Feb. 15, 1955 R. F. HOLLIS 2,701,988

CYLINDER PAPERMAKING MACHINE

Filed June 4, 1951 3 Sheets-Sheet 1

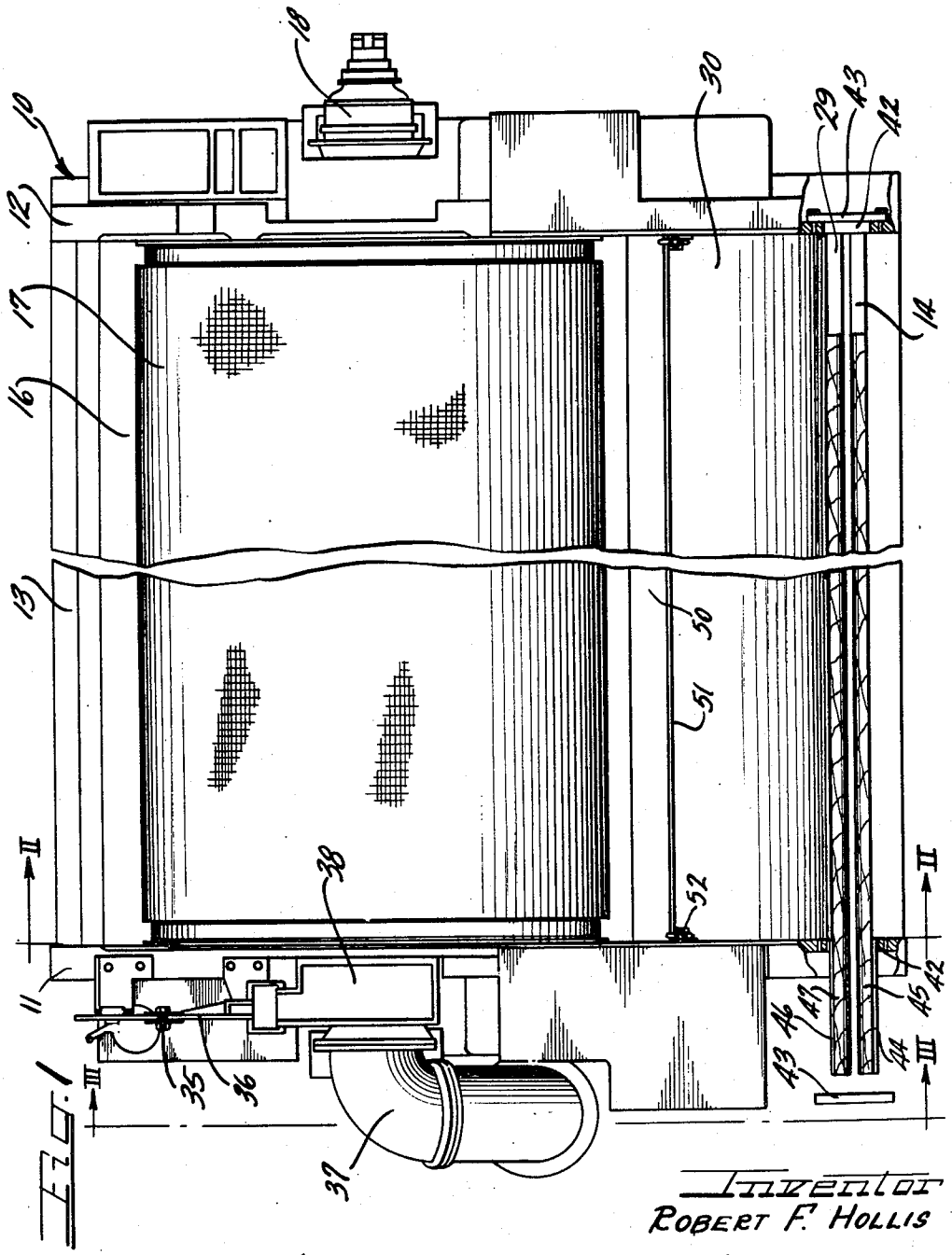


