July 11, 1944. H. G. CRAM 2,353,149

THIN STOCK REGULATOR

Filed Oct. 25, 1941

Fig. 1.

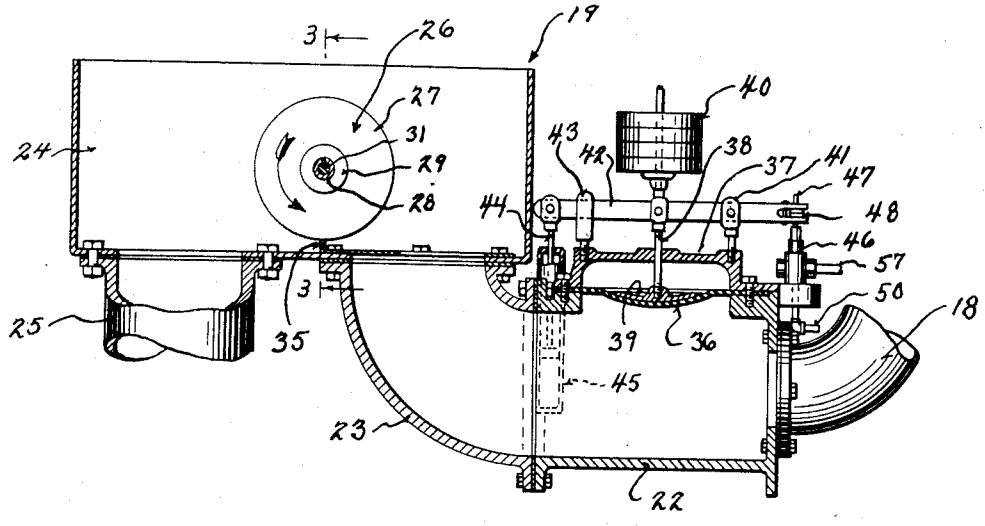
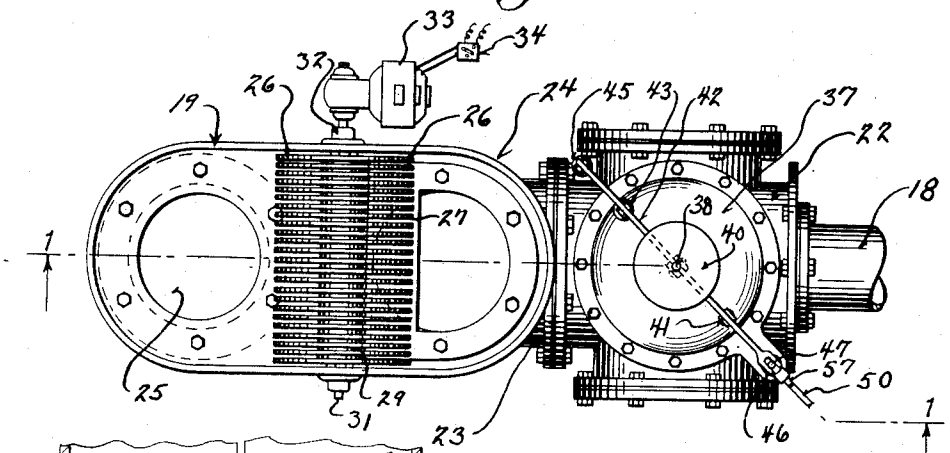


Fig. 2.



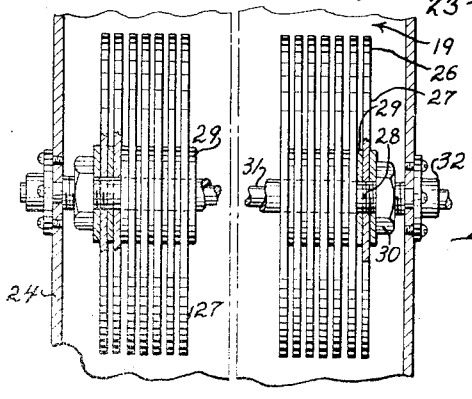


Fig. 3.

INVENTOR
HERVEY G. CRAM

BY Young & Wright

ATTORNEYS

Patented July 11, 1944

2,353,149

UNITED STATES PATENT OFFICE

2,353,149

THIN STOCK REGULATOR

Hervey G. Cram, Appleton, Wis., assignor to The Cram Company, Inc., Appleton, Wis., a corporation of Wisconsin

Application October 25, 1941, Serial No. 416,480

4 Claims. (Cl. 137—78)

This invention appertains to improvements in means for regulating the weight or consistency of pulp and is of the same general character as shown in my pending application Serial #304,774, filed November 16, 1939, and in my Patent 2,280,632, issued April 21, 1942. The apparatuses, as shown in my pending application and in my patent are primarily for the purpose of regulating thick stock, while my present invention is particularly useful in consistency regulators handling thin stock.

