

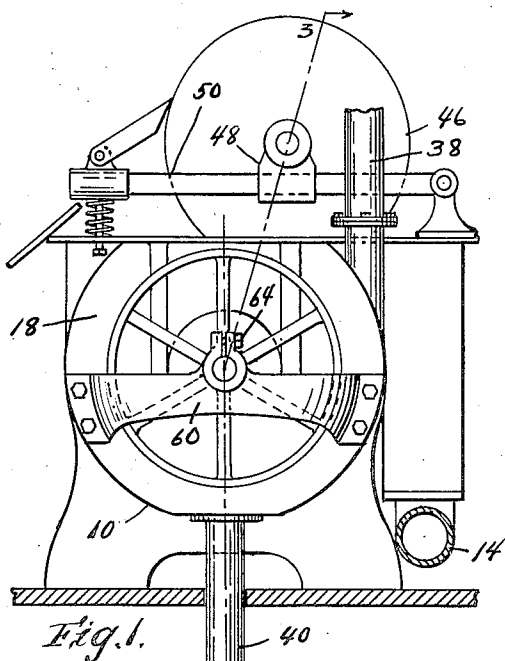
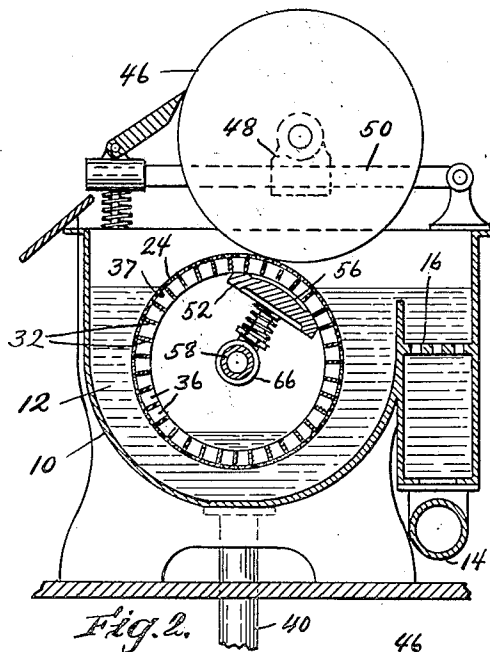
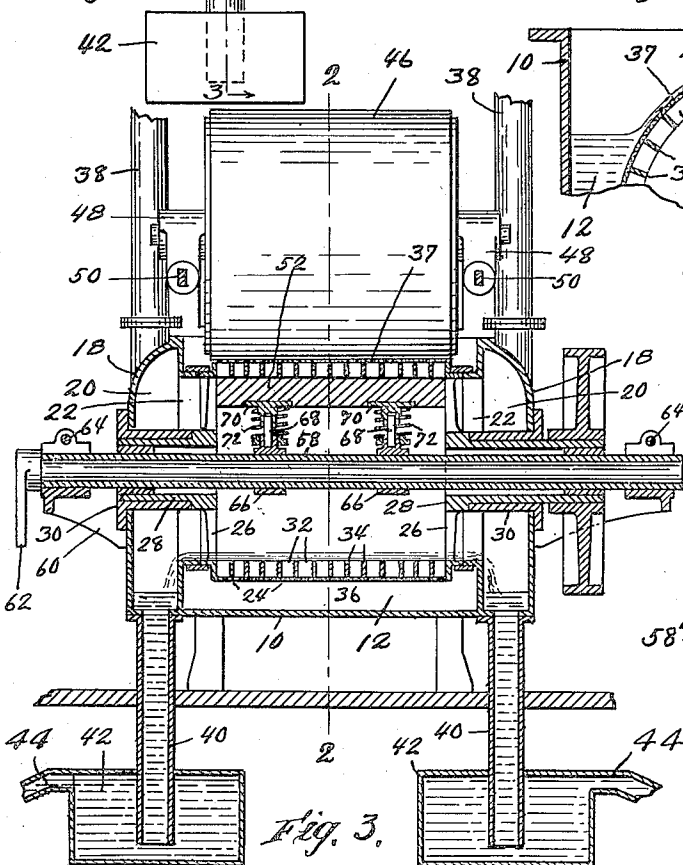
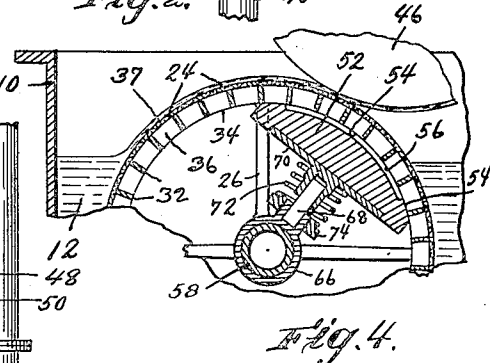
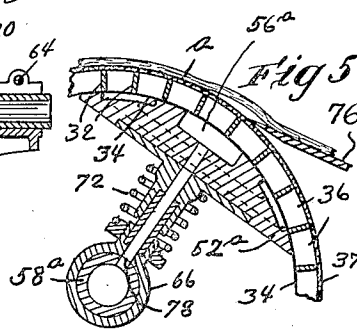
March 8, 1932.

