Feb. 6, 1951 W. J. HOENECKE 2,540,670

BACKFLOW RETARDER

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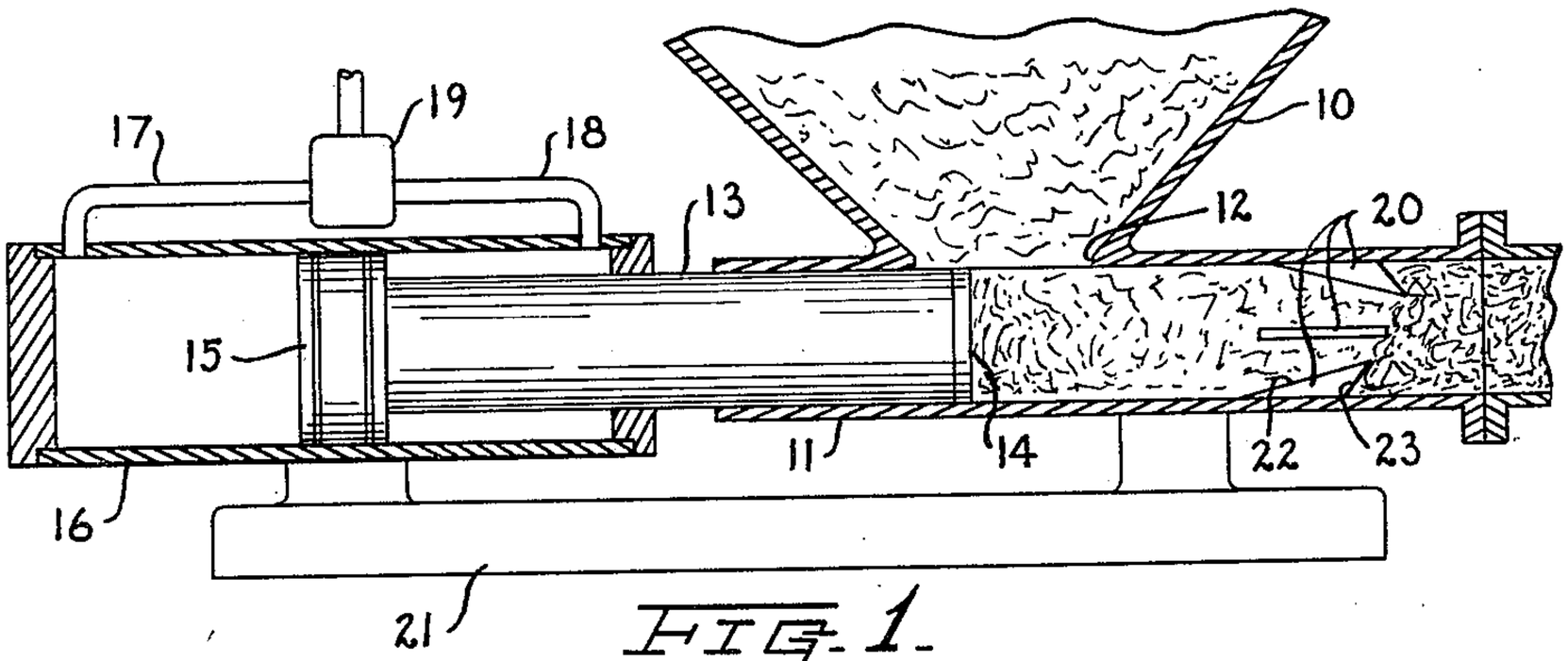

FIG. 1.

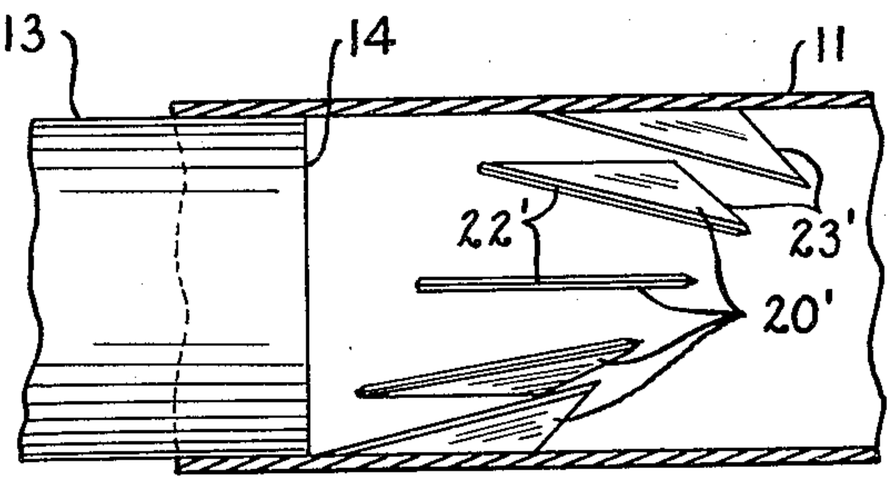

FIG. 2.

