June 8, 1948. S. D. WELLS 2,442,990

APPARATUS FOR WASHING PAPER STOCK

Filed June 24, 1942

Fig. 1

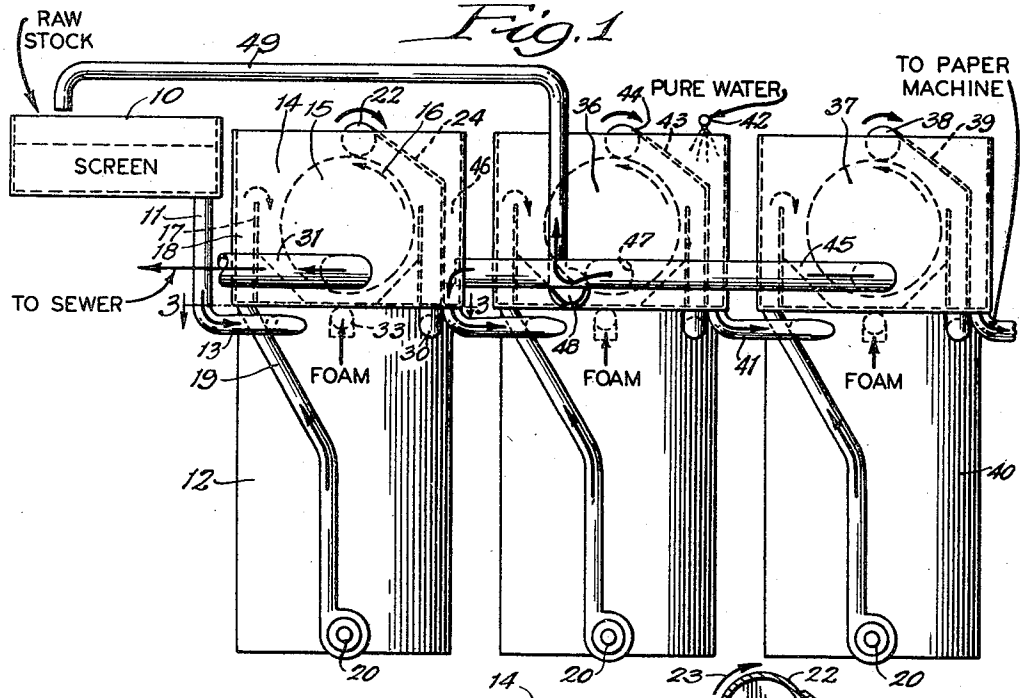


Fig. 2

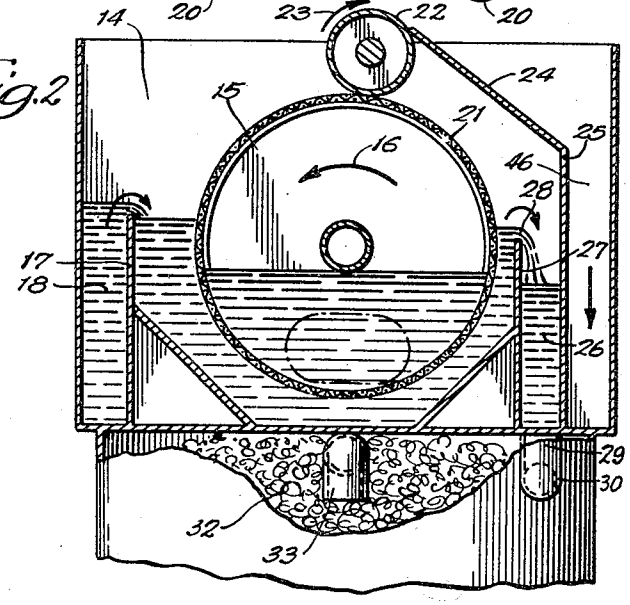
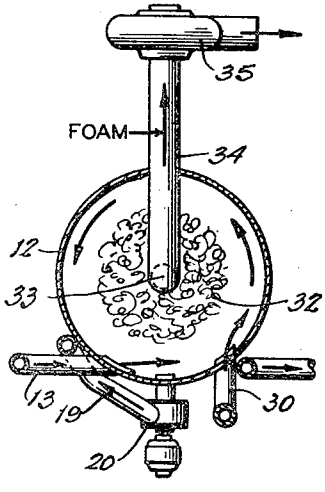


Fig. 3



Inventor:
Sidney D. Wells,

By Soans, Pond & Anderson,
Attorneys.

