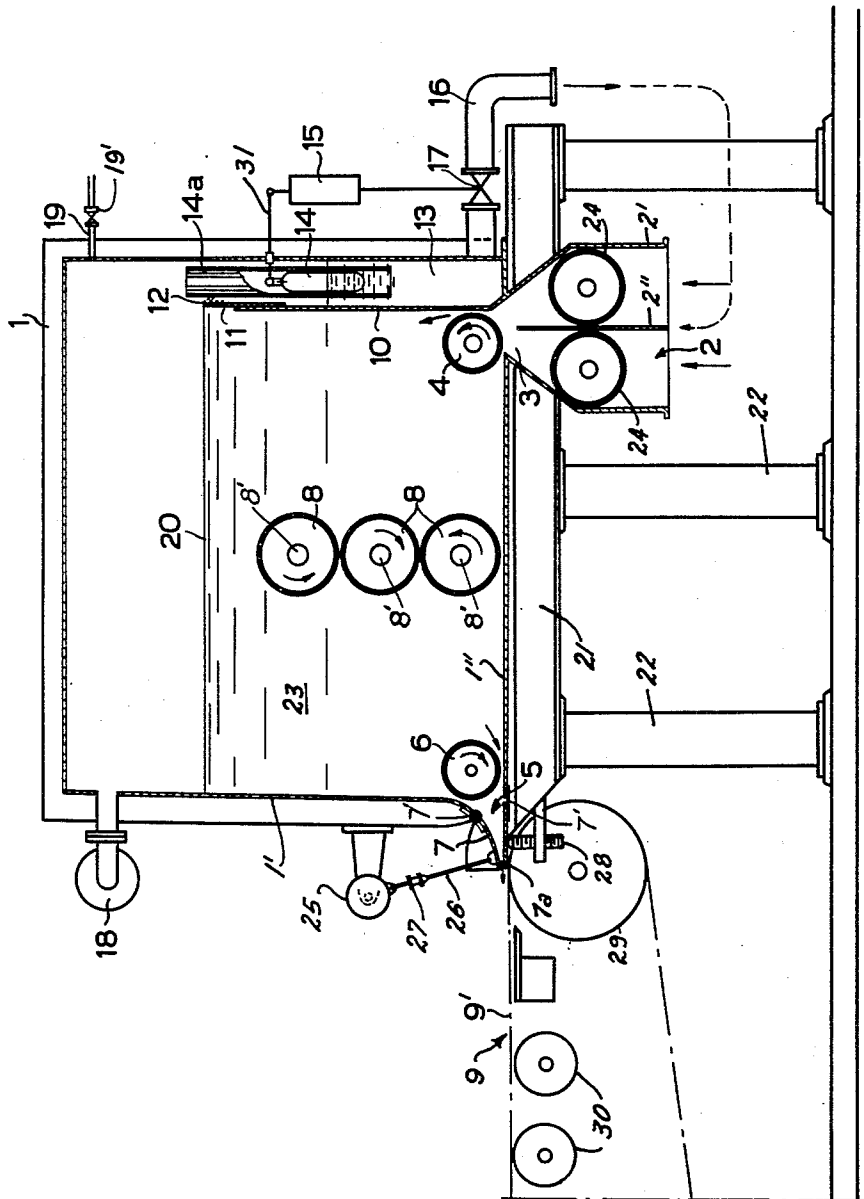


April 26, 1960

E. IKAVALKO

2,934,141

APPARATUS FOR FEEDING PAPER PULP AT A CONTINUOUS
RATE INTO A PAPER MAKING MACHINE
Filed Nov. 2, 1955



INVENTOR:
Erkki Ikaivalko

BY:
Michael S. Striker
att.

1

2,934,141

APPARATUS FOR FEEDING PAPER PULP AT A CONTINUOUS RATE INTO A PAPER MAKING MACHINE

Erkki Ikavalko, Helsinki, Finland, assignor to
Valmet Oy, Helsinki, Finland

Application November 2, 1955, Serial No. 544,522

3 Claims. (Cl. 162—337)

The present invention relates to a method and an apparatus for continuously feeding pulp into a paper making machine, and more particularly to a method and apparatus for continuously feeding pulp at a constant rate.

