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3,357,879

STOCK DISPERSION APPARATUS UTILIZING PRESSURE DIFFERENTIAL
TO UNIFORMLY DISPERSE THE STOCK

Filed Feb. 21, 1964

2 Sheets-Sheet 1

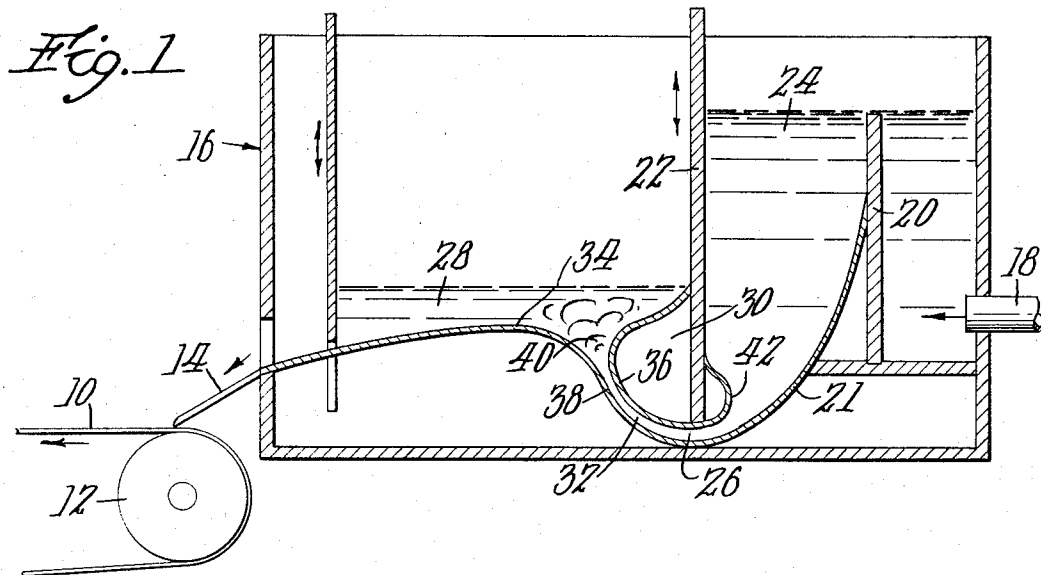


Fig. 2

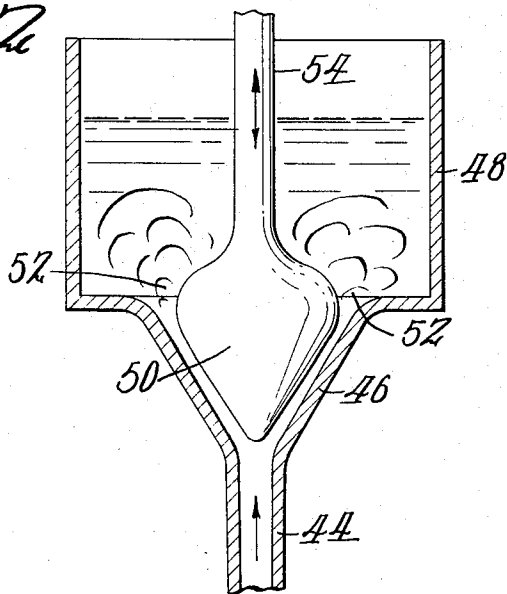
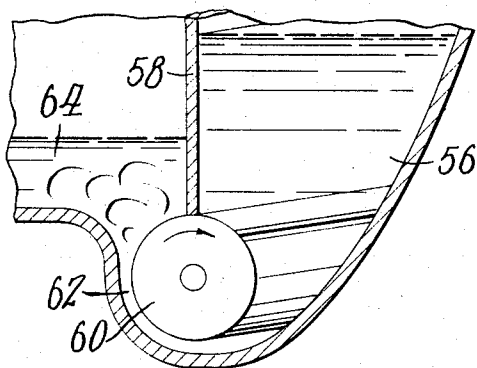