A. J. HAUG

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FILTER

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UNITED STATES PATENT OFFICE

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FILTER

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This invention relates to machines for filtering solids from a mixture of solids and liquids and has particular reference to a paper making machine of the cylinder type.

One of the objects of the present invention is the provision of a machine for the treatment of paper pulp that will handle larger volumes of pulp at a lower operating cost than the machines now in commercial use for this purpose.

A further object of the invention is the provision of a paper making machine having a cylinder the inner face of which is free and unobstructed, with the cylinder being open at its ends for substantially its full diameter so that water can run axially out of the cylinder as soon as it enters it, and also so that the water can escape from the cylinder by gravity without collecting in the cylinder, whereby large amounts of pulp can be handled.

A further object of the invention is the provision of a paper making machine of the cylinder type having suction means which is operable throughout the entire extent of the periphery of the cylinder that is covered by the paper pulp to extract water from the pulp and to means to remove the water from the cylinder without conducting it through the hollow journals of the cylinder, which of necessity must be made large and therefore of expensive construction.

A further object of the invention is generally to improve the construction and operation of filtering devices and paper making machines.

Fig. 1 is a side elevation of the machine embodying the invention.

Fig. 2 is a transverse sectional elevation taken along line 2—2 of Fig. 3.

Fig. 3 is a sectional view taken along line 3—3 of Fig. 1.

Fig. 4 is an enlarged detail of the suction shield of the paper making cylinder.

Fig. 5 is a sectional detail of a modified form of suction shield.

The paper making machine herein shown as embodying the invention consists of a tank 10 having a cylinder compartment 12 into which a mixture of pulp and water continuously flows through the pipe 14. A diffuser

plate 16 is located between the cylinder and the pipe for the purpose of spreading out the flow of stock. The tank 10 is provided with end walls 18 which have chambers 20 therein and circular openings 22 that establish communication between said chambers and the cylinder compartment 12 of the tank. A paper making cylinder 24 is located within said compartment and is supported at its ends on arms 26 carried by hollow shafts or journals 28 that are rotatable in bearings 30 of said end walls 18. The cylinder 24 is formed of axially-spaced circumferential bars 32 and circumferentially-spaced axially-disposed bars 34 as is most clearly shown in Fig. 4 to provide a series of pockets 36 which are open at both the inner and outer peripheral faces of the paper making cylinder. The usual wire screen 37 is supported on the outer periphery of said bars in any suitable or desirable manner.

The ends of the cylinder aligned with the circular openings 22 of the chambers 20 and the bounding walls of said openings are substantially in line with the inner periphery of said cylinder so that water that is within said cylinder can flow horizontally out and into said chambers 20 without obstruction, the cylinder supporting arms 26 being few in number and being sufficiently widely spaced to permit a free flow of water from the cylinder. The bottom of the compartments are substantially below the bottom of the cylinder so that water can not collect within the cylinder. The chambers 20 are provided with outlet openings 38 which are adapted to be connected with a suitable source of suction, not shown, for the purpose of drawing the water of the pulp stock through the cylinder and causing the pulp to form a sheet on the cylinder wire and also for removing water from that portion of the pulp sheet that is above the level of the pulp stock in the cylinder compartment 12. Since the inner periphery of the cylinder is entirely unobstructed except for a suction shield presently to be described, the suction acts on the entire area of the cylinder that is covered by the pulp sheet.

Any suitable means may be used for sealing the cylinder and permitting withdrawing

of the water discharged therefrom. As herein shown water discharge pipes or tubes 40 are connected with the chambers 20 at the bottoms thereof and are extended for a sufficiently great vertical distance therebelow and the open ends of said pipes are terminated below the level of water in tanks 42 from which water can escape through the outlets 44 of said tanks. The height of said pipes 40 above the level of water in said tanks 42 is adapted to be greater than the height that water can be raised by the suction or partial vacuum within the cylinder. Thus the water can flow out of said cylinder entirely by gravity and without the use of pumps and regardless of the suction within the cylinder.