Heretofore the greatest difficulties in feeding paper pulp into paper making machines have been encountered in maintaining the feeding rate of this pulp constant to avoid variations in the thickness of the paper.

It is one object of the present invention to avoid the above difficulties and feed the pulp into the paper making machine at a constant rate.

It is a further object of the present invention to accomplish such a constant feeding rate with relatively simple means so that the operation of the apparatus can be handled in an efficient manner.

It is an additional object of the present invention to provide means by which the feeding rate can be easily adjusted to produce papers of different thickness.

It is yet another object of the present invention to form such an apparatus of relatively few and simple parts so that the apparatus can be produced at an economical price and will give long and trouble-free service.

With the above objects in view, the method for continuously feeding pulp at a constant rate according to the present invention consists in the steps of feeding paper pulp at a rate higher than a given rate into a chamber to form a pulp bath in the chamber, discharging the pulp from the chamber, in response to the pressure head of the pulp bath and the gas pressure acting on the bath, onto a supply conveyor of a paper making machine at a rate smaller than the given rate so that the level of the bath and the pressure head tend to increase, drawing off from the chamber excess pulp which tends to rise above a given level in the chamber in order to maintain the pulp bath constantly at the given level, and maintaining a constant gas pressure in the chamber above the bath, whereby the pulp will be discharged at a constant rate onto the conveyor.

The apparatus for carrying out the method comprises a gas-tight, closed container, an overflow partition in the container connected to the bottom wall and at least one side wall of the container and dividing the container into a chamber for a pulp bath and an overflow compartment, the chamber having an inlet, the overflow partition having a top edge spaced from the top wall of the container, feeding means communicating with the chamber inlet for feeding paper pulp into the chamber, first discharge means communicating with the chamber for discharging pulp therefrom, the discharge means being located adjacent the bottom of the container and being spaced from the inlet, second discharge means communicating with the compartment, and gas pressure regulating means communicating with the container at an elevation higher than the top edge of the partition, whereby when paper pulp is fed into the chamber at a rate higher than the discharge rate of the pulp through the first discharge

2

means the excess pulp will flow over the partition into the overflow compartment to be discharged therefrom by the second discharge means so that the level of the pulp bath in the container will be kept constant and the discharge rate of the pulp through the first discharge means will depend only on the gas pressure above the pulp bath.

Preferably, the horizontal cross-sectional area of the overflow compartment is made substantially smaller than the cross-sectional area of the chamber so that changes in the pulp level in the overflow compartment will have practically no influence on the gas pressure maintained above the pulp level in the container.

The novel features which are considered characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of a specific embodiment when read in connection with the accompanying drawing.

The drawing is a schematic, partly sectioned side view of the apparatus.

The drawing illustrates a gas-tight, closed container 1 supported above the floor by horizontal beams 21 and vertical columns 22. The container 1 is preferably made from steel plates and the inner surfaces of the container are preferably made from stainless or acid-proof steel. The container is divided by an overflow partition 10, 11 into a chamber 23 and into a separate overflow compartment 13.

In the preferred embodiment shown in the drawing, the overflow partition has a lower stationary wall portion 10 fixedly connected to the bottom wall and to opposite side walls of the container 1, and an upper movable wall portion 11 adjustably connected to the lower wall portion 10 and to the side walls of the container. The upper wall portion 11 can be shifted in contact with the lower wall portion 10 in upward or downward direction in any well known manner to adjust the top edge 12 of the upper wall portion 11 between a lower position and an upper position in which the top edge 12 is spaced from the top wall 1 of the container a distance smaller than in the lower position. The limits of this adjustment are such that in the uppermost position the upper wall portion 11 will still be in sealing contact with the lower wall portion 10 and the top edge 12 will be spaced from the top wall of the container 1. In any adjusted position the overflow partition 10, 11 will divide the container in a chamber 23 and an overflow compartment 13 separated from each other and communicating with each other only through the space above the top edge 12 of the movable portion 11 of the overflow partition.

