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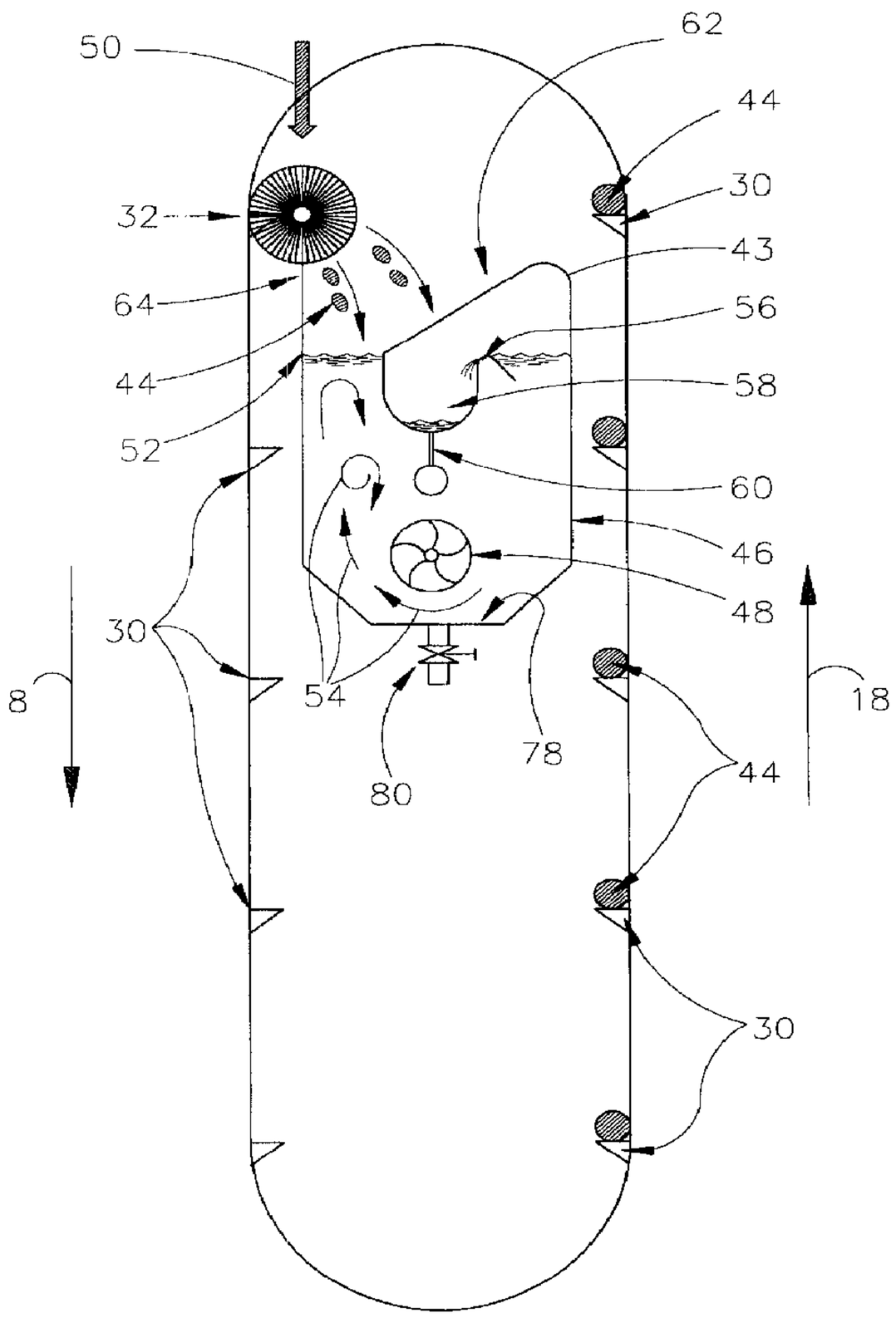
(54) **APPAREIL DE CRIBLAGE DES EAUX USEES**
(54) **SEWAGE SCREENING APPARATUS**



(57) A sewage screening apparatus (10) comprising a screen arrangement having a continuous belt screen (11) for capturing screenings contained within the sewage flow (16) to enable their subsequent removal therefrom, the screen arrangement having a head space (20) above the level of the sewage flow when in use, The apparatus further comprises a washing apparatus (43), housed within the head space (20) of the screen arrangement, into which screenings captured by the screen arrangement and an aqueous liquid are introduced. The washing apparatus (43) includes impeller means (48,) for generating turbulence within the aqueous liquid to effect washing of the screenings prior to their removal from the sewage screening apparatus (10).

ABSTRACT

SEWAGE SCREENING APPARATUS

A sewage screening apparatus (10) comprising a screen arrangement having a continuous belt screen (11) for capturing screenings contained within the sewage flow (16) to enable their subsequent removal therefrom, the screen arrangement having a head space (20) above the level of the sewage flow when in use. The apparatus further comprises a washing apparatus (43), housed within the head space (20) of the screen arrangement, into which screenings captured by the screen arrangement and an aqueous liquid are introduced. The washing apparatus (43) includes impeller means (48,) for generating turbulence within the aqueous liquid to effect washing of the screenings prior to their removal from the sewage screening apparatus (10).

SEWAGE SCREENING APPARATUS

The invention relates to a sewage screening apparatus for removing solid materials from a sewage flow.

It is recognised that the effluent flow entering a sewage treatment plant contains solid materials, such as rags, paper, polythene and other plastic sheeting, and the like, which cannot be processed by the treatment plant. Solids can be removed from the flow by screens or sieves which capture the solids. The screens or sieve are then periodically or continuously operated for cleaning to remove the captured solids, commonly referred to as screenings, for de-watering and compaction and subsequent disposal. One such screening apparatus known in the art is the "continuous-belt screen" which includes a continuous belt screen, driven by means of a drive mechanism, which presents a continuous, moving screening area to the input sewage flow to effect removal of screenings within the sewage flow.

