Dec. 13, 1966 K. HELLSTROM 3,291,682

SUCTION CYLINDER MOLD FOR MAKING PAPER

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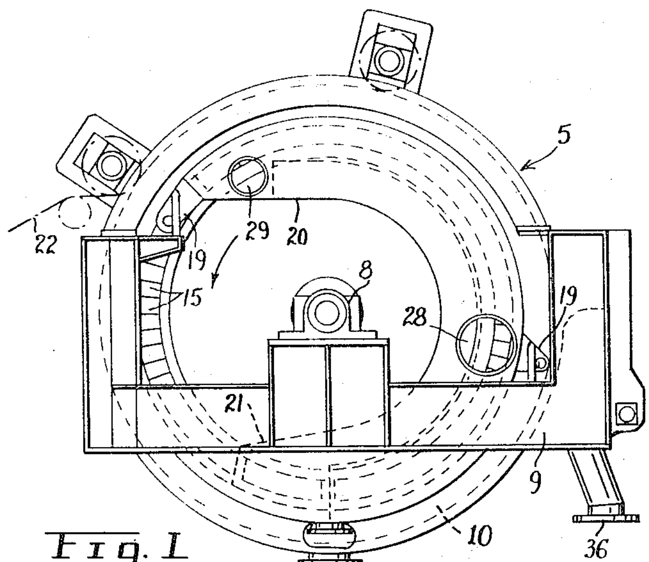

Fig. 1

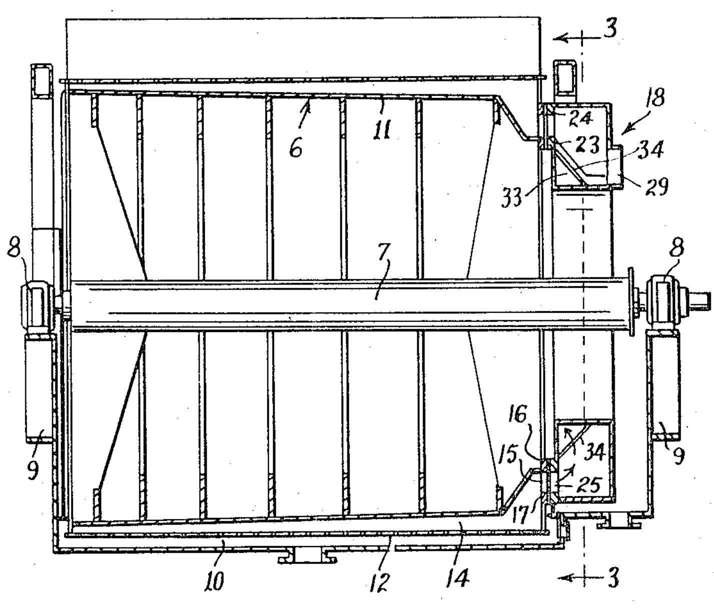

Fig. 2

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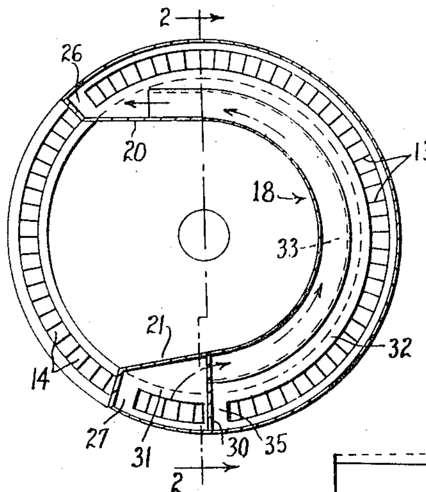


Fig. 3

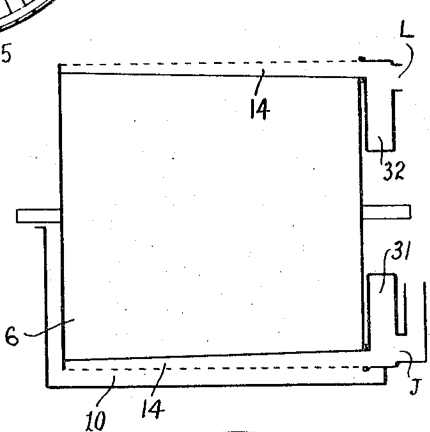
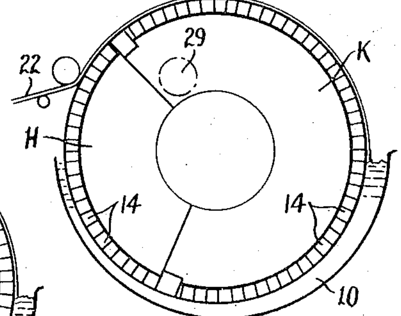


Fig. 4



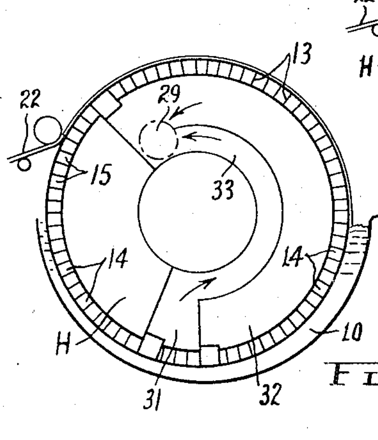


Fig. 5

Fig. 6 PRIOR ART

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SUCTION CYLINDER MOLD FOR MAKING PAPER

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This invention relates to suction moulds for use in the manufacture of pulp for paper making, and particularly to the suction box forming a part of the suction mould and having individual channels for the removal of air and water from the apparatus.