The chamber 23 is provided with an inlet opening 3 formed in a portion of the bottom wall of the chamber 23 adjacent the overflow partition 10, 11. Feeding means 2 are provided communicating with the chamber inlet 3 for feeding paper pulp into the chamber. The feeding means 2 are of known construction and they consist of an inlet box 2' divided by a partition wall 2'' into two separate box compartments into which the paper pulp is fed by a pump, not shown in the drawing. Two perforated hollow rollers 24 driven about horizontal axes by any known drive means are respectively arranged in the box compartments. These rollers 24 serve to thoroughly mix the material fed into the inlet box 2' before it enters into the chamber 23. A similar roller 4, driven in the direction of the arrow about a horizontal axis by drive means, not shown in the drawing, is located inside the chamber 23 adjacent to the inlet opening 3. This roller

4 mainly serves to equalize the flow of the material through the inlet opening 3.

For feeding the pulp onto a conveyor 9 the chamber 23 is further provided with discharge means 5 located at the bottom of the front wall 1' of the container. These discharge means 5 comprise two baffle plates 7 and 7a respectively hinged to the front wall 1' and to the bottom wall 1'' of the container by hinges 7'. The baffle plates 7, 7a project forwardly from these walls, extend in transverse direction over the full width of the conveyor 9 and form between themselves an elongated outlet nozzle communicating with the chamber 23. Regulating means are provided to adjust the position of the baffle plates 7 and 7a. The regulating means for the preferred embodiment shown in the drawing consists in a plurality of eccentrics 25 supported for simultaneous turning movement on the container 1, and connecting rods 26 respectively connecting the eccentrics 25 with the upper baffle plate 7. Only one of the eccentrics 25 and one of the connecting rods 26 are shown in the drawing but it is understood that a whole series of such eccentrics and connecting rods are provided which are mounted spaced from each other along the front wall 1' of the container to support the elongated baffle plate 7 properly over its whole length. To make a fine-adjustment possible, each of the connecting rods is formed from two separate parts which are connected together by adjusting nuts 27 in a well known manner. By turning these nuts, which are threadedly connected to the adjacent ends of the two parts of the connecting rods 26, in one or the other direction, the overall length of the adjusting rod can be adjusted. The angular position of lower baffle plate 7a can be adjusted by means of adjusting screws 28 adjustably screwed in an arm fixed to the beam 21 and bearing with its upper end against the underside of the baffle plate 7a.

By this arrangement, the opening of the outlet nozzle can be adjusted, as well as the position of the outlet nozzle in relation to the feed conveyor 9 located in front of the outlet nozzle. The feed conveyor 9, of known construction, consists of an endless belt 9' formed from a flexible wire mesh which is driven by a drive roll 29 and supported by a plurality of supporting rolls 30.

The overflow compartment 13 is provided with an outlet conduit 16 communicating with the compartment 13 near the bottom of the same. Float means are provided inside the overflow compartment 13 which consist of a protecting tube 14a open at both ends and fixedly mounted on the rear wall of the container 1 and an elongated float 14 located inside the protecting tube 14a. A lever 31 is pivotally mounted on the rear wall of the container 1, whereby this mounting is sealed in any known manner to the rear wall so that neither gas nor liquid may escape through this mounting. The lever 31 reaches through a slot in the protecting tube 14a and is linked at one end to the upper end of the float 14. The other end of the lever 31 is linked to a regulating device 15 which in turn is operatively connected in any well known manner to a valve 17 located in the outlet conduit 16. The regulating device 15 may be a pneumatic, hydraulic or electrical mechanism adapted to translate and to amplify the movements of the lever 31 into the proper adjustment of the valve 17. The outlet conduit 16 is, as schematically illustrated in the drawing, connected to the inlet means 2.

The container 1 is further provided with gas pressure regulating means communicating with the container 1 at an elevation higher than the elevation of the top edge 12 of the overflow partition 10, 11 in the uppermost position of this top edge. The gas pressure regulating means consist of an air pump 18 connected by a conduit with the interior of the container 1 and an air conduit 19 provided with a regulating air valve 19'.