FIG. 1

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Fig. 2

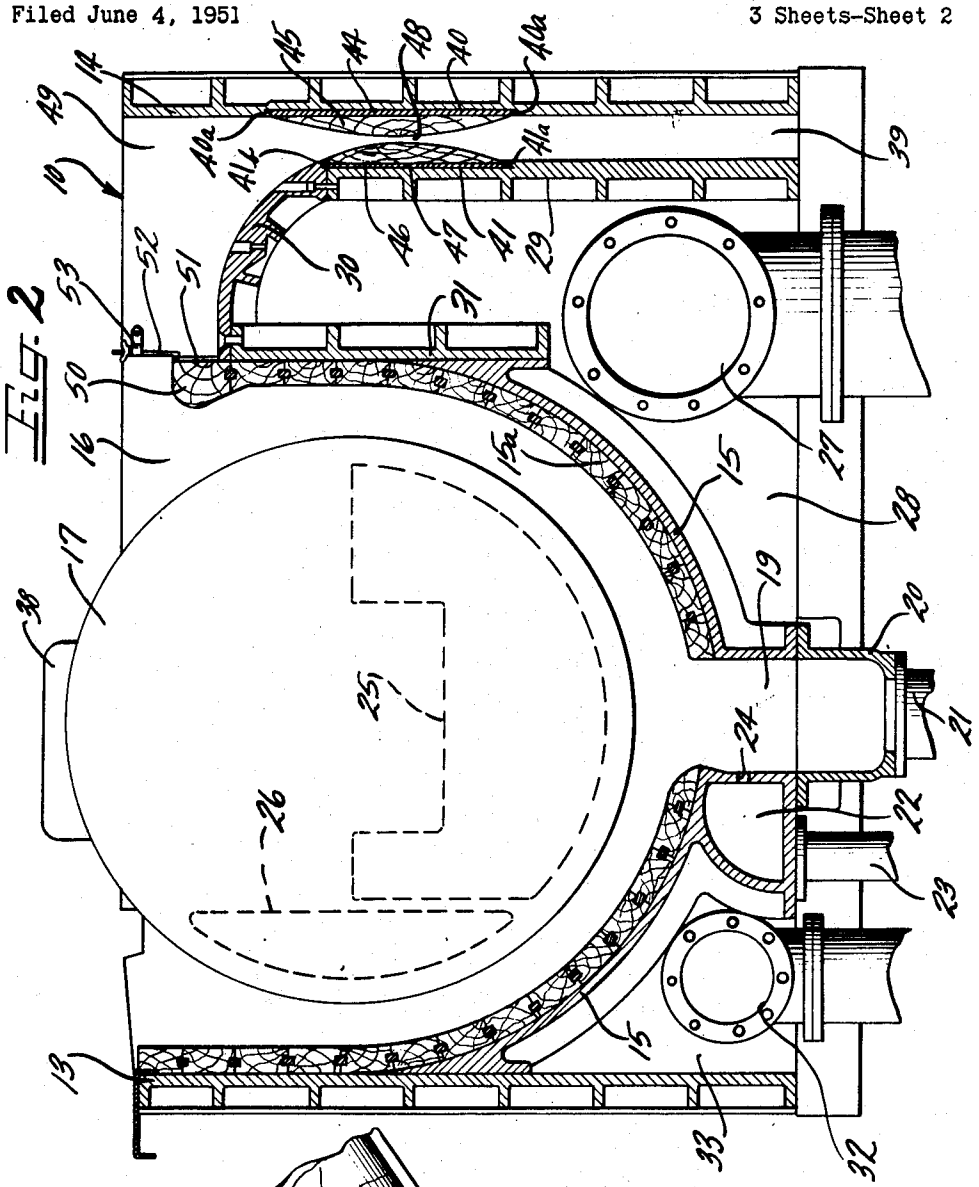
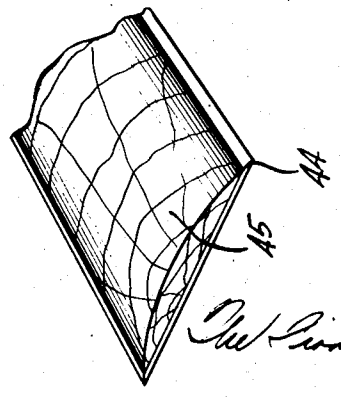