Since a substantial area of the suction box is connected to atmosphere, the first portion of the drainage is effected only by the hydrostatic head of the pulp suspension in the vat of the machine. The amount of water drainage in this section will depend on the drainage characteristics of the pulp suspension and time. Thus for a slow draining stock the time under normal operating conditions may not be sufficient to allow for sufficient drainage to fill the drainage channels of the machine with water. Thus, as these channels pass into the vacuum section of the suction box, they will contain air as well as water. The air thus remaining will expand and release energy and cause air entrainment of the water that is removed from the suction box. If this water is recirculated for dilution of new pulp being delivered to the machine, the air entrainment will tend to slow the drainage of the pulp and thereby reduce the capacity of the machine.

The present invention consists essentially in the provision of a suction box on the discharge end of the suction mould the said suction box having two main compartments both of which are in communication with the individual drainage channels of the machine. One of these two main compartments which is first in communication with water and air filled drainage channels of the machine is connected directly, by means of an enclosed passage or external pipe with the vacuum connection to the suction box for the purpose of initially extracting all or a large proportion of the air and so substantially reduce the entrainment of air to the recirculated water. The second of the main compartments of the suction box functions in the usual manner to extract the remainder of the water from the individual drainage channels of the machine.

The object of the invention is to provide a suction box for suction moulds in which means are provided to extract a large proportion of air from the drainage water in the initial stage of water drainage.

A further object of the invention is to provide means in a suction box whereby, in the first stage of water drainage from a suction mould, the air is extracted from the water and removed.

A further object of the invention is to provide a suction box having two compartments both of which are connected to a common suction connection, one of the compartments being an air extraction compartment and the other a water extraction compartment.

These and other objects of the invention will be apparent from the following detailed specification and the accompanying drawings, in which:

FIG. 1 is a vertical end elevation of the suction mould looking on the drive end of the machine and showing the suction box mounted on the end frame.

FIG. 2 is a longitudinal vertical section taken on the line 2—2 of FIG. 3.

FIG. 3 is a vertical transverse section through the suction box taken on the line 3—3 of FIG. 2.

FIG. 4 is a longitudinal sectional diagram of the suction mould illustrating the separate air and water extraction features of the machine.

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FIG. 5 is a transverse diagram of the apparatus shown in FIG. 4 showing the air and water extraction compartments of the suction box.

FIG. 6 is a diagram similar to FIG. 5 without the air extraction compartment and representing the present mode of operation.

Referring to the drawings, the suction mould **5** consists of a cylinder **6** mounted on the shaft **7** and rotatively mounted in the end bearings **8** which are supported on the stationary end frames **9**, at each end of the pulp vat **10**. The inner deck **11** of the cylinder **6** is imperforate while the outer deck **12** is a perforated shell. The outer perforated deck **12** is generally covered by a wire mesh, not shown in the drawings.

The inner deck **11** is slightly tapered inwardly towards the discharge end of the machine and is provided with a multitude of longitudinal spacers **13** which support the outer deck **12** and form a multitude of longitudinal water drainage channels **14** closed at one end and at the opposite end terminating in the openings **15** located between the inner and outer annular seal rings **16** and **17**.

The cylinder **6** rotates in the vat **10** which is continuously fed with an aqueous suspension of wood fibre which is picked up on the outer deck **12** and the water is drained out through the drainage channels **14**.

The suction box **18** is here shown as being of horseshoe shape and is supported in place against the discharge end of the cylinder **6** by the brackets **19** secured to the stationary end frames **9**. The upper and lower extremities **20** and **21** of the horseshoe shaped suction box are located above and below the horizontal centreline of the cylinder **6** and are projected towards the pulp sheet take-off side of the machine, leaving exposed to the atmosphere a section of drainage openings **15** immediately after the take-off of the pulp sheet **22** from the cylinder **6**.

The vertical face of the suction box **18** facing towards the drainage end of the cylinder **6** is provided with inner and outer arcuate sealing strips **23** and **24** defining an arcuate opening **25** in direct communication with the adjacent drainage channels **14**. End sealing strips **26** and **27** combine with the arcuate sealing strips **23** and **24** to seal the suction box from the atmosphere. The suction box **18** is provided with a white water discharge connection **28** located just below the horizontal centreline of the machine, and a vacuum connection **29** adjacent to the end of the upper extremity **20** of the suction box.

