

PATENT SPECIFICATION (11)

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- (21) Application No. 26009/77 (22) Filed 22 June 1977 (19)
 (61) Patent of addition to No. 1511693 dated 5 April 1976
 (44) Complete Specification published 21 Nov. 1979
 (51) INT. CL.² B01D 35/02 35/16
 (52) Index at acceptance
 BID 1505 1603 1605 1607 1612 1816 1819 2104 2111 T



(54) APPARATUS FOR REMOVING SOLID MATERIAL FROM SEWAGE OR OTHER LIQUID

(71) We, JONES & ATTWOOD LIMITED, a British Company, of Titan Works, Stourbridge, West Midlands DY8 4LR, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to apparatus for removing solid material from a flow of sewage or other liquid.

In our prior patent No. 1,511,693 there is described such apparatus which comprises a duct through which sewage or other liquid is to flow, a first screen located in said duct and adapted to filter solid material from the sewage or other liquid flowing through the duct, a second, vertically extending, screen located adjacent to said first screen such that in use it receives and retains solid material filtered from the flow of sewage or other liquid by the first screen, and a lifting plate mounted for reciprocation between an upper and a lower position in a vertical or substantially vertical direction over said second screen so as to collect solid material therefrom and lift it to a position which in use is above the upper surface of the flow of sewage or other liquid and means for reciprocating the lifting plate.

The object of the present invention is to provide a modification of the apparatus referred to in the preceding paragraph.

In accordance with the invention there is provided apparatus for removing solid material from a flow of sewage or other liquid, said apparatus comprising a duct through which sewage or other liquid is to flow, a first screen located in said duct and adapted to filter solid material from the sewage or other liquid flowing through the duct, a second, vertically extending, screen located adjacent to said first screen and having a substantially horizontally extending foot, and means for reciprocating said second screen in a vertical or substantially vertical direction between a lower position in which in use it receives and retains solid material filtered from the flow of sewage

or other liquid by the first screen and an upper position in which said foot is disposed in a position which in use is above the upper surface of the flow of sewage or other liquid.

The invention will now be more particularly described with reference to the accompanying drawing which is a perspective view showing one example of apparatus constructed in accordance with the invention.

Referring now to the drawing the apparatus shown therein includes a first screen 10 which is located in a duct 11 intended in use to receive a flow of liquid such as for example sewage. Said first screen 10 is of cylindrical configuration and is arranged so that its axis extends in a vertical or generally vertical direction, the screen being formed in any convenient way with slots or apertures through which liquid can flow. The duct 11 is arranged so that it includes an inlet channel which is generally tangential to said first screen and the arrangement is such that liquid flowing through said inlet channel can pass through said first screen 10 into the interior thereof whereas any solid material in the flow of sewage entering said inlet channel will be trapped on the exterior of said first screen and thus filtered from the sewage. The first screen may be fixed but conveniently it is arranged to be rotatable about its axis for which purpose it is connected to an electric motor 12. There is also provided a second screen 13 which comprises a plurality of vertically extending bars 13a which are bent at their lower ends so as to extend in horizontal directions, thus forming a foot 13b. Said second screen 13 is connected to the piston rod of a fluid pressure actuated piston and cylinder unit 14 whereby it can be reciprocated in a vertical or substantially vertical direction and stationary, vertically extending guide bars 15 are provided for guiding the vertical movement of said screen. Thus said second screen 13 is movable between a lower position in which in use it is adapted to receive and retain solid material filtered from the flow of sewage

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or other liquid by the first screen 10 and an upper position in which said foot 13b is disposed above the upper surface of said flow of sewage or other liquid.

5 At the upper end of said guide bars 15 there is provided a compression chamber generally indicated by reference numeral 16 and said chamber has means for removing solid material from the second screen when said foot 13b is in its upper position. Said means includes a pressure head 17
10 mounted at one end of the chamber and connected to a second fluid pressure actuated piston and cylinder unit 18. The opposite end of said chamber 16 tapers in a direction away from the pressure head 17 and is bounded in part by a hinged plate 19 which is loaded by springs which tend to urge the outer free end of said plate in a downward direction. Said plate and/or
20 the walls of the compression chamber in this region and the pressure head itself may also be provided with drainage apertures.