Fig. 4



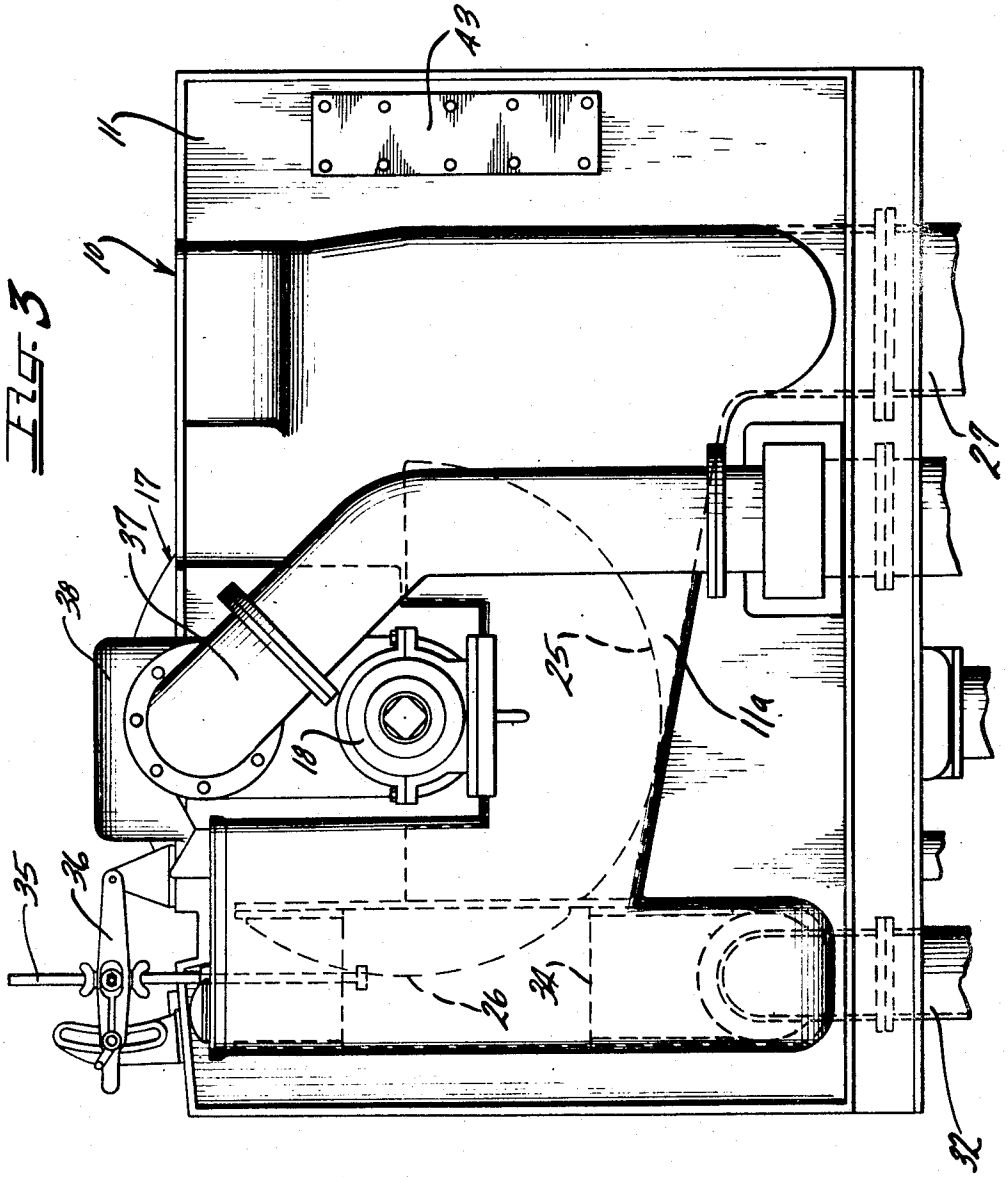
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Fig. 3



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CYLINDER PAPERMAKING MACHINE

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Application June 4, 1951, Serial No. 229,832

2 Claims. (Cl. 92—43)

This is a continuation-in-part of application Serial No. 713,203, filed November 30, 1946, now abandoned.