Three mixing and guiding rollers 8 of similar construction as the rollers 24 are mounted superimposed to

each other within the chamber 23 between the inlet 3 and the outlet 5, and these rollers are rotated about horizontal axes preferably in the direction as indicated by the arrows. The roller shafts 8' are supported in the side walls of the container 1 and are driven by any drive means, not shown in the drawing. The rollers 8 serve to keep the pulp in the chamber 23 homogeneous and in continuous movement.

A roller 6 similar to the rollers 8 is located within the chamber 23 adjacent the outlet 5. This roller is rotated in the direction as indicated and serves to equalize the flow of the material through the outlet. The speed with which the roller is rotated may be varied to adjust the feeding rate of the pulp.

The apparatus as described will operate as follows:

Paper pulp is fed through the feeding means 2 and the inlet opening 3 into the chamber 23 of the container 1. The feeding rate of the pump is adjusted in such a way that this rate is higher than the rate with which the pulp leaves the chamber 23 through the first outlet means 5. Therefore, a pulp bath is formed in the chamber 23 and when the pulp level 20 will reach the top edge 12 of the overflow partition 10, 11, the excess pulp resulting from the difference in the feeding rate and the discharge rate will flow from the chamber 23 into the overflow compartment 13. The pulp level 20 in the chamber 23 with which the outlet 5 communicates will therefore be kept constant all the time.

The excess pulp located in the overflow compartment 13 will be drawn therefrom by means of the outlet conduit 16 and this excess pulp will then be fed back into the inlet box 2' and recycled into the chamber 23. The float 14 located in the overflow compartment 13 below the top edge 12 of the overflow partition 10, 11 serves thereby, in cooperation with the regulating mechanism 15 and the valve 17, to keep the pulp level in the overflow compartment always below the pulp level 20 in the chamber 23. This assures that the excess pulp is always free to flow over the top edge 12 from the chamber 23 into the overflow compartment 13 and prevents a build-up of the pulp level 20 in the compartment 23 above the top edge 12 of the overflow partition.

The air pressure within the container 1 above the pulp level 20 is regulated and kept constant by means of the pump 18 and the valve regulated air conduit 19. Depending on the air pressure desired above the pulp level 20, the pump 18 is driven either as a suction pump or compression pump whereby pressure higher or lower than atmospheric pressure can be built up above the pulp in the container. During the operation of the machine the pump 18 and the valve 19' are regulated in such a way that the air pressure above the pulp level is kept constant. Proper indicating instruments, not shown in the drawing, are provided to observe and/or to regulate the air pressure in the container.

Since the horizontal cross-sectional area of the overflow compartment 13 is only a fraction of the horizontal cross-sectional area of the chamber 23, small variations in the pulp level in the overflow compartment 13 will have no disturbing influence on the constant air pressure maintained above the pulp level.

The discharge rate of the pulp depends on the pressure head of the pulp bath and the gas pressure acting on the bath. Since the pulp level is kept automatically constant by means of the described overflow arrangement, only the air pressure above the pulp level has to be kept also constant to arrive at a practically constant preselected discharge rate, so important in the production of uniform paper.

To regulate the discharge rate for the production of a different grade of paper, the pulp level may be raised or lowered by adjusting the upper wall portion 11 of the overflow partition, by adjusting the air pressure above the pulp level through proper adjustment of the air pump 18 and the regulating valve 19, or by adjusting the posi-

5

tion of the baffle plates 7 and 7a These adjustments may be made separately or in combination as desired. A small adjustment of the flow rate may also be made by adjusting the rotational speed of the roller 6.

The rollers 4, 8 and 24 serve to mix and guide the pulp properly during the operation.

The automatic maintenance of a constant pulp level height within the container by the described arrangement greatly simplifies the operation of the machine and greatly improves the uniformity of the produced paper.

A similar method and apparatus is described in my copending application No. 544,523.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of methods and apparatus for continuously feeding pulp into a paper making machine differing from the types described above.