Fig. 3



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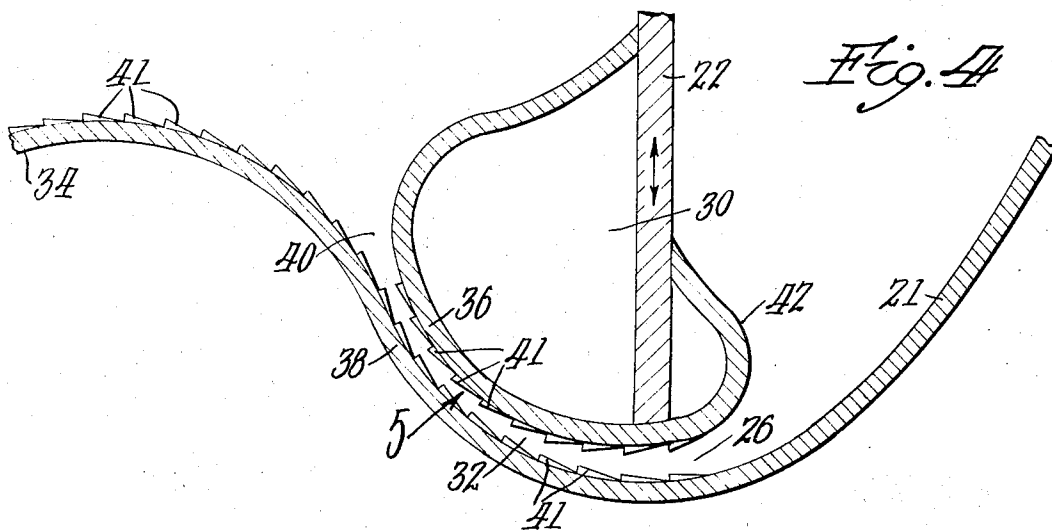


Fig. 6

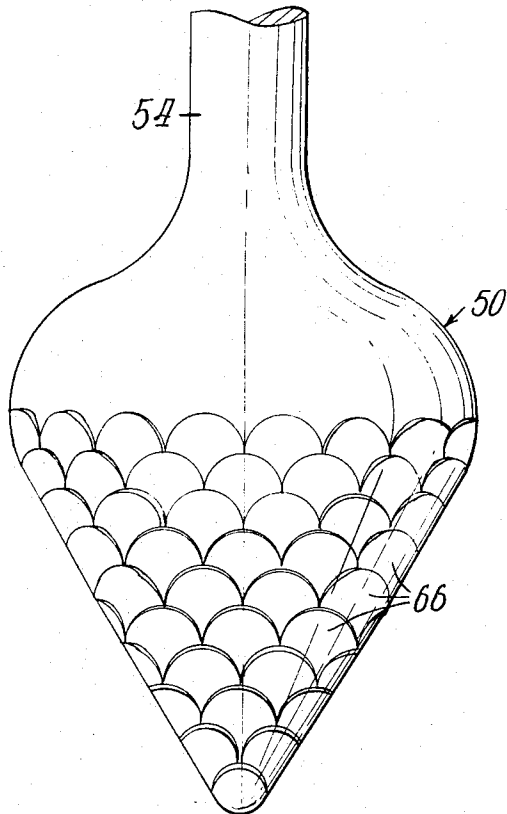
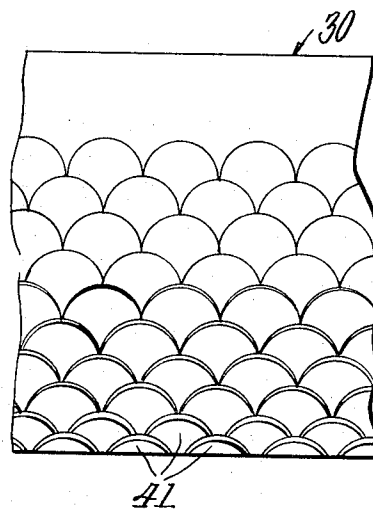


Fig. 5



1

3,357,879

STOCK DISPERSION APPARATUS UTILIZING PRESSURE DIFFERENTIAL TO UNIFORMLY DISPERSE THE STOCK

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9 Claims. (Cl. 162—336)

This invention relates to a new and improved means for the dispersion of flocculent stock prior to its approach to the Fourdrinier wire of a paper making machine, with the general result that the stock is much more uniform as it issues from the apron providing a more uniform and higher grade paper without any additional expense in the stock or in the manufacture thereof. In the present case this is achieved by the use of new and improved explosion chambers, etc., doing away with such prior art devices which have been found to be ineffectual as holy rolls, disc rolls, etc.