A couch roll 46 is located above and to one side of the vertical axis of said cylinder and rotates in engagement therewith and is adapted to pick up the paper or pulp sheet on the cylinder. The couch roll may be constructed and supported in any usual and suitable manner and as here shown is journaled in brackets 48 carried by pivoted and spring supported bars 50.

Since the pulp sheet is removed from the paper making cylinder at the couch roll, the peripheral portion of the cylinder that extends under the couch roll and between it and the level of pulp stock in the cylinder compartment is uncovered and, unless means were provided to prevent such action, air would pass through the uncovered section of the cylinder and destroy the vacuum within the cylinder. I consequently provide means to cover the cylinder at the point where it is not covered by the pulp sheet, whereby to maintain the vacuum within the cylinder. Also, since the vacuum existing within the paper making cylinder will render difficult the transfer of the pulp sheet to the couch roll, I provide means to remove the pulp sheet from the effect of the vacuum within the cylinder and to establish atmospheric pressure on both sides of the pulp sheet at and somewhat in front of the point where the pulp sheet is transferred to the couch roll. To accomplish these ends, I provide a suction shield which consists of a plate 52 which is located within the cylinder and is substantially co-extensive with the length of the cylinder and has an arcuate face 54 that is in engagement with the inner periphery of the cylinder and extends circumferentially from a point below the level of pulp stock in the cylinder compartment to a point under and forwardly of the line of contact between the couch roll and the paper making cylinder.

The arcuate face of said plate has a recess 56 therein which is substantially co-extensive in length with the length of the cylinder and extends from a point in front of the couch roll to some suitable point behind the couch roll where it is under the sheet-free portion of the cylinder and is in free communication

with the atmosphere. As thus arranged, the suction shield serves to block off communication between the atmosphere and the interior of the cylinder through that portion of the cylinder that is free from the pulp sheet. The recess 56 serves to establish atmospheric pressure under the pulp sheet on the cylinder at and also for a suitable distance forwardly of the point where the pulp sheet is taken off the cylinder and is taken onto the couch roll, thereby facilitating the transfer of the pulp sheet.

The shield plate 52 is supported by a hollow shaft 58 which extends axially through the cylinder journals 28 and is supported in bearings of brackets 60 carried by the end walls 18 of the tank. The shaft is angularly adjustable to vary the position of the suction shield plate with respect to the couch roll and the level of pulp stock by means of the handle 62, and the shaft can be secured in any angular setting thereof by tightening the bolts 64 of the bearings of the shaft. Collars 66 are fixed to said shaft within the paper making cylinder and have pins 68 extended radially outwardly therefrom. The shield plate is provided with tubular sockets 70 which surround and are slidable on said pins. Helical springs 72 encircle said sockets and bear against said plate and also against nuts 74 adjustably screw-threaded on said collars 66, whereby the plate is held yieldingly at an adjustable pressure against the inner face of said cylinder.

In the modification illustrated in Fig. 5 the pulp sheet *a* is transferred from the cylinder to a doctor 76. The suction shield 52*a* has a recess 56*a* which is similar in function to the recess 56 and serves to establish atmospheric pressure at and forwardly of the point where the pulp sheet is taken off the cylinder. The shield is provided with a plurality of air passages 78 which communicate with the hollow shaft 58*a* and through which blasts of air can be directed through the region of the atmospheric pressure or by which an air pressure can be directed against the under face of the pulp sheet to break it from its mechanical attachment to the paper making wire immediately in front of the doctor.

By reason of the suction over the entire periphery of the cylinder that is in contact with the pulp stock and the paper sheet, and by having the cylinder free and unobstructed on its inner face, and so arranging the cylinder that water can flow horizontally from the interior of the cylinder by gravity and in such a way that it is not necessary to collect it in a pond within the cylinder, large volumes of water can be handled rapidly without damage to the paper sheet.

I claim:

1. In a paper making machine, the combination of a cylinder compartment, a paper making cylinder rotatable therein which is

internally free from rotating obstructions, said cylinder having an open end, suction means to maintain a reduced air pressure throughout the interior of the cylinder, and gravity-operated means to remove water from the interior of said cylinder through said open end against the action of said suction means.

2. In a paper making machine, the combination of a cylinder compartment, a cylinder horizontally rotatable therein having its ends open substantially the full inner diameter of the cylinder, out of which open ends the water in the cylinder is adapted to flow freely without collecting therein, means to remove the discharged water, the interior of the cylinder being free and unobstructed, and suction means to maintain a reduced air pressure throughout the interior of the cylinder.

3. In a paper making machine, the combination of a cylinder compartment, a cylinder horizontally rotatable therein having at least one open end out of which water from the interior of the cylinder is adapted to flow freely without collecting therein, means to remove the discharged water, and suction means acting through the open end of said cylinder arranged to maintain a reduced air pressure throughout the interior of the cylinder.