Patented June 8, 1948

2,442,990

UNITED STATES PATENT OFFICE

2,442,990

APPARATUS FOR WASHING PAPER STOCK

Sidney D. Wells, Combined Locks, Wis., assignor to The Institute of Paper Chemistry, a corporation of Wisconsin

Application June 24, 1942, Serial No. 448,258

1 Claim. (Cl. 92—20)

1

The invention relates to improvements in process and apparatus for washing paper stock. Although capable of other uses, it is of particular value in washing paper stock made from waste paper which originally carried a large amount of ink or similar impurities.

Although various methods, some more or less successful, have been employed for freeing or getting rid of ink from waste paper which is to be used in the making up of a paper furnish, the final washing of the de-inked paper stock has been attended with considerable difficulty. One of the difficulties has been the removal of the slime or scum which, usually in the form of bubbles or foam, accumulates in the vat or other receptacle which contains the stock during, or subsequent to, the actual washing operation. The concentration of ink pigment in this scum, especially as the washing approaches completion, is many times greater than in the stock, and it is consequently a serious source of contamination of the otherwise well-washed stock.

The principle object of the present invention is to provide a method and apparatus for washing the so-called "de-inked" paper stock in such manner that any residual ink or other waste material will not be carried along with the stock into the paper furnish in the form of bubbles which might interfere with the web-forming operation at a later time and more especially soil or contaminate the otherwise well washed stock.

In illustrating a preferred embodiment of my invention, I have selected a three-stage washer which is set forth in the drawings wherein:

Fig. 1 is a somewhat diagrammatic view of the three-stage washing apparatus;

Fig. 2 is an enlarged vertical section through one of the washing vats; and

Fig. 3 is a plan view taken on the line 3—3 of Fig. 1.

The flow of paper stock from which the ink has been freed is conducted through the usual apparatus for the purpose of removing heavy particles and over a screen arrangement 10 to remove coarse fiber bundles and other unwanted objects. From the screen 10, the stock is conducted through a pipe 11 into the axially vertical cylinder tank 12. The inflow pipe 11 discharges into the upper end of said cylindrical tank 12, and has its lower end arranged at a tangent as shown at 13 in Fig. 3, so that the liquid in the tank will be given an anti-clockwise swirling movement around a vertical axis coinciding with the axis of the tank 12.

Above the tank 12 is located the vat 14 in which

2

rotates on a horizontal axis the cylinder mold 15 of the usual construction. Said cylinder mold 15 rotates in the direction of the arrow 16, and the stock is admitted to the descending side of the cylinder 15 over a weir or baffle 17 which divides the main part of the vat 14 from a distributing box 18. The lower end of said distributing box or head box 18 is connected to the upper end of a conduit 19 through which stock is conveyed upwardly by the pump 20 drawing from the lower end of the tank 12.

As shown best in Fig. 2, the web formed on the screen 21 of the cylinder mold is removed by a couch roll 22 which revolves in the direction of the arrow 23 and from which the stock is stripped by a doctor knife 24. The lower part of the doctor knife 24 extends at rather a sharp angle to the upper end of the partition 25 which constitutes the outer wall of the overflow compartment 26 which receives any stock or pulp which flows over the upper end of the baffle 27. It will be observed that the baffle 27 is slightly lower than the inflow baffle 17, so that it is possible to have a substantial overflow 28, while at the same time there is a satisfactory distribution of stock due to the stock flowing over the inflow baffle 17.

The pulp from the overflow compartment 26 flows therefrom into a conduit 29 which conducts the pulp into an upper zone of the tank 12 through a substantially horizontal conduit 30 which is arranged in substantially a tangential position in reference to the cylindrical tank 12, so that the overflow from the vat will be directed into the tank in a more or less counter-clockwise direction and will supplement the swirling action due to the tangential inflow of stock through the conduit 13.

When the system is in proper operating condition, the pump 20 and conduit 19 will deliver into the head box 18 a considerably greater volume of pulp than is represented by the outflow of waste water which is drained through the screen 21 of the cylinder and flows off through the usual discharge pipes 31 which lead to the sewer. Hence, there will be a substantial amount of pulp overflowing the baffle 27 into the overflow compartment 26. This overflow is of sufficient volume to carry off any slime or bubbles which are carried around with the cylinder mold as it revolves in the vat, and these bubbles, etc., in the overflow are discharged into the cylinder 12. Because of the swirling action due to the tangential inflow pipes 13 and 30, the latter particles, i. e., the foam, accumulate in the center of the upper zone of the tank 12, as indicated at

32, and from time to time, as they accumulate, they may be drawn off through a suction pipe 33 which is connected to a horizontal discharge pipe 34 leading into a suction fan or pump 35.