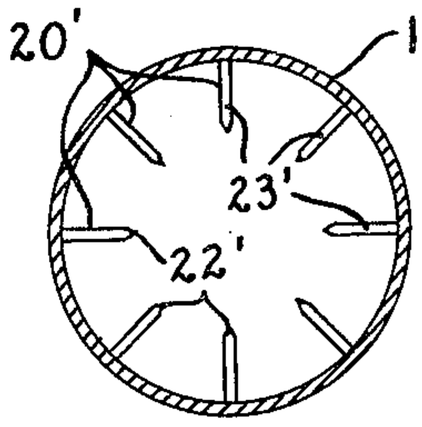

FIG. 3.

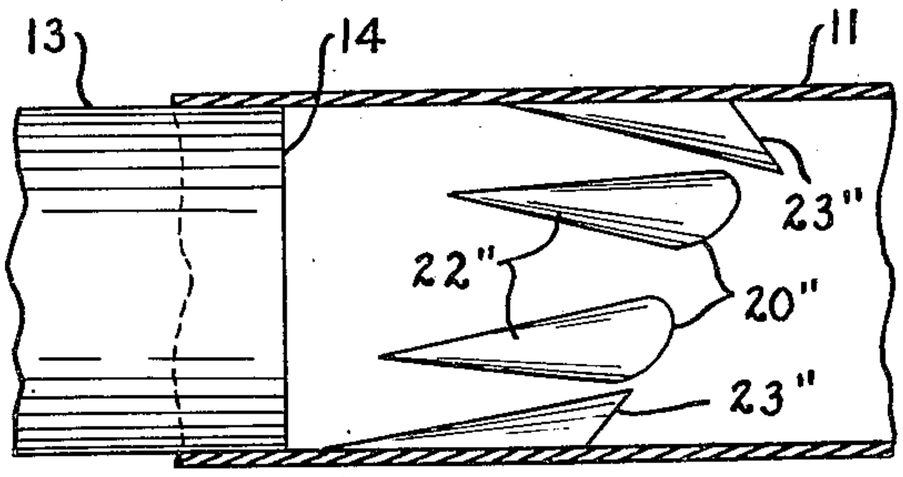

FIG. 4.

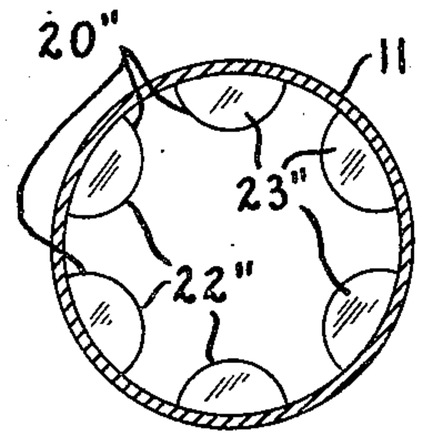

FIG. 5.

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BACKFLOW RETARDER

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7 Claims. (Cl. 198—227)

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The present invention relates generally to improvements in the art of transporting fluent materials, and relates more particularly to improvements in the construction and use of devices for resisting and retarding the counter-flow of relatively dense materials being advanced along a conduit against resisting pressure.

A primary object of my invention is to provide means especially adapted for use in connection with the pumping or like transportation of sewage, sludge or other relatively dense fluent materials having large quantities of fibrous constituents through closed conduits.

Another specific object of this invention is to provide improved devices adapted to permit transportation of high density stock in a highly efficient and extremely economical manner.

Another specific object of my present invention is to provide improved devices which are simple in construction and which may be readily installed in a pipe or like conduit for effectively resisting back flow of fluent materials of relatively high density being advanced therethrough.

A further specific object of the invention is to provide an improved highly efficient back flow retarder or barrier for a closed conduit which is adapted to offer minimum resistance to dense materials being advanced through the conduit against resisting pressure while providing maximum resistance to flow of the materials in a reverse direction.

Another specific object of the present invention is to provide improved and simple back flow resisting means especially adapted for use in conjunction with a pump for efficiently conveying high density fluent stock through a closed conduit against resisting pressure.

An additional specific object of my present invention is to provide an improved back flow retarder comprising, a series of elements mounted in spaced-apart relationship on the inner wall of the conduit through which material is adapted to be advanced against resisting pressure, the elements having the free surfaces thereof inclined inwardly in the direction of advancement of the materials.

These and other objects and advantages of the present invention will be apparent from the following detailed description.

A clear conception of the several features constituting the present improvement, and of the mode of constructing and of utilizing back flow retarders embodying the invention, may be had by referring to the drawing accompanying and forming a part of this specification wherein like

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reference characters designate the same or similar parts in the various views.