This invention relates to cylinder paper making machines, and especially to stock inlets or feed boxes for such machines. The problem of obtaining a uniform feed across the entire width of a paper making machine is particularly difficult in the case of a wide cylinder board machine. In a Fourdrinier machine the stock is applied directly to the forming wire, at a velocity corresponding to the velocity of the wire, in a broad thin stream. In a cylinder board machine, on the other hand, stock is fed to a vat circle in a relatively quiescent condition, since turbulence in the feed from the feed box interferes with uniform deposition of the web on the cylinder mold. In maintaining such a quiescent condition in the feed box difficulty has been experienced heretofore in that the stock tends to settle out, to clot, or lump, and in general to become non-uniformly distributed through the width of the feed box. The problem is recognized in U. S. Patent No. 1,964,291, but the device there disclosed has proved ineffective to solve the problem. In those vats which have been constructed in accordance with that patent, it has been necessary to provide an auxiliary inlet to achieve acceptable stock distribution and fluid flow.

It has been discovered that uniform quiescent flow of stock from the feed box of a cylinder board machine can be accomplished without settling or segregating of the stock within the feed box by providing a vertical passageway of the feed box with a venturi throat through which all of the stock must pass, the cross-sectional area of the constriction of which throat bears a definite relation to the cross-sectional area of the vertical passageway.

In accordance with the present invention, a venturi throat in a vertical passageway of the cylinder vat feed box has a cross-sectional area approximately one-sixth that of the cross-sectional area of the vertical passageway.

The venturi throat discharges into an open-topped chamber directly feeding the making board or weir discharge to the vat circle. The venturi throat may conveniently be provided by two opposed wall members in the feed box. In this manner the size and shape of the throat, within the prescribed limits, can be conveniently changed by varying the shapes of the wall members, the feed box can be quickly opened up for cleaning, and standard cylinder vats can be easily equipped with a venturi throat of this invention.

The stock as it flows upwardly through the feed box and through the venturi throat has its velocity tremendously increased, thereby preventing any settling out or separation of fiber bundles. In addition, the venturi throat, by providing a narrow gap in the feed flow along the entire width of the machine, acts as a stock spreader as well as a stock mixer to prevent development of uneven stock conditions at the making board or weir. It is not necessary that the stock be maintained under pressure after passage through the venturi throat since the pond maintained above the throat has a sufficient head to prevent spouting.

One of the objects of this invention is to provide a cylinder type paper making machine with a feed box from which the flow of stock is quiescent and uniform, and in which there is no segregation of stock.

Other and further objects of the invention will be apparent to those skilled in the art from the following detailed description of the annexed sheets of drawings which, by way of a preferred example only, illustrate one embodiment of the invention.

On the drawings:

Figure 1 is a broken top plan view of a cylinder type paper making machine according to this invention and equipped with a venturi throat in the feed box end thereof and showing the throat-defining boards in a partially removed position.

Figure 2 is a transverse cross-sectional view, with parts in side elevation, taken along the line II—II of Figure 1 and illustrating the cylinder in somewhat diagrammatic form.

Figure 3 is a front side elevational view of the cylinder machine taken along the line III—III of Figure 1.

Figure 4 is a fragmentary perspective view of one of the venturi throat-defining boards used in the feed box of this invention.