It is inevitable that faecal materials from the effluent flow entering the sewage treatment plant will become entrapped with the screenings. In order to improve the working environment of personnel handling the extracted screenings and to minimise potential health hazards, it is desirable that screenings removed from the flow are as free as possible from any faecal material. Usually, screenings removed from the sewage flow by the continuous-belt screen are passed to a secondary washing stage, remote from the screening apparatus, to wash the screenings prior to compaction and removal from the site. Thus, additional conveying means are required for conveying the screenings to the secondary washing stage and subsequently onwards to the de-watering and compaction

stage. The use of a secondary washing stage is disadvantageous in terms of complexity and cost.

EP 0 592 508 describes an alternative apparatus for cleaning screenings to be removed from a sewage flow. In this apparatus, removal of the screenings is effected by means of a screw conveyor having a perforated trough through which sewage in the liquid phase passes. An agitator, in the form of an impeller device, is used to create turbulence in the sewage flow causing faecal contaminants to be washed from the screenings prior to their entry to the screw conveyor and their subsequent removal from the flow. The screenings cannot pass through the perforated trough and are compacted by the screw conveyor for subsequent disposal from the apparatus.

A disadvantage of the apparatus is that it has a relatively low sewage flow capacity and, typically, the apparatus can only be used with sewage flow rates of less than 300-400 litres per second. Thus, the apparatus is not well suited for use as a primary sewage screening system. In particular, the apparatus cannot be employed in a sewage treatment plant serving areas where it is necessary to process a large sewage flow, such as areas of high population. Furthermore, the washing action is effected by repeatedly removing and reintroducing screenings into the region of turbulence by periodically reversing the direction of the screw conveyor during operation. Repeatedly reversing the direction of the screw conveyor in this way is mechanically inconvenient.

It is an object of the present invention to provide an apparatus for removing washed screenings from a sewage flow which alleviates the problems of the prior art.

According to the present invention there is provided a sewage screening apparatus comprising;

a screen arrangement having a continuous belt screen for capturing screenings contained within the sewage flow to enable their subsequent removal therefrom, the screen arrangement having a head space above the level of the sewage flow when in use; and

a washing apparatus, housed within the head space of the screen arrangement, into which screenings captured by the screen arrangement and an aqueous liquid are introduced, wherein the washing apparatus includes impeller means for generating turbulence within the aqueous liquid to effect washing of the screenings prior to their removal from the sewage screening apparatus.

The apparatus has a large flow capacity by virtue of the large screening area presented by the continuous belt screen. The apparatus therefore provides the advantage that it can be used for screening a high volume sewage flow and is therefore particularly suitable for use in a sewage treatment plant serving highly populated areas. Furthermore, owing to its increased capacity, the apparatus is suitable for use as a primary sewage screening apparatus.

In addition, as washing of the screenings removed from the sewage flow is effected within the washing apparatus housed within the screen arrangement, the screenings removed from the screen arrangement need not be passed through a second, remote washing stage prior to their removal from the sewage treatment plant.

The washing apparatus includes a washing tank having impeller means located therein, the washing tank having a back plate and a front plate. The impeller means may be one or more rotary impeller. At least one rotary impeller may be mounted in the back plate of the washing tank. In addition, or alternatively, at least one rotary impeller may be mounted in the front plate of the washing tank. The back plate of the washing tank preferably forms part of a back plate of the screen arrangement.

The apparatus also includes a drive mechanism for driving the belt screen, the drive mechanism being mounted externally of the screen arrangement.
It is usual in conventional continuous belt screen arrangements for the drive mechanism to take the form of a driving wheel located within the head space of the screen arrangement. Mounting the driving mechanism externally of the screen arrangement enables the washing apparatus to be accommodated in the head space of the screen arrangement. Furthermore, contamination of the drive mechanism by the sewage flow is avoided.

The drive mechanism comprises a driven chain carrying a plurality of bracket members for cooperation with a plurality of link members mounted on the belt screen, each of the link members having a drive pin member projecting therefrom, the bracket members cooperating with the projecting pin member to lift the link members and thereby drive the belt screen.

More particularly, each of the link members has two drive pin members, one projecting from each side of the link member, and each bracket member is bifurcated, the two fingers of the bracket member extending one on either side of the link member to engage with a corresponding drive pin member.

The drive mechanism is not limited to use in the screening apparatus of the present invention and may be employed in any sewage screening apparatus having a driven screening belt.

The screening apparatus further includes brushing means, such as a rotary brush, housed within the head space of the screen arrangement, to effect removal of screenings captured by the continuous belt screen into the washing apparatus. The washing tank also includes a weir over which an outlet flow from the washing tank, including the washed screenings, flows into conveyance means for conveying the outlet flow to a subsequent de-watering and compaction stage. The conveyance means may be a launder or a screw conveyor. The washing tank also includes covering means to prevent screenings removed from the continuous belt screen from passing directly into the conveyance means without passing through the washing tank. The washing tank also includes scraping means for scraping materials, including screenings, from the rotary brush into the washing tank. The scraping means may be provided by an upper edge of a side wall of the washing tank.

The washing tank also includes a drainage point within its base to enable drainage of the washing tank. Preferably, the base of the washing tank is of substantially curved or rounded form or the base is formed from separate plates having mitred corners. A base of this shape serves to enhance the mixing and turbulation of the tank contents.

The invention will now be described, by way of example only, with reference to the following drawings in which;

Figure 1 is a perspective view of a conventional screen arrangement;

Figure 2 is a plan view of the apparatus shown in Figure 1;

Figure 3 is a front view of an embodiment of the present invention;

Figure 4 is a side view of a part of the apparatus of Figure 3;

Figure 5 is a perspective view of the apparatus of Figure 3 housed within the main sewage flow channel;

Figure 6 is a perspective view of a part of the drive mechanism for the apparatus shown in Figures 3-5;

Figure 7 is a side view of the drive mechanism shown in Figure 6;

Figure 8 is an enlarged side view of a part of the driving connection of the drive mechanism shown in Figures 6 and 7;

Figure 9 is a perspective view of an apparatus in accordance with an alternative embodiment of the invention;

Figure 10 is a front view of a part of the apparatus in Figure 9; and

Figure 11 is a side view of a part of the apparatus in Figure 10.

Referring to Figure 1, a conventional screening apparatus, referred to generally as 10, for use in a sewage treatment plant includes a number of screen panels 12, each panel 12 being formed from a perforated metal sheet. The screen

panels 12 are connected so as to form a continuous loop providing a belt screen 11, each screen panel 12 being connected to the adjacent screen panels, one on each side, by hinging means 14. Conveniently, the hinging means 14 may be in the form of a series of interdigitated lugs (not shown in detail), arranged along the edge of each panel 12, in which a retaining pin is received, the retaining pin passing through the lugs on adjacent panels 12 to secure adjacent panels together.