4. In a paper making machine, the combination of a cylinder compartment having a chamber provided with a circular opening, and a paper making cylinder horizontally rotatable within said compartment having an open end which is in register with said circular opening and through which water in the interior of the cylinder is adapted to flow into the bottom of said compartment, said compartment having a water outlet at the bottom thereof and having an opening thereinto above the said water outlet by which suction is maintained in the interior of said cylinder through the open end thereof.

5. In a paper making machine, the combination of a paper making cylinder, means to maintain a suction throughout the interior of the cylinder, means to take off the pulp sheet from the surface of the cylinder, and means to maintain atmospheric air on both sides of the pulp sheet at its point of take-off.

6. In a paper making machine, the combination of a paper making surface on which a pulp sheet is formed, means to maintain an air pressure on said pulp sheet on said surface, means to take off the sheet from said surface, and means to shield the pulp sheet at the point of take-off from the action of said air pressure and also to establish atmospheric air under said pulp sheet thereat.

7. In a paper making machine, the combination of a paper making cylinder on which a pulp sheet is adapted to be formed, means permitting water to flow out of said cylinder

by gravity, means to maintain a reduced air pressure throughout the interior of said cylinder, means to take off the pulp sheet from said cylinder, means to shield that portion of the cylinder not covered by the pulp sheet from the action of said suction means, and means to establish atmospheric air on the under side of said pulp sheet at its point of take-off from the cylinder.

8. In a paper making machine, the combination of a paper making cylinder, a take-off device for the pulp sheet on the cylinder, means for permitting the water to flow out of said cylinder by gravity, means to maintain a reduced air pressure throughout the interior of the cylinder, a stationary shield located within said cylinder opposite said take-off device and in covering relation with that portion of the cylinder not covered by the pulp sheet, and means to establish atmospheric air under the pulp sheet at its point of take-off.

9. In a paper making machine, the combination of a perforated paper making cylinder, a take-off device engaged with the pulp sheet on said cylinder for taking off the pulp sheet, means to maintain a suction throughout the interior of said cylinder, a shield member located within said cylinder opposite said take-off device and in covering relation with that portion of the cylinder which is not covered by the pulp sheet, said shield member having a recess adjacent the inner periphery of said cylinder which is located opposite said take-off device and extends from a point under the pulp sheet in front of said device to a point where the cylinder is uncovered and it is exposed to the atmosphere, whereby to establish atmospheric air under the pulp sheet at its point of take-off.

10. In a paper making machine, the combination of a perforated paper making cylinder, a take-off device engaged with the pulp sheet on the cylinder for taking off the pulp sheet, means for permitting the water to flow out of said cylinder by gravity, means to maintain a suction throughout the interior of the cylinder, and a shield device movable circumferentially of the cylinder and located therein over and in confronting relation with that portion of the cylinder which is not covered by the pulp sheet, said device having means to establish atmospheric air under the pulp sheet on said cylinder at its point of take-off.

11. In a paper making machine, the combination of a paper making cylinder, a take-off device for the pulp sheet on the cylinder, means to maintain suction on the interior of the cylinder, means to establish a region of atmospheric air under said pulp sheet on the cylinder at said take-off device, and an air blast forming means operative to discharge a blast of air through said region and against the pulp sheet to detach

it from any mechanical adherency thereof with said cylinder.

12. In a paper making machine, the combination of a paper making cylinder, a take-off device for the pulp sheet on the cylinder, means to maintain suction on the interior of the cylinder, means to establish a region of atmospheric air under said pulp sheet on the cylinder at said take-off device, and means to introduce air at hyper-atmospheric pressure against the pulp sheet within said region to detach the sheet from its mechanical adherency with said cylinder.

13. In a paper making machine, the combination of a tank, a hollow rotary paper making cylinder partially immersed in said tank and having an unobstructed interior and an open end through which water drawn through the cylinder can flow freely by gravity so as to keep the cylinder free from a pool of water, means to remove the water discharged from said cylinder, and other means to maintain a reduced air pressure throughout the interior of the cylinder.

14. In a paper making machine, the combination of a tank, a hollow rotary paper making cylinder partially immersed in said tank and having an unobstructed interior and an open end through which water drawn through the cylinder can flow freely by gravity so as to keep the cylinder free from a pool of water, means to remove the water discharged from said cylinder, other means to maintain a reduced air pressure throughout the interior of the cylinder, means to take off the pulp sheet on said cylinder, and means to maintain atmospheric air on both sides of the pulp sheet at its point of take off.

In testimony whereof, I have signed my name to this specification.

ANTON J. HAUG.

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