As pulp passes through the usual paper mill headbox, it is ordinarily in a condition known as flocculent, containing "flocs" of stock wherein the individual pieces of pulp tend to adhere to each other. It has been the custom in the past to beat this pulp in some way or to agitate it in order to try to disperse it, but this has been found to be ineffective and the present invention, through the use of explosion means, actually causes a true dispersion of the stock so that as it flows onto the wire it is in as uniform a condition as possible preventing thick and thin spots in the resulting paper.

It is an object of the invention therefore to provide a new and improved explosion means which will cause dispersion of the stock and this is done generally through the use of head pressure in a box causing accelerated passage of the stock through a restricted passage to a point in an area of minimum pressure, causing the stock to actually "explode" and become thoroughly dispersed.

Various means can be utilized to produce the explosive effect and all of these means come within the purview of the objects of the invention. For instance, the stock can be passed under a partition which separates a high pressure area in a stock reservoir chamber as in a headbox, to a forward low pressure area thereof, and at the bottom of the partition, which may be adjustable, there is a passage which gradually narrows from the maximum head pressure area to the minimum pressure area, thus causing extreme agitation and explosion of the pulp as it issues from the narrowed end of the passage where it is suddenly released. This passage can be created by means of a fixed enlargement having a certain shape, or by a roll which is either driven or freely rotatable but which has no holes in it, or it can be provided by a conical shaped member in a pipe where the cone has its apex pointed against the direction of flow in the pipe, which may derive its pressure by the use of a pump or by a relatively high head.

Other objects and advantages of the invention will appear hereinafter.

Reference is to be had to the accompanying drawings, in which

FIG. 1 is a view in section through a headbox illustrating a new and improved explosion chamber according to the present invention;

FIG. 2 is a sectional view illustrating a different form of explosion apparatus;

FIG. 3 is a view illustrating a still further form of the invention;

FIG. 4 is a diagrammatic view showing the scale surfaces applied to the device of FIG. 1;

2

FIG. 5 is a view in elevation looking in the direction of arrow 5 in FIG. 4, and

FIG. 6 is a view in elevation showing the scale applied to the device of FIG. 2.

Referring now to FIG. 1 there is diagrammatically shown a Fourdrinier wire 10 trained over the breast roll 12 and provided with an apron 14 extending from the headbox generally indicated at 16. This headbox is provided with a vertically adjustable partition or baffle which extends completely from side edge to side edge thereof and which may be provided with any desired means (not shown) for vertically adjusting the same. It has a stock inlet at 18 and a first partition 20 over which the stock flows down a floor 21 to enter the area of the adjustable partition which is indicated at 22. The stock escapes from the chamber as at 24 through a narrow opening or passage 26 at the lower end of partition 22 into the chamber at 28, and it will be seen therefore that the pressure in chamber 24 is three or four times that in the chamber 28. From the chamber 28 the stock emerges through a slice onto the apron 14 and Fourdrinier wire 10. The maximum head pressure is just beneath partition 22 in the area of the passage at 26.

Partition 22 is provided at its lower edge with a special new and improved longitudinally extending protuberance or explosion block generally indicated at 30 and this provides for a gradually narrowing passage 32 which is in the nature of a venturi, gradually extending upwardly in cooperation with a floor 34 for the chamber 28. The floor 34 extends forwardly and serves to conduct the pulp to the slice and the Fourdrinier wire.

The operation of the explosion block 30 is due to the head pressure on the intake side of the block at 26 which is approximately four times as great as that at the explosion area 40 in the low pressure side 28. The stock moves very rapidly through the restricted passage 32 and emerges into the low pressure area and at that point truly explodes and becomes dispersed to the maximum possible. The main function and operation of this explosion box is not to actually separate the undivided pieces of pulp themselves but to act upon any groups of stock adhering to each other or what is commonly called in the art, it separates the flocculent stock.

In the length of the passage from the intake at 26 to the explosion area 40, the passage preferably has a section where the lower surface 36 of the block 30 is parallel to the corresponding surface at 38 of the floor of the passage. This parallel sided area is just prior to the enlargement at 40 that releases the stock to the low pressure area and has been formed to accelerate the stock flow and to increase the explosive effect for improved dispersion.