The continuous belt screen 11 is driven by a drive mechanism (not shown in Figure 1) such that the screen panels 12 are conveyed upwardly on one side of the arrangement 10 and downwardly on the other side in a direction, as indicated by arrows 18. Such screen arrangements are well known in the art and may be referred to as "continuous belt screens", as the screen panels 12 form a continuous belt, driven by the drive mechanism, which presents a substantially continuous, moving screening area to the input sewage flow.

At the input stage, the sewage flow 16 contains solid materials (not shown), such as rags, paper, plastics materials and stones, which cannot be processed by the treatment plant. The screen panels 12 are formed from sheets of perforated metal, the perforations of which 22 enable the liquid phase of the sewage to pass through the panels 12 onward to the subsequent processing stages of the treatment plant. However, the perforations 22 are such that solid materials in the sewage flow 16, having a greater dimension than the perforations, are captured. The liquid phase of the sewage is therefore passed out from the screen arrangement 10 through the continuous belt screen 11 on each side and through that part at the base, whilst the screenings are retained.

The flow path of the liquid phase of the sewage through the screen arrangement 10 can be seen more clearly in Figure 2, which shows the screen arrangement 10 housed within the main sewage channel 24 of the processing plant. Seal points 26 between the belt screen and the main channel 24 separate the input sewage flow 16 from the screened output flow 28.

Hooks or prongs 30 are arranged internally on the belt screen 11 at spaced locations around the loop. The hooks 30 are usually located between adjoining screen panels 12 and serve to capture the screenings contained within the sewage flow 16 as the belt screen passes continuously therethrough. The screenings may be removed from the belt screen 11 by means of a rotary brush 32 housed within the head space 20 of the screen arrangement 10 as they are conveyed through the head space 20 past the rotary brush 32.

The apparatus also includes a hopper 34, housed within the head space 20, into which captured screenings, contaminated by faecal materials, are dislodged from the belt screen 11 by the rotary brush 32. At the upper part of the screen arrangement 10, aqueous liquid 36 is passed through a sparge washing system 40 onto the belt screen 11 to flush any materials which become entrapped in the perforations 22 of the screen panels 12. The screenings removed by the rotary brush 32, along with any materials flushed from the belt screen 11 by the liquid 36, are then discharged from the hopper 34 into a launder 42 which carries the screenings to a subsequent washing stage. The subsequent washing stage is remote from the screen arrangement 10 and therefore additional conveying means are required for conveying the screenings to the secondary washing stage and subsequently onwards to the de-watering and compaction stage. The complexity and cost of the apparatus is therefore increased.

It is common for the continuous belt screen to be driven by means of a rotating wheel mechanism located within the head space 20 at the top of the screen arrangement 10. However, if the head space 20 accommodates this rotating wheel mechanism, the rotary brush 32 cannot then easily be accommodated therein. The present invention overcomes this problem, as will be described hereinafter.

Referring to Figure 3, the screening apparatus of the present invention includes a screen arrangement 10, as shown in Figure 1, and a washing apparatus, referred to generally as 43. The washing apparatus 43 is housed within the head space 20 of the screen arrangement 10, the head space 20 being that region within the belt screen 11 above the level of liquid sewage. The washing apparatus may be housed anywhere above the sewage level within the screen arrangement 10 but is preferably housed towards the upper portion of the head space 20.

The washing apparatus is generally of the kind described in EP 0 557 030, and includes a washing tank 46 and an impeller device 48, such as a rotary impeller, housed within the washing tank 46. A washing liquid 50 is introduced into the washing tank 46 by means of a sparge washing system (not shown), filling the washing tank 46 to level 52. The washing liquid 50 also serves to flush any materials from the belt screen 11 which have become entrapped in the perforations 22 of the screen panels 12. The impeller 48 is driven by a motor (not shown in Figure 3) and serves to create a turbulence effect within the contents of the washing tank 46.

As the belt screen 11 is moved continuously by means of the drive mechanism the hooks 30, arranged internally on the belt screen 11, capture the screenings

44 within the flow such that they are conveyed upwardly on the hooks 30 towards the head space 20. As the screenings are conveyed passed the rotary brush 32 on the belt screen 11, the brush 32 removes the screenings from the belt screen 11 into the washing tank 46. Preferably, the hooks 30 are grouped together to form rows of hooks spaced internally around the loop. The hooks may be located between adjoining screen panels 12, although they need not be included between each of the adjoining panels 12.

The screenings introduced into the washing tank 46 are therefore subjected to a rigorous swirling motion, as indicated by arrows 54, produced by the driven rotary impeller 48. The swirling motion serves to wash the screenings and thereby removes any faecal contaminants which are entrapped with the screenings.

Having been subjected to the intense washing action within the tank 46, the screenings pass over a weir 56 within the washing tank 46 into a launder 58. A sufficiently large volume of washing liquid also passes over the weir 56 into the launder 58, thereby ensuring the washed screenings are carried to the subsequent de-watering and compaction stage by the flow of liquid.
The washing tank 46 includes a baffle plate 60 arranged underneath the launder 58. Along with the profile of the launder 58, the baffle plate 60 serves to separate the washing tank 46 into two parts; a primary washing part, in which the region of turbulence washes the screenings introduced thereto (as indicated by arrows 54) and a secondary outlet part from which washed screenings are discharged to the launder 58 in the outlet flow.

The washing tank 46 also includes a cover 62, arranged above the launder 58, to prevent screenings brushed from the belt screen 11 by-passing the washing

process within the tank 46 and falling directly into the launder 58. Preferably, the side wall 64 of the washing tank 46 extends upwardly towards the rotary brush 32, thereby providing a scraping edge to aid removal of screenings from the brush 32 into the washing tank 46.