25 Beneath said piston and cylinder unit 18 there is provided a third fluid pressure actuated piston and cylinder unit 20, the piston rod of which is connected to horizontally extending spaced prongs or forks 21. These forks 21 extend through aligned apertures formed in the pressure head 17
30 and are designed to enter between the spaced bars forming said foot 13b when the latter is in its upper position.

35 Associated with the first screen 10 is scraper means in the form of scraper bars 22 arranged to scrape off solid material collected on the outside of the first screen 10.

40 The above described screening apparatus is arranged to operate intermittently and the operation can in fact be automatically controlled by the level of the sewage or liquid in the duct 11. Thus considering the first screen 10 in a stationary condition and the level of the liquid or sewage in the duct 11 rising from a relatively low level, the upper surface of said liquid or sewage will eventually reach a pre-determined point somewhat below the top of
50 the first screen 10 when a high level switch (not shown) is operated which actuates the piston and cylinder unit 14 to cause said second screen 13 to descend from its upper position in which it has previously come to rest. When said foot 13b of the second
55 screen 13 reaches its lower position the motor 12 is actuated to effect rotation of the first screen 10. The scraper bars 22 clean screenings off said first screen 10 and such screenings are eventually trapped on the second screen 13 and will be supported thereon by said foot 13b. After a pre-determined period, the first screen 10 stops and reverses rotation for a short time to
65 clear any solids that may have been trapped

between the screen and the scraper bars and then stops. The piston and cylinder unit 14 then is actuated to lift the foot 13b and the screenings supported thereon to a position above the upper surface of the sewage or liquid in the duct 11.

At this stage the piston and cylinder unit 20 which up to now has been in a retracted position is actuated so as to advance the forks 21 to bring them into a position in which they enter between the bars of the foot 13b and the unit 14 is then again actuated to cause said screen 13 and its foot 13b to descend once again to collect more screenings from the first screen 10. During the time that said foot 13b is in its lower position the pressure head 17 is advanced by the piston and cylinder unit 18 to clear the screenings from the forks 21 and push them into the right-hand end of the compression chamber 16, such screenings being de-watered by the pressure exerted by the hinged plate 19. This de-watering period is adjustable and at the end of this period the pressure head 17 returns followed by the forks 21 so that the second screen 13 and foot 13b can again be lifted carrying newly collected screenings.

The apparatus will continue to run if the quantity of solids in the sewage or liquid or the flow rate is such that the level of liquid or sewage remains above the aforementioned high level switch but if the flow rate is relatively low or the quantity of solids in the flow of sewage or liquid is comparatively light the level of the sewage or liquid will fall until it reaches a low level switch (also not shown) which will act to stop actuation of the machine after it has operated through a few pre-determined number of additional cycles to clear any screenings which may have been collected. The apparatus will then remain inactive in a position in which the screen 10 is stopped and the foot 13b of the screen 13 is in its upper position until the level of liquid or sewage has again arisen to the level of said high level switch.

WHAT WE CLAIM IS:—

1. Apparatus for removing solid material from a flow of sewage or other liquid, said apparatus comprising a duct through which sewage or other liquid is to flow, a first screen located in said duct and adapted to filter solid material from the sewage or other liquid flowing through the duct, a second, vertically extending, screen located adjacent to said first screen and having a substantially horizontally extending foot, and means for reciprocating said second screen in a vertical or substantially vertical direction between a lower position in which in use it receives and retains solid material filtered from the flow of sewage



or other liquid by the first screen 10 and an upper position in which said foot 13b is disposed above the upper surface of said flow of sewage or other liquid.

5 At the upper end of said guide bars 15 there is provided a compression chamber generally indicated by reference numeral 16 and said chamber has means for removing solid material from the second screen 10 when said foot 13b is in its upper position. Said means includes a pressure head 17 10 mounted at one end of the chamber and connected to a second fluid pressure actuated piston and cylinder unit 18. The opposite end of said chamber 16 tapers in a direction away from the pressure head 17 and is bounded in part by a hinged plate 19 which is loaded by springs which tend to urge the outer free end of said plate in a downward direction. Said plate and/or 20 the walls of the compression chamber in this region and the pressure head itself may also be provided with drainage apertures.

Beneath said piston and cylinder unit 18 25 there is provided a third fluid pressure actuated piston and cylinder unit 20, the piston rod of which is connected to horizontally extending spaced prongs or forks 21. These forks 21 extend through aligned 30 apertures formed in the pressure head 17 and are designed to enter between the spaced bars forming said foot 13b when the latter is in its upper position.

