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L. A. DIX

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DRIER HEAD

Filed May 10, 1930

2 Sheets-Sheet 1

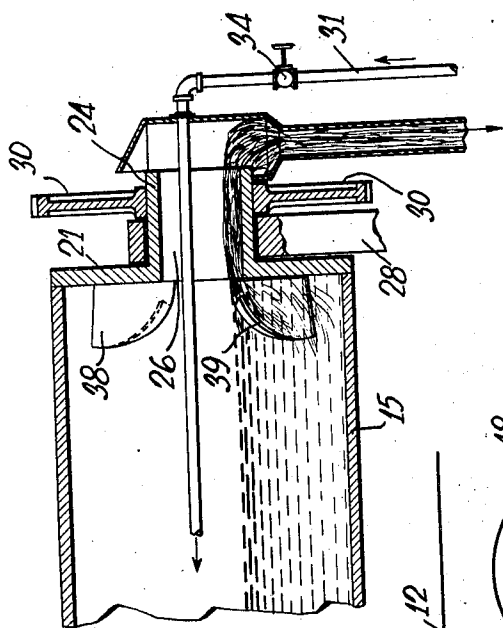


Fig. 2.

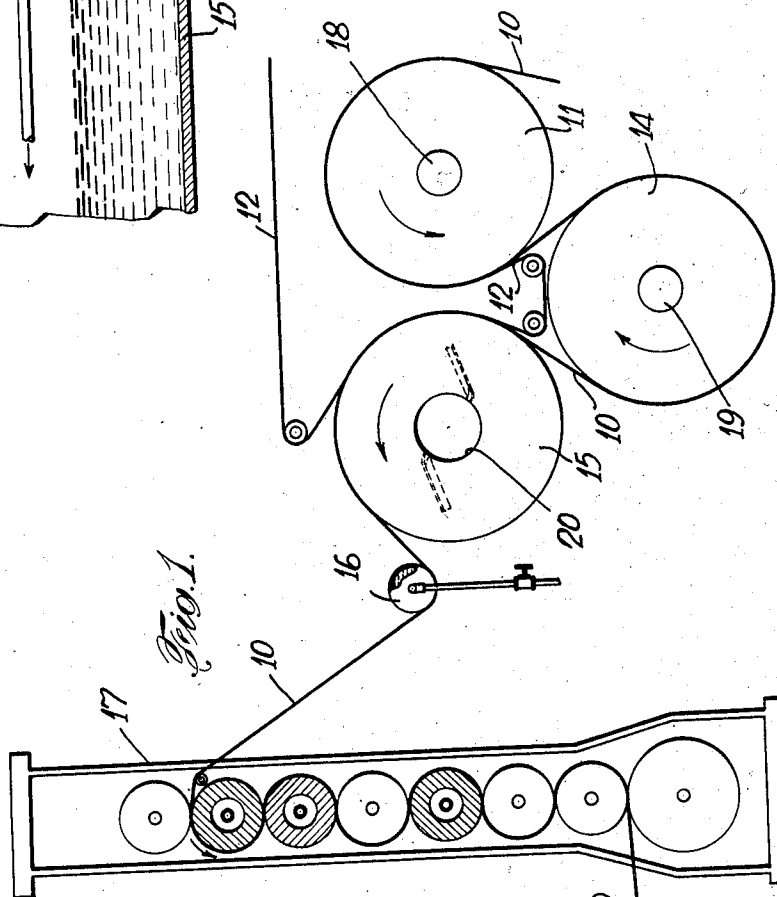


Fig. 1.

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DRIER HEAD

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This invention relates to improvements in apparatus for making paper.

In particular the invention pertains to novel construction of drier rolls or cylinders of paper making machines.

In the manufacture of certain kinds of paper such as newsprint, it is desirable to have the so-called wire side of the paper as smooth or approximately so as the other side which is known as the top or felt side. The wire side is that side which contacts with the Fourdrinier wire during the early stage of the operation of the paper machine.

When the wire side of the paper is of desired smoothness it will readily and satisfactorily receive the printing ink without blurring and smudging. Also, with the smooth surface less quantity of ink is necessary and much more satisfactory printing work is accomplished.