As shown on the drawings:

In Figures 1 to 3 inclusive the reference numeral **10** designates generally the stock vat of the cylinder machine of this invention. The vat **10** has a front side wall **11**, a rear side **12**, a rear end wall **13**, and a front end wall **14**. Arcuate partition walls **15** extending between the front and rear side walls **11** and **12** carry boards **15***a* and define a vat circle **16** in the vat. A cylinder mold **17** is rotatably mounted in the vat circle **16** and is supported on bearings **18** carried by the side walls **11** and **12**. Partition walls are arranged in the vat to provide a trap or sump **19** at the bottom of the vat circle **16** which is drained by an outlet box **20** connected to a drain pipe **21**. Additional walls in the vat define a sub-chamber **22** extending alongside of the sump **19** and fed by a pipe **23**. An outlet slot **24** communicates with the sump **19** along the length thereof to join the chamber **22** with the sump for feeding diluting water, stock, or the like to the sump as desired.

The interior of the cylinder mold **17**, discharges through an opening in the front side wall **11** of the vat designated by the dotted line **25**. This opening **25** is supplemented with a second opening shown by the dotted line **26**. The two openings **25** and **26** control drainage of white water out of the interior of the cylinder mold, the water flowing through the end of the mold.

The front side wall **11**, as shown in Figure 3, has a raised chamber-defining portion **11***a* communicating with the openings **25** and **26** and discharging to an outlet pipe **27** connected to the lower end of the chamber portion at the front end wall **14**. As shown in Figure 2, the pipe **27** is underneath the partition wall **15** and is in a chamber **28** in the vat bounded by an upstanding end wall **29** in spaced parallel relation to the end wall **14** and an arcuate bridging top wall **30** joining the top of the wall **29** with another vertical wall **31** secured on the upper end of the arcuate portion **15**.

The raised portion of the front side wall **11** has a second drainage sump shown in Figure 3 communicating with a drain pipe **32**. This drain pipe **32** is in a chamber **33** under the vat circle **15** between the rear end wall **13** and the walls defining the passageway **22**. A gate or weir **34** suspended from a rod **35** carried by an adjustable lever **36** on top of the wall **11** is interposed between the opening **26** and the chamber-defining portion **11***a* of the front side wall **11** to control drainage of white water into the pipe **32**. The arrangement is such that the pipe **27** drains most but not all of the white water out of the cylinder mold **17** at a rate insufficient to maintain a white water level below the weir gate **34** so that the height of the gate determines the actual white water level in the cylinder mold. The gate receives white water and foam thereover and discharges to the pipe **32**.

The upper portion of the cylinder mold has communication with an exhaust pipe **37** connected to a fitting **38** on the front side wall **11** having communication with the interior of the top of the mold. The pipe **37** is connected to a fan or suction device for drawing air from the mold.

The walls **14** and **29** shown in Figure 2 are in spaced opposed parallel relationship to define a vertical passageway **39** therebetween. This passageway is open at the bottom end thereof and is supplied with stock by means of a feed pipe or the like (not shown).

The wall **14** has a groove or recess **40** intermediate the top and bottom thereof and extending from the front to the rear side walls of the vat. This recess **40** has undercut or dovetailed top and bottom edges **40***a*. A sim-

ilar groove or recess 41 is provided in the inner face of the wall 29 in opposed relation to the recess 40. This recess 41 has an undercut or dovetailed bottom edge 41*a* and an open top edge that registers with an undercut or dovetailed edge 41*b* in the wall member 30.

As shown in Figure 1, the front and rear side walls 11 and 12 have openings 42 registering with the space between the walls 14 and 29 and aligned with the recesses 40 and 41. These openings are closed by removable plates 43 bolted or otherwise secured on the walls 11 and 12.

A metal plate 44 slidably fits in the recess or groove 40 and has beveled top and bottom edges fitting the undercut edges 40*a* of this recess. The plate 44 is as long as the width of the machine to extend between the front and rear side plates 11 and 12. A wooden board 45 is carried by the front face of the plate 44, and this board has a curved contour so that it is thickest at its midportion.