One of the primary objects of this invention is to provide means in a consistency regulator for effectively and efficiently holding back the flow of thin stock or pulp through a body in accordance with its consistency, so that the consistency of the main body of the pulp or stock can be controlled. By thin stock is meant, stocks ranging from, say, 1/5 of 1% bone dry solids, to 1½%.

Another salient object of my invention is to provide means in a thin stock regulator for holding back the flow of stock or pulp through a body in accordance with its consistency which includes a rotary cylinder through which the pulp or stock flows.

A still further object of my invention is to provide means for positively rotating the cylinder to cause the constant washing of the pulp off the same by the flow of the stock through the cylinder on the down-stream side.

A still further important object of my invention is to provide means for rotating the cylinder at different desired speeds, in order to vary the consistency of the regulated stock, in that it is apparent that by presenting more cylinder surface to the stock in a given period of time by increasing surface speed (within reason), more liquid will be passed through the cylinder and more solids will adhere to the surface and be passed over, thereby reducing the head on the diaphragm. By slowing the rotation of the cylinder, the reverse action will take place.

With these and other objects in view, the invention consists in the novel construction, arrangement, and formation of parts, as will be hereinafter more specifically described, claimed, and illustrated in the accompanying drawing, in which drawing:

Figure 1 is a longitudinal, sectional view through my novel thin stock retarder, taken on the line 1—1 of Figure 2 looking in the direction of the arrows.

Figure 2 is a top, plan view of my thin stock retarder.

Figure 3 is an enlarged, fragmentary, transverse sectional view through the retarder taken on the line 3—3 of Figure 1 looking in the direction of the arrows and illustrating one preferred form of cylinder which can be used in my retarder.

Referring to the drawing in detail, wherein similar reference characters designate corresponding parts throughout the several views, the numeral 19 generally indicates my novel stock or pulp retarder and it will be noted that the same includes a hollow body portion 22, and one end of this hollow body portion 22 has connected therewith a pipe 18. This pipe 18 delivers a part of the stock from the stock chest (not shown) to my retarder. The opposite end of the body 22 has connected therewith an elbow coupling 23, which leads to the bottom of a control tank or box 24 adjacent to one end thereof. The opposite end of the box or tank has connected therewith a depending pipe 25 for returning the stock or pulp to the chest.

Arranged within the tank or box 24 between the elbow coupling 23 and the return pipe 25 is a control cylinder 26. This cylinder 26 extends entirely across the box 24, and in its preferred form includes a plurality of spaced discs 27. These discs 27 are held in their equidistantly spaced position on a hub sleeve 28 by means of spacing washers 29. Nuts 30 can be utilized for firmly clamping the discs 27 and the spacer washers 29 on the hub sleeve. The hub sleeve is, in turn, fastened to an operating shaft 31, which is rotatably mounted in suitable bearings 32 carried by the sides of the box or tank 24.

A variable speed electric motor 33 can be employed for rotating the shaft 31 and the cylinder. A control box 34 can be used in conjunction with the motor for varying or controlling the speed of rotation of said motor. Fastened to the bottom wall of the tank or box 24 is a transversely extending, relatively short partition plate 35, which terminates in close proximity to the periphery of the cylinder 26.

The bottom portion 22 of the regulator has its upper end closed by a diaphragm 36, which is sensitive to pressure or to the head of stock in said body. A cap or dome 37 is employed for securely holding the diaphragm in place and for effectively closing the top of the body 22, and this dome or cap slidably supports a guide rod 38. The lower end of the guide rod 38 carries a bearing head 39, which rests upon the diaphragm, and this guide rod is normally urged downwardly by weights 40 of a predetermined mass.

Rockably mounted adjacent its outer end on a supporting bracket 41 is a control lever 42. This lever extends substantially the length of the body 22, and its inner end is guided by a suitable guide bracket 43. This inner end is also supported by a pivoted rod 44, which extends into an oil stabilizing device dash pot 45. The lever 42 is employed for actuating a pilot valve 46, and the stem 47 thereof is operatively and

adjustably connected to the outer end of the lever 42 by a suitable connection 48.

Briefly, a thin channel is provided between each plate or disc 27 of the cylinder 26 for the passage of stock. Stock passing through these rotating discs has a tendency to form a sheet on the cylinder, and forming a sheet on the cylinder means that the water passes through, leaving a film of stock on the periphery of the cylinder, which passes over the top of the cylinder with the rotation thereof. This film of stock is discharged on the downstream side of the cylinder, by the action of the stock passing between the plates and washing it off. It is apparent that the thickness of the sheet being formed on the cylinder is determined by the consistency of the stock, and the thicker the sheet formed on the cylinder, the slower the passage of stock through the cylinder; the slower the passage of stock through the cylinder, the higher the head on the upstream side of the cylinder, and, therefore, the head on the upstream side of the cylinder will vary with the consistency of the stock passing to the cylinder.