With both sides of the paper of substantially the same smoothness, there is obtained good satisfactory uniform printing and uniform operation of the printing presses.

A desirable manner of obtaining a uniformity and equality of smoothness is to properly control the amount of moisture in or on the paper sheet as may be obtained by controlling moisture on the surface of a drier cylinder which contacts with the wire side of the paper.

A main object of this invention is to provide a novel construction of paper making machine parts which in their normal operation may be controlled so as to create the desired finish or smoothness on a selected side of the paper such as the wire side.

Another object of the invention is to provide an improved drier cylinder adapted to have a cooling medium flowed therethrough so as to control an amount of created moisture on the surface of the roll or cylinder that contacts with the side of the paper which is to be given a smooth finish.

Another object is to produce a novel drier cylinder of the built up construction wherein there is provided means for assisting the flow of a cooling medium through the cylinder so that the amount of moisture produced on the exterior surface thereof may be read-

ily controlled, and more uniformly distributed across the length of the roll or cylinder.

In one particular in the built up type of drier rolls, the invention provides a novel type of head of the roll which permits of proper flow of the water or cooling medium out of the roll and to have a ready capacity for handling a large quantity of a cooling medium when that medium is of relatively low temperature, such for instance as during the summer months.

Other objects and advantages will be more apparent from the reading of the detail description given below:

The drawings forming a part of this invention disclose a preferred form thereof, wherein,

Fig. 1 represents, in part diagrammatically a suitable arrangement for putting the invention into practice;

Fig. 2 represents, a sectional view of one end of a drier roll of a paper making machine showing a particular formation of the roll head, the supporting bearing, the driving gear, the water introducing and exit means, and fins associated with the head of the roll;

Fig. 3 is a sectional view of a complete roll illustrating the invention with fins in desired positions on the roll heads;

Fig. 4 is a sectional view taken through the roll looking toward the head and illustrating a series of more than two fins;

Fig. 5 is a sectional view taken on the line of 5—5 of Fig. 3 showing two fins;

Fig. 6 is a partial sectional view of the roll along its axis and illustrating the curved portions of the fins shown in Fig. 5;

Fig. 7 is another view similar to Fig. 4, illustrating two large fins and a plurality of smaller size fins;

Fig. 8 is a sectional view along the axis of the roll illustrating another view of the fins shown in Fig. 7;

Fig. 9 is a sectional view of one of the fins taken on the line 9—9 of Fig. 4;

Fig. 10 is a sectional view taken on the line 10—10 of a fin shown in Fig. 4;

Fig. 11 is a sectional view taken on the line 11—11 of one of the fins in Fig. 5; and,

Fig. 12 is a sectional view of a fin taken on the line 12—12 of Fig. 4.

In the figures like numbers represent like parts altho they may be somewhat modified in construction.

In general, the invention herein has to do with apparatus which permits the formation of a predetermined or desired amount of moisture or condensation to be introduced into the paper so as to obtain the desired finish on either or both sides of the paper sheet by the time the sheet is finished. This object may be accomplished in any desired manner, such for instance as by providing moisture on the exterior of a drier roll or cylinder for the purpose of producing an improved surface on one side of the sheet of paper being manufactured. The particular desired surface to be treated, in this instance, is what is known as the wire side. It is to be understood that there may be one or more rolls for treating one or both sides of the paper sheet.

The preferred means or forms for producing the desired moisture and for having it properly contact with a sheet of paper constitutes an ordinary drier roll or cylinder with certain modifications provided for handling a cooling medium. This cooling medium in contacting with the interior of the roll will cause the formation of moisture on the exterior thereof. The formation of this moisture may be due to several causes, the exact theory of which is not fully understood at this time. It is however appreciated that the part of the roll after the sheet of paper has left it is of relatively high temperature and when the cooling medium on the interior is of a desired temperature then moisture is formed on the exterior by condensation or other phenomenon.

In carrying forward this invention it is desired to employ a cooling medium that is satisfactory for the purpose and to control the temperature thereof. In the event a cooling medium is handy but a means for controlling the temperature is not readily available the objects of this invention may be readily accomplished by controlling the quantity of the cooling medium passing through the roll. If a temperature controlling apparatus is employed then there will be a regulation of the quantity of flow.