Figure 4 shows a side view of the washing tank 46 housed within the screen arrangement 10. The impeller 48 is driven by a motor 70 mounted in a back plate 72 of the washing tank 46 such that the motor is external to the washing tank 46. Preferably, the back plate 72 also forms part of the back plate of the screen arrangement 10. In this way, the motor 70 is also mounted externally to the screen arrangement 10, thereby avoiding contamination of the motor 70 by the effluent flow within the screen arrangement 10. Removal of the back plate 72 enables easy access to the internal parts of the washing tank 46, for example for cleaning purposes.

Preferably, the direction of rotation of the impeller 48 is towards the incoming screenings (i.e. anti-clockwise as viewed in Figure 3). In this way, the swirling motion imparted to the contents of the washing tank 46 acts on the screenings so as to force them into the primary washing part of the washing tank 46. Thus, the screenings are maintained within the region of turbulence for as long as possible, thereby optimising the washing effect.

It is advantageous if the base 78 of the washing tank 46 is of substantially curved or rounded form or is formed from separate plates having mitred corners. A base having this shape serves to enhance the mixing and turbulation of the tank contents. Periodically it may be necessary to remove solid materials, such as stones, which collect in the base region 78 of the washing tank 46. For this purpose a drainage point 80 may be provided in the base region 78 of the

washing tank 46. The drainage point 80 also enables the contents of the tank 46 to be emptied, for example if access to the impeller is required if any damage has occurred thereto. As described previously, access to the impeller 48 can be achieved by removing the back plate 72.

As well as washing faecal contaminants from the screenings, the swirling motion generated by the impeller assists in breaking the faecal materials into finely comminuted form. As a further aid to comminution of the faecal materials, the inner surface of the washing tank 46 may be provided with an abrasive lining so that, as the faecal materials are thrown against the wall of the tank by the turbulent flow within the washing tank, mechanical attrition of the faecal materials occurs. For example, the abrasive lining on the inner wall of the washing tank 46 may be a metallic or ceramic particle based abrasive coating.

The comminution of the faecal materials in this way is advantageous as any liquefied faecal materials passing over the weir with the screenings will be separated from screenings in the subsequent de-watering and compaction stage and can then be re-supplied to the sewage flow channel for further processing in the sewage treatment plant. Maintaining the faecal materials within the sewage flow ensures the biological loading of the sewage treatment plant is maintained.

The outlet flow from the weir 56 therefore includes washed screenings, liquefied faecal material and washing liquid. The outlet flow discharged over the weir 56 into the launder 58 is conveyed to the subsequent de-watering and compaction stage of the apparatus. The de-watering and compaction stage may include a screw compactor of the kind described in EP 0 557 030. Such a screw

compactor includes a perforated trough region and a rotatable screw. The washing liquid and the liquefied faecal materials in the outlet flow can pass through the perforated trough, whilst the washed screenings are compacted by the rotating screw. The compacted screenings can then be safely disposed of in an incinerator or into a removal vehicle and the washing liquid and the liquefied faecal materials, being free from screenings, are returned to the sewage flow for further treatment.

It will be appreciated that the launder used for conveying screenings from the weir 56 to the subsequent de-watering and compaction stage may be replaced with another suitable conveyance means, such as a screw conveyor.

The screen arrangement 10 is housed in the main sewage channel 24, as shown in Figure 5. For clarity, the washing apparatus shown in Figure 3 is not shown in Figure 5 but, as described hereinbefore, is located above the sewage level, illustrated generally by the dotted line 81. The continuous belt screen 11 presents a large screening area to the input sewage flow 16, the screening area being provided by the belt screen 11 on two vertical sides of the screen arrangement 10 and at the base of the screen arrangement. The screening apparatus therefore has a large sewage flow capacity and, typically, is capable of screening an input sewage flow at a rate of up to 3000 litres per second. The apparatus is therefore particularly suitable for use in areas having a high population. Furthermore, owing to the large sewage flow capacity, the apparatus is suitable for use as a primary sewage screening apparatus.

The dimensions of the washing tank 46 housed within the screen arrangement 10 will be determined by the volume of sewage to be passed through the sewage screening apparatus. For washing tanks of larger dimension it is

preferable to include two or more impeller devices 48 within the tank 46. Each of the impellers may be mounted on the back plate 72 or, alternatively, one or more impeller may be mounted on a front plate of the washing tank 46 oppositely facing the back plate 72. The washing liquid introduced into the washing tank 46 is an aqueous liquid and may include a washing compound to aid the washing process.

In use, the impeller device 48 is driven by the motor 70 during the period of operation of the continuous belt screen 11. However, it is preferable if the impeller is driven for a longer period than the belt screen so that the washing action continues after operation of the belt screen has ceased. Thus, all the screenings removed from the belt screen are washed fully. It may also be preferable to pause operation of the impeller during operation of the belt screen 11 as re-starting of impeller rotation can cause any materials which have become attached to the impeller to be dislodged therefrom. In addition, aeration within the tank contents which results from the impeller action causes the screenings to float to the top of the tank 46 (i.e. towards the weir 56) when impeller motion stops.

In the present invention, the drive mechanism for the belt screen is mounted externally to the screen arrangement 10 on a sidewall of the screen arrangement 10, the drive mechanism engaging with both sides of the belt screen 11 as it passes through the head space 20 to effect the driving connection. Referring to Figures 6-8, only the drive connection for one side of the belt screen 11 is shown for clarity. The drive mechanism for this side includes a roller chain 90, formed from a plurality of chain links 92, and driven by means of a chain wheel 94 mounted on a drive shaft 96. The drive shaft 96 is driven by means of a motor 97 in the direction of arrow 102, the roller chain 90 therefore being

driven by the chain wheel 94 in the direction of arrows 104. Idler wheels 98,100 hold the roller chain 90 under tension, the roller chain tension being adjustable by means of an adjustable tensioning plate 106. The face of the adjustable tensioning plate 108 is formed from a high density plastic material.

Mounted at each end of the screen panels 12 forming the belt screen 11 is a link member 110. As described previously, the screen panels 12 are connected together by means of hinge pins 14, passing through a plurality of interdigitated lugs (not shown) arranged along the edge of each screen panel 12. The hinge pins 14 also pass through apertures formed in the link members 110, thereby securing the link members 110 to their respective screen panel 12. Each of the link members 110 also includes a drive pin 114, or peg, projecting laterally therefrom.