Fig. 1 is a somewhat diagrammatic representation showing a vertical longitudinal section through a typical standard fibrous material transporting pump, the discharge conduit of which is provided with my improved back flow retarder;

Fig. 2 is an enlarged similar fragmentary section through a conduit provided with a slightly modified back flow retarder and showing the active portion of the pump plunger in foremost position;

Fig. 3 is a similarly enlarged transverse section through the conduit and showing an end view of the retarder of Fig. 2;

Fig. 4 is a likewise enlarged fragmentary longitudinal section through a discharge conduit provided with a further modified back flow retarder and also showing the active portion of the pump plunger in foremost position; and

Fig. 5 is a similarly enlarged transverse section through the conduit and showing an end view of the retarder of Fig. 4.

While the invention has been shown and described herein as being embodied in the discharge conduit of a typical pump of the reciprocating plunger or ram type, it is not my desire or intention to thereby unnecessarily limit the scope or utility thereof.

Referring to the drawing, and particularly Fig. 1 thereof, the typical assemblage shown therein as embodying the invention comprises, in general, an upper material supply hopper 10 communicating with a lower discharge conduit 11 through an inlet opening 12; a material moving pump plunger or ram 13 slidable within the conduit 11 with the free end or active portion 14 thereof movable past the opening 12, the opposite end of the plunger 13 being provided with a piston 15 reciprocable within a cylinder 16 having suitable ports 17, 18 adjacent its opposite ends for admission of operating fluid under pressure past a suitable valve 19 from a source of supply, not shown, to the piston displacement chambers; and an annular series of substantially radial fins or barbs 20 confined within the conduit 11 beyond the limit of travel therein of the plunger 13.

To maintain the plunger 13 and conduit 11 in proper alinement, a suitable base 21 rigidly supporting the conduit 11 and cylinder 16 may be provided; and the assemblage may be mounted in any desired and convenient location for receiving the materials to be transported, a supply

of which is shown in the hopper 10 and conduit 11 in Fig. 1. The vanes 20 are barb-shaped with both the leading edges 22 and the trailing edges 23 thereof inclined inwardly toward the center of the conduit 11 in the direction of advancement of the materials; and these vanes 20 may be firmly secured to the inner wall of the discharge conduit 11 in any suitable manner as by welding. As shown, the vanes 20 are preferably arranged helically within the conduit 11 so as to twist the advancing material and thereby prevent undesirable resistance to the flow; and in some instances, dependent on the type and density of the stock being handled, it is desirable to provide more than one group of vanes 20.

In actual use of the device, the high density stock, which may consist of a fluent mixture of liquid and materials having relatively large quantities of fibrous, stringy or lumpy constituents such as meat, rags, leather clippings, paper pulp, or the like, is fed to the hopper 10 from which it moves by gravity through the pump inlet opening 12 to the discharge conduit 11. As fluid under pressure is supplied to the cylinder 16, being directed by the valve 19 alternately through the ports 17, 18, the piston 15 is caused to reciprocate in an obvious manner within the cylinder, carrying the plunger 13 therewith and causing the active portion 14 of the plunger 13 to reciprocate in the conduit 11 below the opening 12. Obviously, on each forward stroke of the piston 15 and plunger 13, the active portion 14 of the plunger causes a batch of the material supplied by the hopper 10 through the opening 12 to advance along the conduit 11 toward and past the vanes 20. Because of the barb-like shape of the vanes 20 and the helical arrangement thereof within the conduit, the relatively dense fluent stock is advanced past the vanes 20 with a minimum of resistance offered thereby; but once beyond the vanes 20 within the conduit 11, the inclined surfaces of the trailing edges 23 of the vanes offer maximum resistance to counter flow of the materials particularly because of the fibrous, stringy and/or lumpy make-up of the materials which catch on the surfaces of the edges 23. As back flow of the materials being advanced against resisting pressure in the conduit 11 is effectively checked or retarded by the vanes 20, the piston 15 and plunger 13 continuously reciprocate with the active portion 14 of the plunger advancing additional batches of stock from the hopper 10 through the conduit 11 and past the vanes or barbs 20 to the desired locality.

Referring to Figs. 2 and 3, the back flow retarder shown therein is substantially like that hereinabove described with reference to Fig. 1 comprising, an annular series of substantially radial fins or vanes 20' confined within the conduit 11 beyond the limit of travel therein of the plunger 13. However, the barb-shaped vanes 20' are slightly modified in that the inclined leading edges 22' thereof are formed sharp as knife-edges to cut through the advancing charges of fibrous materials and thus additionally reduce the resistance to the flow during pumping while the inclined trailing edges 23' have substantially flat surfaces as in the embodiment of Fig. 1. The vanes 20' of Figs. 2 and 3 are likewise preferably arranged helically to twist the advancing material as hereinabove

described, and a considerable number of these vanes may be utilized in one or more annular groupings as found necessary without causing excessive resistance to flow of the advancing stock.