Referring now to Fig. 1, a sheet of paper 10 is shown passing first on to a roll 11 and around the same under a felt 12 which presses it closely to the roll, and the sheet then passes around the roll 14 and under a felt (not shown) in the same manner as it is held on roll 11. This paper sheet then passes around roll 15 and from there under the spring or tension roll 16 and from there into the calender stack 17 and passes between the various rolls as indicated and then comes off the machine as a finished sheet.

All the rolls, 11, 14 and 15, are journaled for rotation. The journals 18 and 19 are of the usual size and journal 20 is of a larger size and construction which will be hereinafter more fully described.

Referring now to Figs. 2 and 3 the construction of a roll or cylinder as shown in sectional view, it will be noted that the roll has a relatively long cylinder portion provided with heads 21 and 22 at the ends. These heads are affixed to the cylinder portion in a liquid tight manner. The heads are provided with journals 24 and 25 respectively and have relatively large journal openings 26 and 27.

These journals are mounted in bearings suitably supported in parts 28 and 29 of the paper making machine. Any suitable type of bearing may be employed. Gear 30 is employed for revolving the rolls at a desired rate of speed. Any type of gear driving mechanism may be employed and operated from any suitable source of power.

One of the very desirable features of the invention herein is the control of the ingress and egress of the cooling medium to the interior of the cylinder. One form thereof as illustrated in the drawings are pipes 31 and 32 to introduce the medium to the interior of the roll. Valves 34 and 35 may regulate the quantity. When the water fills the roll to the level at the edge of the journal openings then it overflows into suitable receivers 36 and 37. It is very desirable to have a great flexibility in controlling the quantity of water or cooling medium into and out of the roll so as to purposely produce a desired amount of moisture forming on the exterior surface of roll 15. For this reason the pipes 31 and 32 and the receivers 36 and 37 shall be selected to readily obtain this result.

Referring now to Fig. 1, experience has shown that the proper formation of moisture on the exterior surface of roll 15 when brought in contact with the paper sheet 10 as it engages that roll, and is held thereto until it leaves the roll produces a desired condition of the paper so that after it passes through the calender rolls a final desired sheet of paper is obtained.

Another advantageous means of controlling the flow of the cooling medium through the roll has been found to materially improve the production of moisture, such means is the addition to the interior surfaces of the heads of suitable members which will assist in moving the cooling medium through the roll in a novel manner. It has been found that suitable types of fins 38, 39 and 40, 41 may be employed whereby the cooling medium, such as water, will be moved so that the water near the cylinder portion will be moved out and the fresh water entering by pipes 31 and 32 will drop down toward the cylinder portion of the roll.

In the normal operation of roll 15 with the cooling medium therein, the fins readily and quickly assist in the movement of the water from the cylinder walls to the opening of the journal, and with some types of fins throw the water part way into the journal for exit. With such structures it is found that the cooling medium which has been right near the surface of the cylinder portion will be drawn away from that portion and moved to the journal openings thereby allowing the relatively cool incoming water to be drawn down into contact with the cylinder walls rather than having this cool water flowing out of the roll due to the level of the water in the roll being as high as the journal edges. Thus, by creating a flow of the water from the center of the roll toward the ends thereof, it is possible to in another manner assist in controlling the effect of the cooling medium. When the temperature of the cooling medium has been controlled outside of the roll then the quantity or flow of cooling medium through the roll may be properly governed so that proper moisture status will be formed on the exterior of the roll.

It will be noted that as the paper sheet leaves the roll 15 that the temperature of the roll is relatively high and that this portion of the roll then rotates to a position where the interior of the roll is subject to a large quantity of the cooling medium and then the exterior surface again engages the sheet.

It has been found that a film of the cooling medium will be carried around and start an engagement with the interior of the roll due to the centrifugal force on the water. It will therefore be seen that when the roll engages the larger quantity of the water or cooling medium there will be a change of temperature.