While the invention has been illustrated and described as embodied in a method and apparatus for continuously feeding pulp at a constant rate, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can be by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. Pulp handling apparatus for a paper making machine comprising, in combination, a gas-tight, closed container; an overflow partition in said container connected to the bottom wall and at least one side wall of said container and dividing said container into a chamber for a pulp bath and an overflow compartment, said chamber having an inlet, said overflow partition having a top edge spaced from the top wall of said container; feeding means communicating with said chamber inlet for feeding paper pulp into said chamber; discharge means communicating with said chamber for discharging pulp therefrom, said discharge means being located adjacent the bottom of said container and being spaced from said inlet; an outlet conduit communicating with said overflow compartment near the bottom thereof; valve means operatively connected to said outlet conduit; float means located in said overflow compartment below said top edge of said overflow partition, said float means being operatively connected to said valve means for automatically controlling said valve means depending on the pulp level in said overflow compartment; and gas pressure regulating means communicating with said container at an elevation higher than said top edge of said partition.

2. Pulp handling apparatus for a paper making machine comprising, in combination, a gas-tight, closed container; an overflow partition in said container connected to the bottom wall and at least one side wall of said container and dividing said container into a chamber for a pulp bath and an overflow compartment, said chamber having an inlet, said overflow partition having a top edge spaced from the top wall of said container, and the horizontal cross-sectional area of said overflow compartment

6

being substantially smaller than the horizontal cross-sectional area of said chamber; feeding means communicating with said chamber inlet for feeding paper pulp into said chamber; discharge means communicating with said chamber for discharging pulp therefrom, said discharge means being located adjacent the bottom of said container and being spaced from said inlet; an outlet conduit communicating with said overflow compartment near the bottom thereof; valve means operatively connected to said outlet conduit; float means located in said overflow compartment below said top edge of said overflow partition, said float means being operatively connected to said valve means for automatically controlling said valve means depending on the pulp level in said overflow compartment; and gas pressure regulating means communicating with said container at an elevation higher than said top edge of said partition.

3. Pulp handling apparatus for a paper making machine comprising, in combination, a gas-tight, closed container; an overflow partition in said container having a lower stationary wall portion fixedly connected to the bottom wall and at least one side wall of said container and having an upper movable wall portion adjustably connected to said lower stationary wall portion and at least to said one side wall, said wall portions dividing said container into a chamber for a pulp bath and an overflow compartment, said chamber having an inlet, said upper wall portion having a top edge and being movable between a lower position and an upper position in which said top edge is spaced from the top wall of said container a distance smaller than in the lower position; feeding means communicating with said chamber inlet for feeding paper pulp into said chamber; discharge means communicating with said chamber for discharging pulp therefrom, said discharge means being located adjacent the bottom of said container and being spaced from said inlet; an outlet conduit communicating with said overflow compartment near the bottom thereof; valve means operatively connected to said outlet conduit; control means for automatically controlling said valve means depending on the pulp level in said overflow compartment; and gas pressure regulating means communicating with said container at an elevation higher than said top edge of said upper wall portion in the upper position thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

1,166,042	Dillman	Dec. 28, 1915
1,248,972	Witham et al.	Dec. 4, 1917
2,132,874	Morden	Oct. 11, 1938
2,203,802	Thaler	June 11, 1940
2,255,951	Tomtlund	Sept. 16, 1941
2,280,632	Cram	Apr. 21, 1942
2,388,627	Witham	Nov. 6, 1945
2,548,108	Hornbostel	Apr. 10, 1951
2,550,552	Goodwillie	Apr. 24, 1951
2,563,790	Lowe	Aug. 7, 1951
2,677,316	Heys	May 4, 1954
2,677,991	Goumeniouk	May 11, 1954
2,714,341	Poirier	Aug. 2, 1955
2,728,271	Witworth et al.	Dec. 27, 1955
2,756,648	Lee	July 31, 1956
2,756,649	Lee	July 31, 1956
2,756,650	Lee	July 31, 1956
2,756,651	Lee	July 31, 1956