The roller chain 90 carries bifurcated brackets 112, referred to as "lifting" brackets, by means of a connection with the chain links 92, the brackets being spaced on the roller chain 90 at locations corresponding to the positioning of the link members 110 of the belt screen 11. As a lifting bracket 112 is carried by the driven roller chain 90 around the base 91 of the roller chain 90 and subsequently upwards, the upper surface of the each of the fingers of the bracket 112 comes into contact with a corresponding drive pin 114 on a link member 110. The bracket 112 thereby serves to "lift" the drive pins 114, and hence the link member 110, in an upward direction, thus driving the belt screen 11. The tensioning plate 106 serves to ensure that the brackets 112 embrace the link members 110 at the correct depth so that the bracket provides the required lifting force for the drive pins 114.

The link members 110 may be formed from a high density plastic material and are shaped to cooperate with vertically extending guide tracks 116 for guiding the link members 110 as they are driven in an upward direction by the driven roller chain 90. The guide tracks 116 may be formed from a high density plastic material and are supported by a steel angle track 118 which may form part of the outer housing of the screen arrangement 10. Equivalent guide tracks for the link members mounted on the other side of the belt screen 11 are also provided (not shown in Figure 6).

External mounting of the drive mechanism leaves sufficient room in the head space 20 of the screen arrangement for accommodation of the washing tank 46 and the rotary brush 32. Furthermore, as the drive mechanism is mounted externally, contamination of the drive mechanism by the effluent is avoided. In addition, the driving motion effected by the lifting mechanism of the brackets 112 and the link members 110 is particularly effective and the mechanism has a longer operating life than conventional drive mechanisms.

The drive mechanism also provides an advantage over conventional drive mechanisms which are mounted on the top curve of the screen arrangement. By mounting the drive mechanism on a vertical side of the screen arrangement, the bearing load on the top curve is minimised and the wear on the apparatus is reduced. The operating life of the apparatus is therefore improved.

With reference to Figures 9, 10 and 11, there is shown an alternative embodiment of the invention in which the washing tank 46 is provided with a valve arrangement 130 which is operable between open and closed positions to control the discharge of liquid and washed screenings from the washing tank 46. When the valve arrangement 130 is in the open position, liquid within the

washing tank 46 and washed screenings are able to flow through an outlet port (not shown) provided in the washing tank 46, into the launder 58 to be discharged from the screening apparatus. When the valve arrangement 130 is in the closed position, the outlet port is closed such that liquid and the screenings are unable to flow from the washing tank 46 into the launder 58.

The valve arrangement 130 is operable in response to an output signal from a sensor 132, as shown in Figure 10, for sensing the level of liquid within the washing tank 46. In use, when the level of liquid within the washing tank 46 reaches an upper level 134, the output signal generated by the liquid level sensor 132 is used to initiate opening of the valve arrangement 130. The valve arrangement 130 remains open for a period of time which is sufficient to permit the washing tank 46 to drain to a liquid level no less than a lower level 136. When the level of liquid in the washing tank 46 reaches the lower level 136, the output signal generated by the sensor 132 is used to initiate closure of the valve arrangement 130. Under such circumstances, liquid within the washing tank 46 and washed screenings are unable to flow through the outlet port into the launder 58.

The output signal from the sensor 132 is also used to control operation of the motor 70 for the impeller 48 such that, when the level of liquid within the washing tank 46 reaches the lower level 136, operation of the motor 70 is ceased. Operation of the impeller 38 therefore ceases when the level of liquid within the washing tank 46 reaches the lower liquid level 136.

Typically, the output signals generated by the sensor 132 may be supplied to an electronic control unit (not shown), or a computer processor, for controlling operation of the valve arrangement 130 and the drive mechanism for the screen

arrangement. When the output signal from the sensor 132 indicates that the level of liquid in the washing tank 46 has reached the upper level 134 and the valve arrangement 130 is opened, a signal is provided to the drive mechanism for the screen arrangement to halt operation of the belt screen 11. This prevents any unwashed screenings delivered to the washing tank 46 whilst the valve arrangement 130 is open from being discharged into the launder 58. It will be appreciated that the apparatus shown in Figures 9, 10 and 11 enables washed screenings to be discharged from the apparatus in batches, rather than continuously.

The inset in Figure 6 shows the direction of travel of the belt screen 11 (as indicated by the arrows 18) when the drive mechanism is mounted on the right hand, vertical side of the screen arrangement and is driven in the direction of arrow 104. However, it will be appreciated that the direction of travel 18 may be reversed by mounting the drive mechanism on the left hand vertical side of the screen arrangement.

The drive mechanism described hereinbefore is not limited to use in the sewage screening apparatus of the present invention and may be employed in any sewage screening apparatus having a driven screening belt.

CLAIMS

1. A sewage screening apparatus (10) comprising;

a screen arrangement having a continuous belt screen (11) for capturing screenings contained within the sewage flow (16) to enable their subsequent removal therefrom, the screen arrangement having a head space (20) above the level of the sewage flow when in use;

characterised in that the apparatus comprises a washing apparatus (43), housed within the head space (20) of the screen arrangement, into which screenings captured by the screen arrangement and an aqueous liquid are introduced, wherein the washing apparatus (43) includes impeller means (48) for generating turbulence within the aqueous liquid to effect washing of the screenings prior to their removal from the sewage screening apparatus (10).

2 The sewage screening apparatus as claimed in Claim 1, wherein the washing apparatus (43) includes a washing tank (46) having impeller means (48) located therein, the washing tank (46) having a back plate (72) and a front plate.

3. The sewage screening apparatus as claimed in Claim 2, wherein the impeller means include one or more rotary impeller (48).

4. The sewage screening apparatus as claimed in Claim 3, wherein at least one rotary impeller (48) is mounted in the back plate (72) of the washing tank (46).

5. The sewage screening apparatus as claimed in Claim 3 or Claim 4, wherein at least one rotary impeller (48) is mounted in the front plate of the washing tank (46).

6. The sewage screening apparatus as claimed in any of Claims 2 to 5, wherein the back plate (72) of the washing tank (46) forms part of a back plate of the screen arrangement.

7. The sewage screening apparatus as claimed in any of Claims 1 to 6, wherein the washing apparatus (43) is provided with a valve arrangement (130) which is operable between an open position, in which screenings are discharged from the washing tank (46), and a closed position in which screenings are prevented from being discharged from the washing tank (46).