In producing the completed rolls so that proper cooling and moisture formation is obtained by having a desired quantity of flow of a cooling medium, it has been found that the openings in the journals should preferably be between one-sixteenth ($\frac{1}{16}$) and one-quarter ($\frac{1}{4}$) of the diameter of the head. Also, in other instances the diameter of the opening in the journal may be any desired size such for instance as being less than two-thirds ($\frac{2}{3}$) the radius of the head part of the roll.

Referring now to Figs. 5 and 6 there is shown the preferred form of the fins which may be considered as an agitating means. They may be of any desired formation but it has been found satisfactory to make them of a relatively wide width, such for instance as 6 inches or less, depending upon the size of the roll. In some rolls the width may be greater than 6 inches if desired. The desired construction of the fin of this type is shown in Fig. 11 wherein a flange 42 is provided and the upstanding part 44 is shown of a

relatively greater length than the flange portion. These fins may be affixed or associated with the inner-surfaces of the heads in any suitable manner, such for instance as being cast or spot welded. It is desirable to have the fins located so that they will guide the cooling medium from the circumference of the roll to the journal openings. It is preferred to locate them as indicated in Fig. 5 so that the liquid will be guided in a most efficient and small power consuming manner toward the journal opening. In addition, it is preferred to bend them at the upper ends 45 and 46 as particularly noted in Fig. 6 so that the cooling medium is thrown into the journal opening.

It is desired with the relatively large size fins to have two of them positioned at 180 degrees from each other on one head and to have two others on the opposite head of the roll placed 180 degrees apart between themselves, but at a 90 degree relation to the fins on the first hand.

While there has just been described a desirable form of fin, any other form, size or number of them may be employed so long as a desired result is obtained. For instance in Fig. 4, there is shown a plurality of fins, cross sections of which vary as illustrated in Figs. 9, 10 and 12. The type of fin illustrated in Fig. 12 shows the cup curve feature and the fin may take any desired formation throughout its length, such for instance as being curved or angled as illustrated. Usually when there is a large number of these fins the portions which extend outward from the head are of relatively small widths in comparison to the extensions 44 of fins 38 and 39.

Referring now to Figs. 7 and 8, there is illustrated two large fins 38 and 39 and a plurality of the small type fins. It will be understood that any combination or size or curvatures of fins may be employed to obtain the satisfactory and efficient result required in any particular construction of roll.

The lengths and positions of the fins may be carried as desired. It has been illustrated herein to place the fins so that their ends do not reach to the circumference of the roll while the other ends are preferred to be positioned nearer the edges of the journal openings. If satisfactory to obtain the purposes of the invention, any fin may be positioned at any angle to a radius line and positioned nearer to or at the circumference and may be of different lengths. Preferably the fins are in length about two-thirds the distance from the cylinder wall to the journal openings.

It will therefore be seen that the invention herein relates particularly to a new and novel formation of apparatus which will permit the formation of a desired quantity of moisture and the contact of this moisture with

the paper sheet so that the paper which is finally produced from the paper making machine has the proper condition of surfaces which give maximum efficiency in the printing and use thereafter.

It will also be seen that the invention may be readily accomplished by the improved form of heads having fins for assisting in the flow of the cooling medium through the drier roll.

It will be understood that while a preferred form of the construction has herein been shown and described, there may be changes and modifications made therein, but such changes and modifications are to be considered as being within the scope of the invention as out-lined in the following claims.

What is claimed is:

1. In a paper making machine, a revolving roll having relatively large size journals on each end thereof, said journals having openings extending to the interior of the said roll; means, for introducing a cooling medium into said roll through said journals, and means extending part way from a journal to the circumference of the roll for extracting a quantity of said medium through one of said journals, the quantity of said medium passing into and out of said roll being sufficient to at all times create a predetermined amount of moisture on the exterior surface of said roll.

2. In a paper making machine, a roll comprising a cylinder, two heads for closing the ends of said cylinder in a water tight manner, each of said heads being provided with a journal having a large opening therein to admit water to the interior and to allow the water to flow therefrom, each of said journals acting as supports for said roll, and means mounted on the interior of said heads for moving the water toward the open journal, said means on said head extending only part way to the circumference of the roll.