The stock is now separated evenly and being homogeneous flows evenly without pulsation along the remainder of the floor of the headbox to the left of the explosion partition 22 in FIG. 1 to the Fourdrinier wire.

Incidentally to this operation, the fish scale surfaces clearly illustrated in my application Ser. No. 299,659 filed Aug. 2, 1963 can also be applied not only to the apron 14 but also to the surfaces of the explosion block 30, and the complementary surfaces forming the passage. This causes an even and faster flow of the stock. These scales are indicated at 41 in FIGS. 4 and 5 in exaggerated condition, but in any event the scales cause a criss-cross pattern in the flow of the fluid to achieve a more even and faster flow.

The portion 42 of the explosion block 30 at the high pressure side of the baffle is to provide for a gradual narrowing of the passage 32 from an extremely wide mouth to a narrow mouth at the parallel area 36, 38.

Referring now to FIG. 2, there is here shown a variation of the explosion block wherein there is an intake

3

pipe 44 under influence of a pump or the like which pumps the stock say for instance in an upwardly directed manner as illustrated to a conical enlargement 46. This enlargement leads into the flow box 48 which can be compared to the chamber 28 in FIG. 1 and leads to the apron and Fourdrinier wire as before. In the enlarged conical portion 46 there is a conical explosion block 50. This block has a surface to provide for a conical narrow passage to the explosion area as 52 at least a part of this passage having parallel walls. The pump provides pressure in the pipe 44 but it is released in the area 52 and the same explosion as before takes place. The conical explosion block 50 may be provided with a ram or the like 54 which can be made adjustable so as to provide a narrower or wider passage between the enlargement 46 and the surface of the conical explosion block 50. Various changes in size and shape may be made in order to accommodate different kinds of stock, different situations and kind of paper being made. The fish scale surfaces mentioned above can be used here also.

In FIG. 3 there is still a further form of the device shown. The high pressure side of the box is illustrated at 56 and this can be more or less comparable to the chamber 24 in FIG. 1. There is a baffle 58 at the lower edge of which there is provided a roller 60. There are no holes in this roller. The roller can be driven in the clockwise direction as indicated by the arrow or it can be merely journaled so that the flow of the stock turns it, but in any event there is a restricted passage at 62 which leads from the high pressure area 56 to the low pressure area 64 where the explosion takes place as before. The surface of the roller can be utilized with the fish scale above mentioned and so also can the surface in combination with which the roller provides the passage, and the stock passes under the roller and through passage 62 in manner similar to that previously explained.

FIG. 6 illustrates the scale surface 66 like that at 41 but arranged on the conical surface of member 50. The corresponding surface of enlargement 46 may also be supplied with the scales, and the same is true of roller 60 and its complementary surface forming passage 62.

Having thus described my invention and the advantages thereof, I do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what I claim is:

1. Apparatus for dispensing fluid material, comprising:

- (a) box like receptacle means for receiving fluid material including first fluid material means and second fluid receiving material means, separated by separating means providing a passageway permitting movement of fluid material from said first material receiving means to said second material receiving means;
- (b) said first fluid material receiving means being constructed to accumulate fluid material to a sufficient depth to create a first pressure of a first predetermined magnitude;
- (c) said second fluid material receiving means being constructed to restrict the depth of fluid material so as to create a second pressure the magnitude of which is sufficiently reduced with respect to the magnitude of said first pressure to create an explosive type dispersing action as the fluid material enters said second fluid material receiving means; and
- (d) fluid moving means for moving the said fluid material into said first fluid material receiving means, said passageway, and said second fluid material receiving means.

2. The fluid dispersing apparatus of claim 1, wherein opposed surfaces of said fluid passageway are formed with a configuration of fish scale like staggered and overlapping protuberances.

3. The apparatus of claim 1, wherein

- (a) said separating means includes a rotatably disposed cylindrical element;

4

- (b) said box-like receptacle includes a trough disposed to receive said cylindrical element to form therewith said passageway;

- (c) said trough being formed with a portion of its surface arcuate in cross-sectional configuration and disposed in said second fluid material receiving means, and another portion of its surface of curvilinear cross-sectional configuration and disposed in said first fluid material receiving means, the diameter of said another portion of said trough increasing as it progresses into said first fluid material receiving means; and

- (d) drive means to rotate said cylindrical element to move the fluid between same and the opposed surface of said trough.