In many cases, it is advisable to re-wash the pulp after it has been subjected to the first washing treatment just described. To this end, the washed pulp which is removed by doctor 24 is conducted into a second washing apparatus 36 very similar to the one previously described, and, if necessary, to still another cylinder apparatus 37 by which time it is in proper condition to be used in making the paper.

Describing the arrangements of the third or final washing apparatus 37, it will be seen that everything about it is the same as in the case of the vat 14 and associated arrangements, it being understood, however, that the pulp which is removed from the couch roll 38 by doctor 39 is then ready to be used in making up the furnish for the paper machine. The tank 40 associated with the vat 37 receives its supply of pulp from the second stage of the washing through the tangent pipe 41. Said pulp which enters tank 40 through conduit 41 is made of the proper consistency by means of a pure water spray 42 located above the inclined doctor 43 which removes the stock from the couch roll 44 of the second cylinder mold. Also, the effluent from the cylinder mold in vat 37, which is discharged through the waste water pipes 45, is discharged not into the sewer, but into the washed stock compartment 46 of the first vat, so that the water is in effect re-used for re-washing the pulp after it has been first washed in the vat 14. A sufficient volume of water flows through the exit pipes 45 from the vat 37 in order to form a liquid pulp of proper consistency to be washed effectively in the second stage of the apparatus. The diluted stock in compartment 46 flows through conduit 50 into the second washing unit.

As to the end discharges 47 of the second cylinder mold, these also are not connected to the sewer but to the inlet of a pump 48 which, by means of a pipe 49, conveys the effluent into the box of the screen 10 where said effluent is mixed with the incoming flow stock. Hence, it will be seen that the only effluent which is connected directly to the sewer and hence wasted is the effluent from the first washing stage, out of pipes 31.

The scope of the invention is to be determined by reference to the appended claim.

I claim:

A paper stock washing machine comprising a battery of connected tank and vat units means connected with each of said tanks for effecting the foam-removal of foreign ingredients, means

for introducing raw stock into the tank of the first tank-and-vat unit, a pair of vertically-disposed horizontally-spaced weirs in each of said vats for separating the interior thereof into a stock inlet distributing compartment, a stock overflow outlet compartment, and an intermediate mold compartment, a rotatable mold in each of said vats equipped with means for collecting and removing stock fibers therefrom for delivery outside of the respective connected tank-and-vat unit, conduit means for conveying the stock from each of said tanks to the inlet distributing compartment of the vat of the respective unit, other conduit means connecting the stock overflow outlet compartment of each vat with the tank of the corresponding unit so as to resubject the stock overflow to the foam-forming agitation of said tank, third conduit means for delivering the fibers from one mold tangentially into the upper zone of the tank of the subsequent tank-and-vat unit whereby said fibers are resubject to swirling agitation, and means for removing the water from the interior of each of said molds.

SIDNEY D. WELLS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
718,651	McConville	Jan. 20, 1903
813,984	MacNaughton	Feb. 27, 1906
983,441	Harvey	Feb. 7, 1911
1,245,839	Waring	Nov. 6, 1917
1,396,227	Marr	Nov. 8, 1921
1,405,944	Shartle	Feb. 7, 1922
1,468,337	Winestock	Sept. 18, 1923
1,632,802	Richter	June 21, 1927
1,700,925	Dezurik	Feb. 5, 1929
1,707,604	Fisher	Apr. 2, 1929
1,746,434	Lowe	Feb. 11, 1930
1,828,279	Brown	Oct. 20, 1931
2,005,839	Edge	June 25, 1935
2,018,938	Wells	Oct. 29, 1935
2,060,685	Murphy	Nov. 10, 1936
2,077,059	Snyder	Apr. 13, 1937
2,078,810	Richter	Apr. 27, 1937
2,098,608	Berges	Nov. 9, 1937
2,116,511	Earle	May 10, 1938
2,193,032	Mackenzie	Mar. 12, 1940
2,249,128	Goldsmith	July 15, 1941
2,331,455	Cowles	Oct. 12, 1943
2,355,243	Scheid	Aug. 8, 1944

OTHER REFERENCES

Technical Association Papers Series 19 (1936), pages 167 to 171.