A vertical division plate **30** is located within the lower extremity **21** of the suction box to divide the suction box into two compartments, an air extraction compartment **31** occupying the lower extremity **21** of the suction box, and a water compartment **32** occupying the remainder of the suction box.

An arcuate air passageway **33** is formed within the water compartment by the plate **34**. This air passageway **33** extends from the division plate **30** around the inner arcuate surface of the suction box to within a short distance of the vacuum connection **29**. The air passageway **33** is open at both ends and is in direct communication with the air extraction chamber **31** at one end and with the water compartment **32** and with the vacuum connection **29** at its opposite end. Sealing strips **35** located between the arcuate sealing strips **23** and **24** at the location of the division plate **30**, seal the air extraction compartment **31** from the water compartment **32**.

The operation of the invention will be described with particular reference to FIGS. 4, 5 and 6. The pulp stock enters the vat **10** through the stock inlet **36** and is picked up by the rotating cylinder **6** in well known manner. Since the section H of the apparatus is connected to atmosphere, the first portion of drainage from the channels **14** is effected only by hydrostatic head of the pulp suspension in the vat **10**. The amount of water drained in the section H will depend on the drainage characteristics of the pulp suspension and time. Thus for a slow draining stock, the time under normal operating conditions may not be sufficient to allow for sufficient drainage to fill the channels **14** with water. Thus, as these channels **14** pass into the vacuum section K (FIG. 6), they will contain air as well as water. The air thus remaining in the water will expand and release energy and cause air entrainment of the water that is removed from the suction box. If this water is recirculated for dilution of new pulp coming to the vat **10** of the machine, the air entrainment will tend to slow down the drainage of the pulp and thereby reduce the capacity of the machine.

The present invention, as illustrated in the diagrams FIGS. 4 and 5, avoids or substantially reduces the degree of air entrainment. As the channels **14** pass from the area H and into communication with the air extraction compartment **31**, vacuum effected through the passageway **33**, extracts a large percentage of air from the water. Therefore as the channels **14** move into communication with the compartment **32**, very little, if any, air is entrained and the water from this compartment **32** can be used to the utmost advantage for recirculation with new pulp delivered to the vat **10** without any decrease in the efficiency or capacity of the machine.

In FIG. 4 the air extracted from the water in the compartment **31** is shown being taken away through the external connection J, while the water from the compartment **32** is taken away through the external connection L. Under certain circumstances it may be more advantageous to replace the internal passageway **33** with the external connection J in FIG. 4.

With the above described improvement in suction box construction and operation as applied to suction moulds a higher efficiency in water drainage is obtained, resulting in the machine being able to work to full capacity and permitting the use of recirculated water substantially free of entrained air.

What I claim is:

1. A suction mould for drying pulp in which a cylinder is rotatably mounted in a pulp vat between stationary bearings, and a stationary suction box is mounted in sealing contact with the discharge end of the said cylinder, the said cylinder having an outer perforated peripheral surface and a series of longitudinal water drainage channels located immediately under the perforated surface of said channel, the said drainage channels communicating with the atmosphere and with said suction box, a first air extraction compartment and a second water drainage compartment in said suction box, the said air extraction compartment being located adjacent the lower end of the vertical centreline of the cylinder, vacuum means in said suction box located adjacent the upper end of the said centreline of the cylinder and an internal passage in the suction box connecting the said air extraction compartment with said vacuum means, the said vacuum means in operation, separately extracting air and water from said drainage channels through said first air extraction compartment and said second water drainage compartment.

2. A suction mould for drying pulp comprising a perforated cylinder, a series of longitudinal drainage channels located on the inner peripheral surface of the perforated cylinder, the said channels draining towards one end of the said cylinder, a stationary suction box mounted on one end of said cylinder and in communication with the drainage ends of the said drainage channels, the said suction box having a horseshoe shape with the extremities of the horseshoe shape being located above and below the horizontal centreline of the said cylinder, a division plate in the lower extremity of the horseshoe suction box to form separate air extraction and water drainage compartments, the said air extraction compartment being located in the lower extremity of the horseshoe suction box and the water drainage compartment extending around the horseshoe shape towards the upper extremity of the suction box, an air passageway in said water drainage compartment, the said air passageway at its lower end communicating with the said air extraction compartment and at its upper and opposite end communicating with the said water drainage compartment adjacent the upper extremity of the suction box, and vacuum means connected with the upper extremity of the suction box adjacent the upper end of said air passageway.

3. A suction mould as set forth in claim **2** in which the said suction box is of rectangular cross section and the said air passageway is formed by a plate secured to two adjacent sides of the suction box.

4. A suction mould as set forth in claim **2** in which the uppper extremity of the horseshoe shaped suction box is located adjacent to and approximately level with the pulp sheet take-off of the machine.

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