4. A headbox for processing flocculent fluid paper stock, comprising:

- (a) oppositely disposed front, rear, and side walls extending upwardly from a bottom wall to form a box-like receptacle;
- (b) a stock inlet in said rear wall of said receptacle to permit the flow of fluid paper stock into said receptacle;
- (c) a first partition spanning said side walls proximate to and spaced from said rear wall and forming therewithin a dam to receive fluid paper stock as it issues from said stock inlet, and to permit the fluid paper stock to pass over a top edge of said first partition to be further processed;
- (d) a second partition spanning said side walls in spaced relationship with said first partition and forming therewith a first chamber to receive the fluid paper stock after it passes over said top edge of said first partition and to accumulate the fluid paper stock to a first predetermined depth;
- (e) said second partition furthermore terminating short of said bottom of said box-like receptacle and carrying, proximate the bottom edge thereof, an explosion block having a longitudinally extending outer surface which progresses in a curvilinear configuration away from the surface of said second partition within said first chamber and towards the bottom edge thereof, passing under said bottom edge and away from the surface of said second partition outside said first chamber to then return and flow into said surface of said second partition outside said first chamber;
- (f) said first chamber including a longitudinally extending curvilinear floor progressing from a surface of said first partition within said first chamber towards said bottom wall of said box-like receptacle to pass under said bottom edge of said second partition and then curve upwardly and away from said second partition to a predetermined location from which said floor curves down and away from said second partition until it extends to at least said front wall of said box-like receptacle;
- (g) said floor coacting with said explosion block to form a passageway to permit fluid paper stock to pass from said first chamber to a second chamber to receive fluid paper stock from said first chamber; and
- (h) discharge means permitting the fluid paper stock to flow from said second chamber and adjusted to control the depth of fluid paper stock within said second chamber so that there is a sufficient difference between same and said first predetermined depth of the fluid paper stock in said first chamber to create an explosive like turbulence in the movement of the fluid paper stock as it issues from said passageway.

5. The headbox of claim 4, wherein said second partition is disposed for selective movement towards and away from said floor to thereby control the size of said passageway.

6. The headbox of claim 4 wherein said explosion block and said floor are formed to provide said passageway with

5

a configuration which gradually diminishes in size and which then suddenly increases in size so as to provide a venturi-like effect upon the fluid material as it passes through said passageway.

7. The headbox of claim 4, wherein at least a portion 5 of said surface of said explosion block and at least a portion of said surface of said floor are formed with an overlapping and staggered array of fish scale like protuberances.

8. The headbox of claim 4, wherein

- (a) said explosion block is in the form of a longitudinally extending cylinder rotatably disposed along the lower edge of said second partition; and 10
(b) drive means are provided to rotate said cylinder in a direction to induce the fluid paper stock to pass 15 from the outer surface of said cylinder and said floor.

9. A headbox for dispersing flocculent fluid pare stock, comprising:

- (a) a plurality of vertically disposed and spaced walls 20 interconnected with and rising from a bottom wall and forming therewith a box-like receptacle to receive fluid paper stock;
(b) said bottom wall of said receptacle including an opening of predetermined cross-sectional configura- 25 tion;
(c) a stock intake pipe extending from beneath and towards said bottom wall of said receptacle and having a cross-sectional configuration which is similar to said predetermined cross-sectional configuration of 30 said opening but which for at least a portion of its length is smaller than said opening;
(d) said stock intake pipe further including a connecting portion having a cross-sectional configuration 35 which is similar to said predetermined cross-sectional

6

configuration of said opening and which increases in size as it approaches said opening until it coincides therewith and connects with said bottom wall of said receptacle thereabout;

- (e) an explosion block for disposition proximate said connecting portion of said stock intake pipe and having a configuration similar thereto and to form with the opposed surfaces thereof a passageway for controlling the flow of fluid paper stock from said stock intake pipe to said receptacle;
(f) the opposed surfaces of said explosion block and said connecting portion of said stock intake pipe being formed with an array of staggered and overlapping fish scale like protuberance; and
(g) pump means to pump flocculent fluid paper stock through said stock intake pipe and to apply a predetermined pressure thereto such that as said fluid paper stock emerges from said passageway it is dispersed with an explosive type action.

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