8. The sewage screening apparatus as claimed in Claim 7, wherein the washing apparatus (43) is provided with sensing means (132) for sensing the level of liquid within the washing tank (46).

9. The sewage screening apparatus as claimed in Claim 8, wherein the valve arrangement (130) is operable in response to an output signal provided by the sensing means (132).

10. The sewage screening apparatus as claimed in any of Claims 7 to 9, further comprising means for halting operation of the belt screen (11) when the valve arrangement is in an open position.

11. The sewage screening apparatus as claimed in any of Claims 7 to 10, comprising a control unit for controlling operation of the belt screen (11) and the valve arrangement (130).

12. The sewage screening apparatus as claimed any of Claims 1 to 11, wherein the washing tank (46) also includes a weir (56) over which an outlet flow from the washing tank (46), including the washed screenings, flows into conveyance means (58) for conveying the outlet flow to a subsequent de-watering and compaction stage.

13. The sewage screening apparatus as claimed in Claim 12 , wherein the washing tank (46) also includes covering means to prevent screenings removed from the continuous belt screen (11) from passing directly into the conveyance means (58) without passing through the washing tank (46).

14. The sewage screening apparatus as claimed in any of Claims 1 to 13, wherein the washing tank (46) also includes scraping means (64) for scraping materials, including screenings, from a rotary brush (32) into the washing tank (46).

15. The sewage screening apparatus as claimed in Claim 14, wherein the scraping means are provided by an upper edge of a side wall (64) of the washing tank (46).

16. The sewage screening apparatus as claimed in any of Claims 1 to 15, wherein the washing tank (46) includes a drainage point (80) within its base to enable drainage of the washing tank (46).

17. The sewage screening apparatus as claimed in Claim 16, wherein the base of the washing tank (46) is of substantially curved or rounded form.

18. The sewage screening apparatus as claimed in any of Claims 1 to 17, further comprising a drive mechanism (90, 92, 94) for driving the belt screen (11), the drive mechanism being mounted externally of the screen arrangement (10).

19. The sewage screening apparatus as claimed in Claim 18, wherein the drive mechanism comprises a driven chain (90) carrying a plurality of bracket members (112) for cooperation with a plurality of link members (110) mounted on the belt screen (11), each of the link members (110) having a drive pin member (114) projecting therefrom, the bracket members (112) cooperating with the projecting pin member (114) to lift the link members (110) and thereby drive the belt screen (11), in use.

20. The sewage screening apparatus as claimed in Claim 19, wherein each of the link members (110) has two drive pin members (114), one projecting from each side of the associated link member (110), and wherein each bracket member (112) is bifurcated, the two fingers of the bracket member (112) extending one on either side of the link member (110) to engage with a corresponding drive pin member (114).

21. A drive mechanism for use in a sewage screening apparatus as claimed in any of Claim 1 to 20, comprising a driven chain (90) carrying a plurality of bracket members (112) for cooperation with a plurality of link members (110) mounted on the belt screen (11), each of the link members (110) having a drive pin member (114) projecting therefrom, the bracket members (112) cooperating

with the projecting pin member (114) to lift the link members (110) and thereby drive the belt screen (11), in use.