Referring to Figs. 4 and 5, the modified back flow retarder shown therein comprises, an annular series of tapered abutments 20'' confined within the conduit 11 beyond the limit of travel therein of the plunger 13. The modified abutments or barriers 20'' are each formed with the leading surface 22'' thereof rounded and outwardly flared in the direction of flow of the advancing materials to assume a half-conical shape; and the bases of these half-cones form the trailing surfaces 23'' of the abutments 20'' and are inclined inwardly toward the central axis of the conduit 11 in the direction of advancement of the materials. As in the forms of the device hereinabove described, the barrier plates or barbs 20'' are also preferably arranged helically to twist the advancing material; and when the barbs of Figs. 4 and 5 are utilized, it is generally preferable to utilize a fewer number in series than when the vanes or barbs of Figs. 1, 2 and 3 are used both because of the greater resistance to advancing flow of the type of Figs. 4 and 5 and because of the larger trailing surface 23'' which offers additional resistance to back flow. The type of retarder shown in Figs. 4 and 5 may be utilized most effectively where it is not desired to cut up the materials being transported and also when materials of certain consistencies are being handled.

From the foregoing detailed description, it will be apparent that my present invention provides an improved device for resisting and retarding the back flow of relatively dense materials being advanced along a conduit against resisting pressure, thereby making it possible to transport such materials or high density stock for considerable distances by means of a pump of standard construction in a simple, efficient and economical manner. Without the improved back flow retarder, the high density stock is found to back up with every rearward movement of the plunger 13, thereby causing jamming of the stock at the pump inlet and consequent failure of the pump. The improved back flow retarders are also extremely simple and durable in construction and may be readily installed in any conduit for use with any type of pump. The vane elements or abutments 20, 20' and 20'', when properly installed, offer minimum resistance to the flow of high density stock during advancement thereof through the conduit but the training edges or surfaces of these elements are inclined so as to offer maximum resistance to flow of materials in a reverse direction, thereby affording an effective check for back flow of the stock. The improved devices are especially adapted for use in connection with the pumping or like transportation of waste, sewage, pulp and the like of high density and stock containing large quantities of stringy and fibrous constituents. Devices manufactured and utilized in accordance with the invention have proven highly satisfactory in actual commercial use in tanneries and the like, and it has been found that pumps may be utilized for transporting high density stock, which would otherwise necessitate other means of transportation, through use of the improved devices.

It should be understood that it is not desired to limit this invention to the exact details of construction, or to the precise mode of use, herein

shown and described, for various modifications within the scope of the appended claims may occur to persons skilled in the art to which this invention pertains.

I claim:

1. For use in connection with means for advancing materials along a closed conduit against resisting pressure, a back flow retarder comprising, an annular series of helically disposed spaced elongated elements each mounted along one longitudinal edge thereof on the inner wall of the conduit, said elements having another longitudinal edge thereof inclined inwardly in the direction of advancement of the materials.

2. For use in connection with means for advancing materials along a closed conduit against resisting pressure, a back flow retarder comprising, a series of spaced elements each having an elongated supporting edge mounted on the inner wall of the conduit, said elements having the leading and trailing edges thereof inclined inwardly at different oblique angles toward the central axis of the conduit in the direction of advancement of the materials.

3. For use in connection with means for advancing materials along a closed conduit against resisting pressure, a back flow retarder comprising, a series of radial fins mounted in spaced apart relationship on the inner wall of the conduit, said fins having the leading and trailing edges thereof inclined inwardly in the direction of advancement of the materials, the leading edges of said fins being sharp.

4. For use in connection with means for advancing materials along a closed conduit against resisting pressure, a back flow retarder comprising an annular series of helically disposed radial fins mounted in spaced apart relationship on the inner wall of the conduit, said fins having the leading and trailing edges thereof inclined inwardly in the direction of advancement of the materials, the leading edges of said fins being sharp.

5. For use in connection with means for advancing materials along a closed conduit against resisting pressure, a back flow retarder comprising, a series of half-conical elements mounted in spaced relationship on the inner wall of the conduit with the bases thereof forming the trailing surfaces.

6. For use in connection with means for advancing materials along a closed conduit against resisting pressure, a back flow retarder comprising, a series of half-conical elements mounted in spaced relationship on the inner wall of the conduit with the bases thereof forming the trailing surfaces and being inclined inwardly in the direction of advancement of the materials.

7. For use in connection with means for advancing materials along a closed conduit against resisting pressure, a back flow retarder comprising, an annular series of helically disposed half-conical elements mounted in spaced relationship on the inner wall of the conduit with the bases thereof forming the trailing surfaces and being inclined inwardly in the direction of advancement of the materials.

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REFERENCES CITED

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

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