A similar plate 46 fits in the recess or groove 41 on the wall 29 and has beveled edges for fitting in the undercut edges 41*a* and 41*b*. This plate 46 carries a wooden board 47 also of an arcuate contour to be thickest at its central portion. The two plates 44 and 46 with the boards 45 and 47 thereon are easily inserted in the recesses or grooves of the walls 14 and 29 through an opening 42 in the walls 11 and 12 as illustrated in Figure 1. The plates when mounted on the walls carry the boards 45 and 47 in spaced opposed relationship to define a venturi passageway 48 in the upper end of the vertical passageway 39. This passageway 48 converges to a relatively narrow throat extending across the full width of the passageway 39 and then diverges from this throat along a gradually widening path into an open-topped chamber 49 above the wall 30. As can be seen in Figure 2, the curvature of the board 47 is substantially a continuation of that of the arcuate bottom-defining wall 30, so as to present a substantially smooth and continuous arcuate surface from the making board to the lower edge of the board 47. As can be seen from the same figure, the curvature of the board 45 is less than that of the board 47, and the board 45 extends above the upper edge of the board 47. Both of the boards 45 and 47 form parts of the surfaces of the walls on which they are mounted. The cross-sectional area of the throat of the venturi is approximately one-sixth that of the unconstricted part of the vertical passageway 39. This chamber 49 discharges into the upper end of the vat circle 16 over a making board 50. A gate or weir 51 is mounted behind the making board 50 and is raised and lowered by means of rods 52 in brackets 53 for varying the height of a pond maintained in the chamber 49.

In operation of the cylinder machine of this invention stock is fed into the bottom of the passageway 39 from one or more feed pipes and flows upwardly through the passageway into the lower end of the venturi passageway. As the venturi passageway converges the pressure head of the stock is converted into a velocity head so that, by the time the stock reaches the narrow gap in the venturi throat, it is traveling at a very high velocity to equalize flow conditions across the entire width of the machine. Stock bundles or fibers cannot separate out at this high velocity. Such results are not accomplished if the area of the venturi throat is more than one-fourth or less than one-eighth of the area of the passageway 39. The rapidly flowing stock leaving the venturi throat flows through the diverging passageway into the lower end of the chamber 49. This chamber 49 is maintained under atmospheric pressure since it has

an open top. However, it affords a sufficient head to prevent spouting of stock and undue agitation above the throat.

The size or shape of the venturi throat, within the limits prescribed, can be varied at will by replacement of the throat-defining boards 45 and 46. These boards and their supporting plates are easily removed so that the feed box can be opened up for cleaning. Stock entering the vat circle over the making board 50 is drained through the foraminous surface of the cylinder mold 17, the white water is removed as described hereinabove, and the stock fibers are deposited on the foraminous surface in web form.

While the illustrative embodiment shown and described provides means for readily replacing the venturi throat of this invention it will be understood that the principles of this invention are applicable to various other constructions in which the venturi throat may be integral with or so mounted as to be more difficultly removable from the passageway ahead of the throat. Various other details of construction may be varied through a wide range without departing from the principles of this invention provided only that the ratio of the venturi throat opening to that of the passageway ahead of it be maintained at approximately 1 to 6.

Thus it can be seen that a feed box for a cylinder paper making machine is provided which introduces the stock uniformly across the entire width of the machine, with no segregation of the stock in the feed box.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

1. A cylinder paper machine comprising a stock vat defining a vat circle and a feed box supplying stock to the vat circle over a making board, said feed box having a vertical stock supply passageway across the width of the vat, defined by two vertical walls, said feed box having a convexly arcuate bottom extending between said making board and a contiguous wall of said passageway, the other wall defining said passageway extending above said bottom, a vertically arcuate wall member carried by the said contiguous wall and forming a part of the surface thereof, the curvature of said wall member being substantially a continuation of the curvature of the said bottom so as to provide a smooth arcuate surface between the making board and the lower edge of the wall member, said wall member extending across the width of the vat, a vertically arcuate opposing wall member carried by the other passageway-defining wall and extending across the width of the vat, said wall members forming a venturi throat, the ratio of the distance between said wall members at maximum constriction of the venturi throat to the distance between the walls below the throat being approximately one to six.

2. The cylinder paper making machine of claim 1 wherein the opposing wall member is of less curvature than and extends above the wall member carried by the contiguous wall.

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