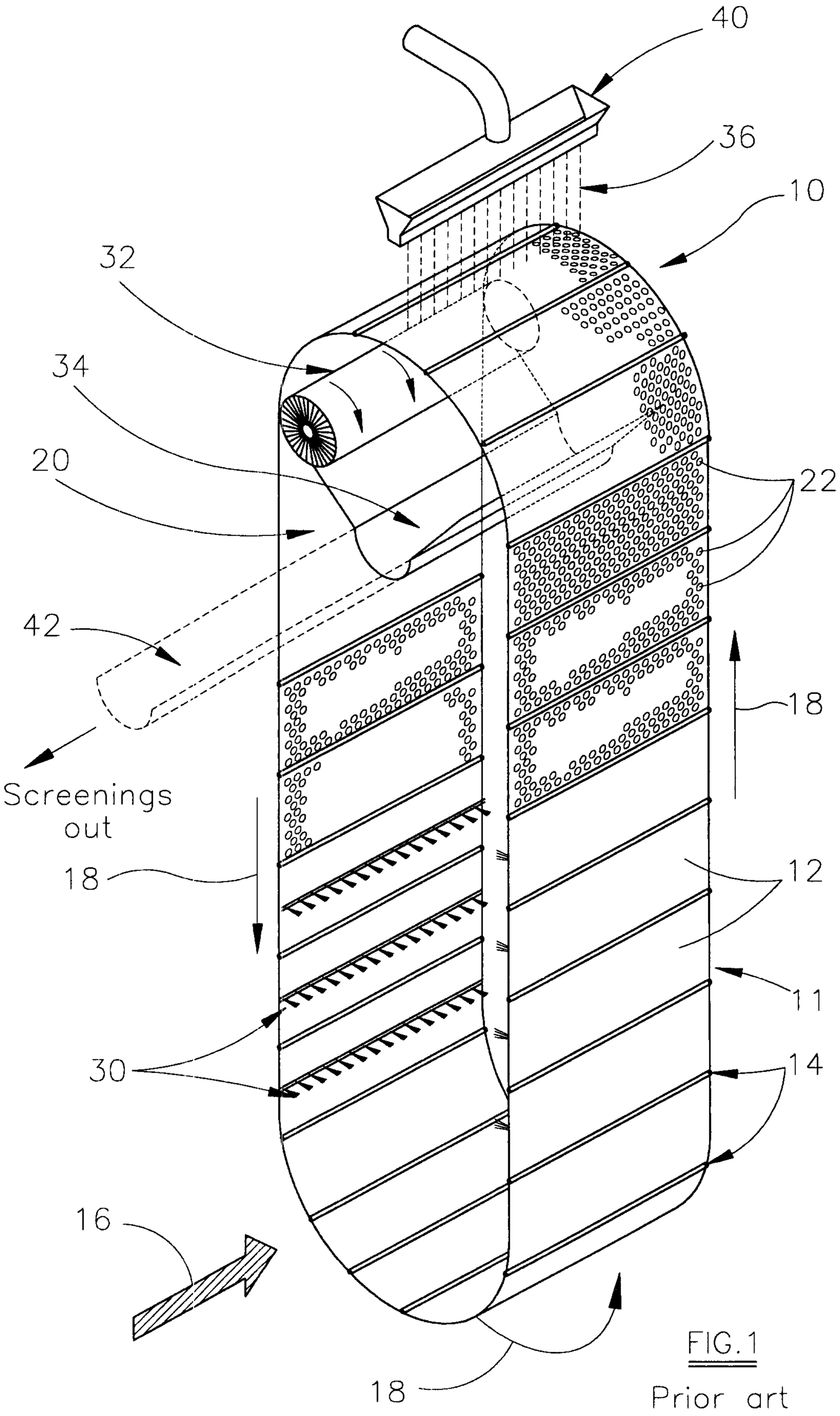


FIG.1
Prior art

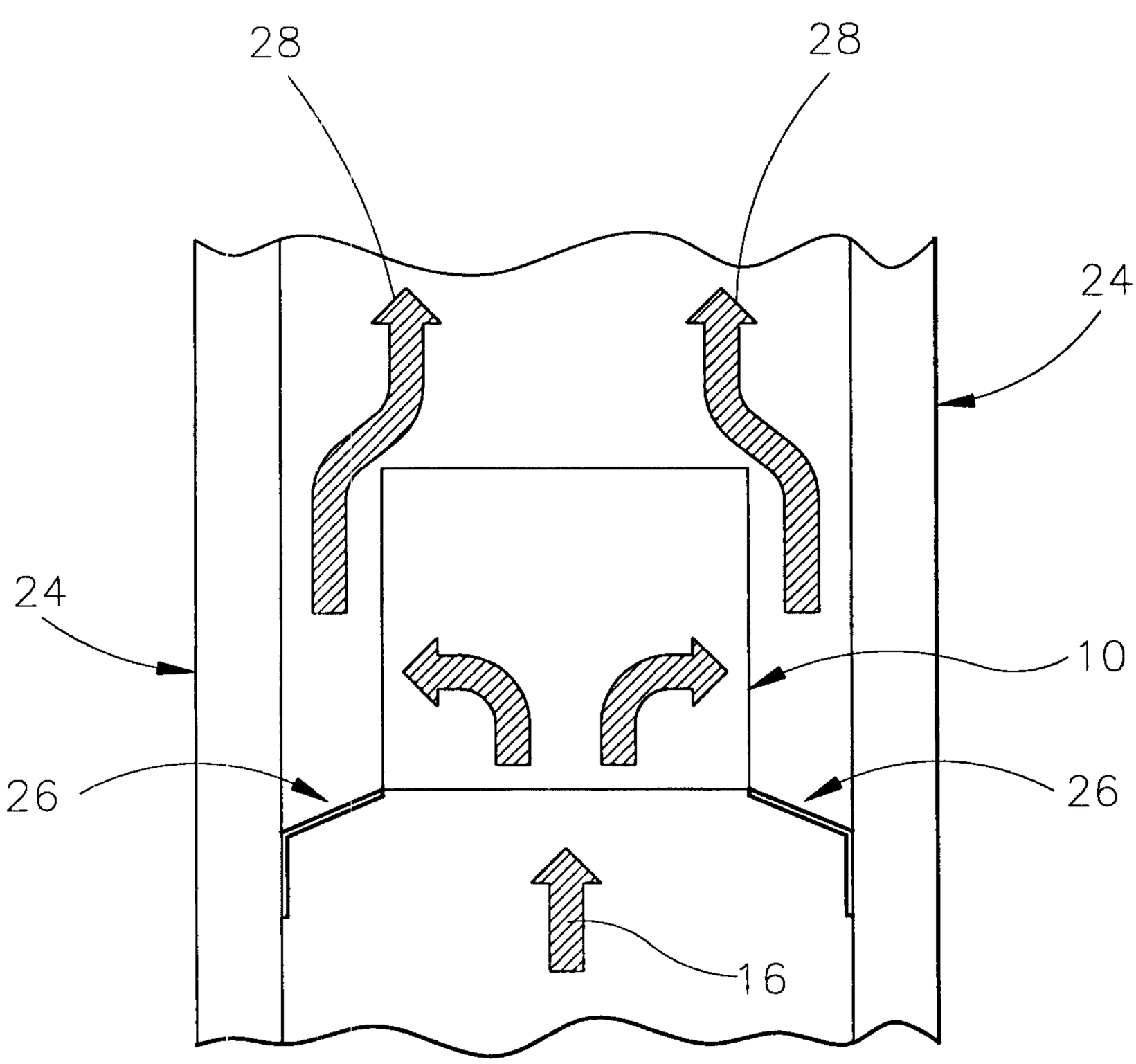