3. In a paper making machine, a roll comprising a cylinder, two heads for closing the ends of said cylinder in a water tight manner, an opening in one of said heads for the ingress and egress of a cooling medium to the interior of said roll, and fins associated with the interior side of said head having an opening therein for assisting in creating a flow of the cooling medium out of said roll, said fins being positioned with their outer ends away from the inner circumference of said roll.

4. In a roll for a paper making machine, a head having a journal with an opening of diameter less than two-thirds the radius of said head, and means on the inside of said head for guiding a cooling liquid from the circumference of said roll toward said journal opening, said means on the inside of said head positioned to have its outer end away from the inner circumference of said roll.

5. In a roll for a paper making machine, a

head having a journal with an opening of diameter less than two-thirds the radius of said head, and a fin affixed to the interior of said head for guiding a cooling medium from near the circumference of said head to the journal opening, said fin having a length equal to approximately two-thirds the distance from the journal opening to the circumference of said head, and being positioned with its outer end away from the inner circumference of said roll.

6. In a roll for a paper making machine, a head having a journal with an opening of diameter less than two-thirds the radius of said head, and two opposite fins attached to the interior surface of said head to guide a cooling medium from near the circumference of said head toward the open journal, said fins being positioned on said head so that the outer ends of said fins are away from the inner circumference of said roll.

7. In a roll for the paper making machine, a head having a journal with an opening of diameter less than two-thirds the radius of said head, and a fin affixed to the innerside of said head and positioned at an angle to a radius line to gradually guide a cooling medium from near the circumference of said head to the journal opening, said fin having its end near said journal opening bent to throw the medium into said journal opening and having its outer end positioned away from the inner circumference of said roll.

8. In a drier roll for a paper making machine, a head having a journal with an opening of diameter less than two-thirds the radius of said head, and a plurality of fins affixed to the interior of said head for guiding a cooling medium from near the circumference of said head toward the journal opening, one of said fins being curved to throw a cooling medium into the journal opening, the majority of said fins having a length approximately two-thirds of the distance between the outer edge of said head and the edge of the journal opening.

9. In a paper making machine, a head for a roll having a journal opening, the center of said opening coinciding with the axis of said head, fins attached to the side of said head opposite to said journal and positioned opposite each other, said fins having a length at least one-half the radial distance from the opening of said journal to the circumference of said head, each of said fins having the end thereof nearer the journal opening bent to throw a liquid passing along said fin toward said journal opening and having its outer end positioned away from the inner circumference of said roll.

10. In a paper making machine, a revolving roll comprising a cylindrical portion, heads affixed to the end of said cylindrical portion in water tight fashion, said heads having journal openings therein, said jour-

nals adapted to support said roll, the openings in said journals allowing ingress and egress of a cooling medium to and from the interior of said roll, and a plurality of fins mounted on the interior of said heads for guiding the cooling medium from near the circumference of said roll to the journal openings, said fins being mounted so that their outer ends are positioned away from the inner circumference of said roll.

11. In a paper making machine, a revolving roll comprising a cylindrical portion, heads affixed to the end of said cylindrical portion in water tight fashion, said heads having journal openings therein, said journals adapted to support said roll, the openings in said journals allowing ingress and egress of a cooling medium to and from the interior of said roll, and a plurality of fins of appreciable width affixed to each of said heads for guiding the cooling medium from the surface of said cylinder portion toward the open journals, said fins being curved to tend to throw the cooling medium through the openings in said journals, said fins being positioned with their outer ends away from the inner circumference of said roll.

12. In a paper making machine a revolving roll positioned in said machine after the last drying roll and in close proximity thereto and having the formed paper sheet passed thereover and contacting therewith over a material length of arc to receive moisture formed on the exterior of said roll, said revolving roll carrying a material amount of cooling medium, fins mounted on the inside ends of the walls of said roll for creating a flow of said medium from the interior of said roll to the exterior thereof, said fins having their outer ends positioned away from the inner circumference of said roll, and means for supplying said medium to the interior of said roll.

In testimony whereof I have hereunto set my hand.

LAWTON A. DIX.