Associated with the first screen 10 is 35 scraper means in the form of scraper bars 22 arranged to scrape off solid material collected on the outside of the first screen 10.

40 The above described screening apparatus is arranged to operate intermittently and the operation can in fact be automatically controlled by the level of the sewage or liquid in the duct 11. Thus considering 45 the first screen 10 in a stationary condition and the level of the liquid or sewage in the duct 11 rising from a relatively low level, the upper surface of said liquid or sewage will eventually reach a pre-determined point somewhat below the top of 50 the first screen 10 when a high level switch (not shown) is operated which actuates the piston and cylinder unit 14 to cause said second screen 13 to descend from its upper position in which it has previously come to rest. When said foot 13b of the second 55 screen 13 reaches its lower position the motor 12 is actuated to effect rotation of the first screen 10. The scraper bars 22 clean screenings off said first screen 10 and such screenings are eventually trapped on 60 the second screen 13 and will be supported thereon by said foot 13b. After a pre-determined period, the first screen 10 stops and reverses rotation for a short time to 65 clear any solids that may have been trapped

between the screen and the scraper bars and then stops. The piston and cylinder unit 14 then is actuated to lift the foot 13b and the screenings supported thereon to a position above the upper surface of the 70 sewage or liquid in the duct 11.

At this stage the piston and cylinder unit 20 which up to now has been in a retracted position is actuated so as to advance the 75 forks 21 to bring them into a position in which they enter between the bars of the foot 13b and the unit 14 is then again actuated to cause said screen 13 and its foot 13b to descend once again to collect more screenings from the first screen 10. During 80 the time that said foot 13b is in its lower position the pressure head 17 is advanced by the piston and cylinder unit 18 to clear the screenings from the forks 21 and push them into the right-hand end of the compression chamber 16, such screenings being de-watered by the pressure exerted by the hinged plate 19. This de-watering period is adjustable and at the end of 85 this period the pressure head 17 returns followed by the works 21 so that the second screen 13 and foot 13b can again be lifted carrying newly collected screenings. 90

The apparatus will continue to run if the 95 quantity of solids in the sewage or liquid or the flow rate is such that the level of liquid or sewage remains above the aforementioned high level switch but if the flow rate is relatively low or the quantity of solids in the flow of sewage or liquid is 100 comparatively light the level of the sewage or liquid will fall until it reaches a low level switch (also not shown) which will act to stop actuation of the machine after it has operated through a few pre-determined number of additional cycles to clear 105 any screenings which may have been collected. The apparatus will then remain inactive in a position in which the screen 10 is stopped and the foot 13b of the screen 110 13 is in its upper position until the level of liquid or sewage has again arisen to the level of said high level switch.

WHAT WE CLAIM IS:—

115 1. Apparatus for removing solid material from a flow of sewage or other liquid, said apparatus comprising a duct through which sewage or other liquid is to flow, a first screen located in said duct and adapted to filter solid material from the 120 sewage or other liquid flowing through the duct, a second, vertically extending, screen located adjacent to said first screen and having a substantially horizontally extending foot, and means for reciprocating said second screen in a vertical or substantially 125 vertical direction between a lower position in which in use it receives and retains solid material filtered from the flow of sewage 130



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3 or other liquid by the first screen and an upper position in which said foot is disposed in a position which in use is above the upper surface of the flow of sewage or other liquid.

5 2. Apparatus as claimed in Claim 1 wherein there is provided a fluid-pressure operated piston and cylinder head for reciprocating said second screen.

10 3. Apparatus as claimed in either of the preceding claims wherein there is provided a substantially horizontally extending compression chamber having means for removing solid material from said second screen

15 when it is in its upper position.

20 4. Apparatus as claimed in Claim 3 wherein said compression chamber is provided with a pressure head which is horizontally reciprocable by means of a second fluid pressure operated piston and cylinder unit and which is adapted to compress solid

material removed from said second screen.

5. Apparatus as claimed in Claim 4 wherein there is provided a forked member which is horizontally reciprocable by means of a third fluid pressure operated piston and cylinder unit and which is arranged to co-act with said second screen to remove solid material therefrom and support such material until it is engaged by said pressure head for compression thereby.

6. Apparatus for removing solid material from a flow of sewage or other liquid, said apparatus being substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1979.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY,
from which copies may be obtained.