacent thereto, a stationary discharge pipe extending through the opposite end of the roll, a scoop member connected to the discharge pipe, said scoop member extending adjacent the interior longitudinal wall of the roll to maintain a desired depth of continuously changing cooling medium adjacent the interior longitudinal wall of the roll, said scoop member being movable toward and from the interior wall of the roll to vary the depth of the film maintained adjacent the interior wall of the roll, and means for preventing leakage of medium along the exterior wall of the discharge pipe.

3. Apparatus according to claim 2 in which the turbolator means consists of expanded metal disposed over the interior wall of the roll.

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