With a constant rate of volume flow to the retarder, it is apparent that the head on the upstream side of the cylinder determines the pressure of the stock in the body of the retarder, and that this pressure is proportional to the consistency passing through the regulator. This pressure is reflected on the diaphragm 36 and transmitted therefrom through the lever 42 to a valve 46. This valve 46 forms part of an apparatus (not shown) for diluting stock as the same is delivered to the point of use.

In a cylinder detector, as described above, with a differential in pressure between the outside and inside of the cylinder when operating in a mixture of liquids and solids, the tendency is for the liquid to separate from the solids and pass through the cylinder face, leaving the solids collected on the face of the cylinder and passing over with rotation.

In this connection, it is well to visualize that at the bottom on the upstream side where the cylinder begins to contact the pulp, the first indication is a thickening of the stock in proximity to the face of the cylinder becoming progressively thicker, until at the point where the cylinder emerges from the pond, it may actually become a web, such as a wet sheet of paper being formed on a paper machine.

It is apparent from the above that if the stock passing through the regulator increases in consistency, the sheet will form much quicker and also be a heavier or thicker web on the face of the cylinder. When this occurs, the volume of liquid passing through the cylinder will be relatively less, and, as against a constant flow of liquid into the regulator, the result is a relative increase in head on the upstream side of the cylinder, and an increase in pressure on the diaphragm, with the resultant effect on the dilution line control valve 46. The reverse will be the effect with a decrease in the consistency of the stock as delivered to the regulator.

As stated, the motor 33 for driving the cylinder can be operated at different speeds. The purpose of this is to be able to vary the web gathered on the face of the cylinder at will, in that it is apparent that by presenting more cylinder surface to the stock in a given period of time by increasing surface speed, more liquid will be passed through the cylinder, and more solids will adhere to the surface and be passed over, thereby reducing the head on the diaphragm. By slowing the cylinder, the reverse action will take place.

Changes in details may be made which do not depart from the spirit and scope of my claims, and what I claim as new is:

1. A consistency responsive apparatus for thin pulp or stock comprising a body having an inlet opening for pulp and a discharge opening for pulp, a rotary cylinder in said body between the inlet opening and the discharge opening so constructed and arranged that on rotation about its axis liquid passes therethrough at right-angles to its axis and solid matter collects on its periphery at a rate depending on the consistency of the stock, and a transversely extending partition in said body between the cylinder and the bottom of the body so arranged as to prevent the passage of pulp between the cylinder and body whereby to hold back the pulp on the inlet side of the body in accordance with the consistency of the stock.

2. A consistency responsive apparatus for thin stock or pulp comprising a body having an inlet opening for pulp and a discharge opening for pulp, a rotary cylinder in said body between the inlet opening and the discharge opening so constructed and arranged that on rotation about its axis liquid passes therethrough at right-angles to its axis and solid matter collects on its periphery at a rate depending on the consistency of the stock, and means between the body and the cylinder for preventing the passage of pulp between the cylinder and body, the arrangement being such as to hold back the pulp on the inlet side of the body in accordance with the consistency of the stock.

3. In a consistency responsive apparatus for thin pulp or stock, a retarder including a box having an inlet opening for pulp and a discharge opening for pulp, means for maintaining a constant flow of pulp on the inlet side of said box, and a rotatable retarding cylinder extending transversely across said box between said inlet and said discharge for pulp for retarding the flow of pulp through said box according to the consistency of said pulp, said cylinder including a plurality of equidistantly spaced discs, the spaces between said discs being such that liquids will pass through said cylinder and solid matter collected on its periphery during rotation of said cylinder about its axis, and means between the cylinder and box for preventing the passage of pulp between the cylinder and the box.

4. In a consistency responsive apparatus for thin pulp or stock, a retarder including a box having an inlet opening for pulp and a discharge opening for pulp, means for maintaining a constant flow of pulp to the inlet side of said box, a rotatable retarding cylinder extending transversely across said box between said inlet and said discharge for pulp so constructed and arranged that on rotation about its axis liquid passes therethrough at right-angles to its axis and solid matter collects on its periphery at a rate depending on the consistency of the stock means between the cylinder and box arranged to prevent the passage of pulp between the cylinder and body, whereby so as to hold back the pulp on the inlet side of the body in accordance with the consistency of the stock, means for positively rotating the cylinder, and means for varying the speed of rotation of said cylinder.

HERVEY G. CRAM.