FIG.2

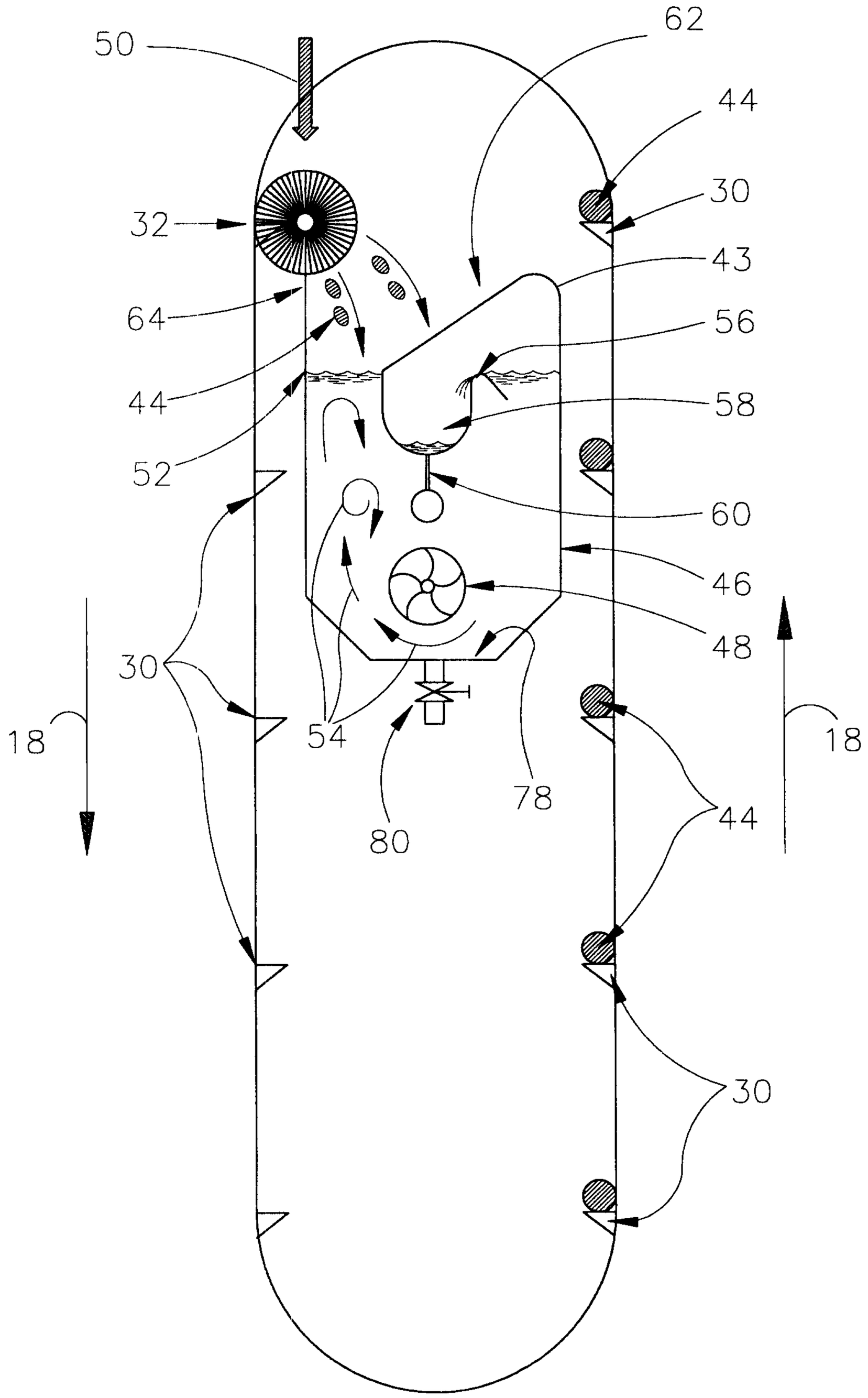


FIG.3

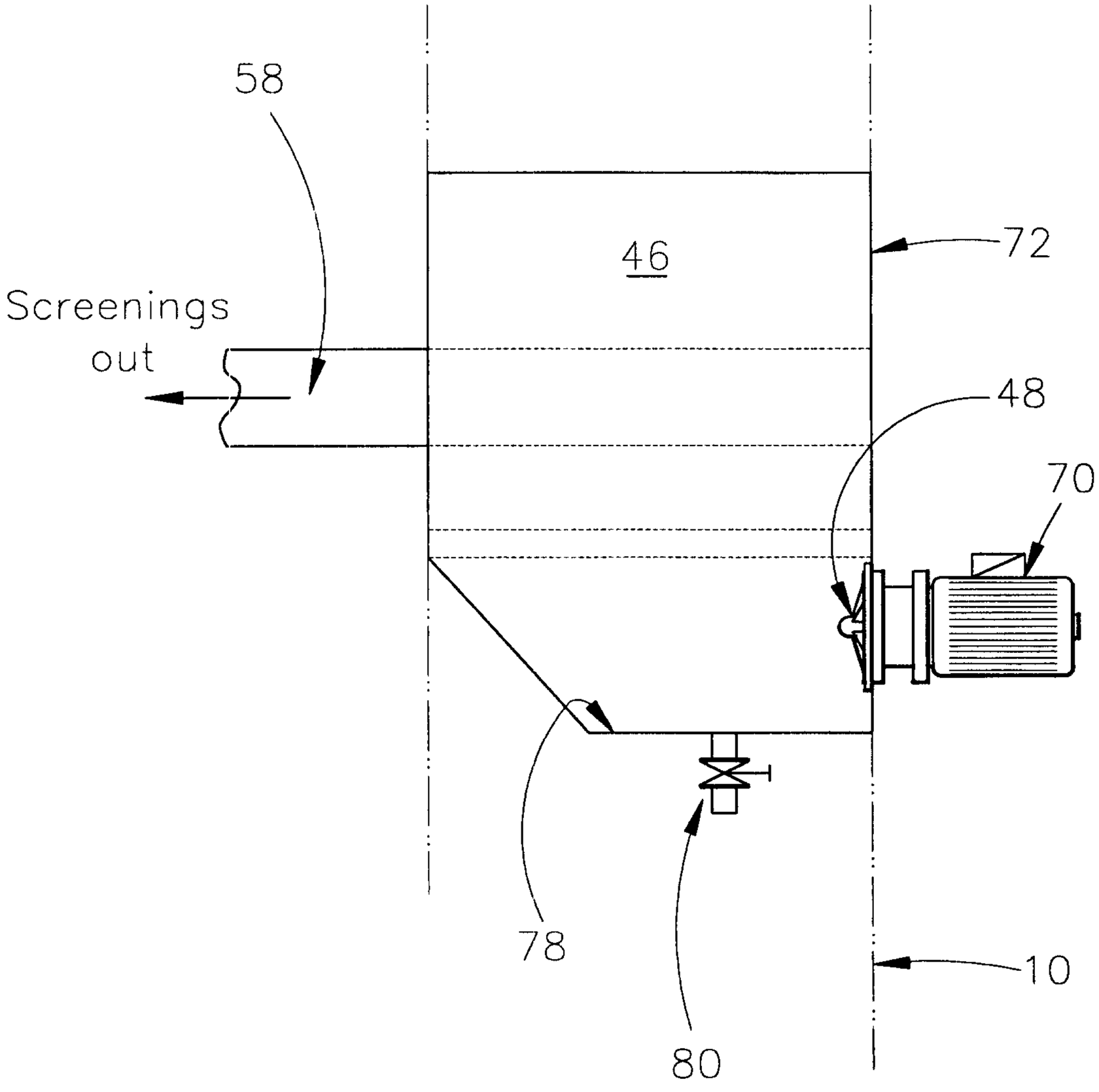


FIG.4

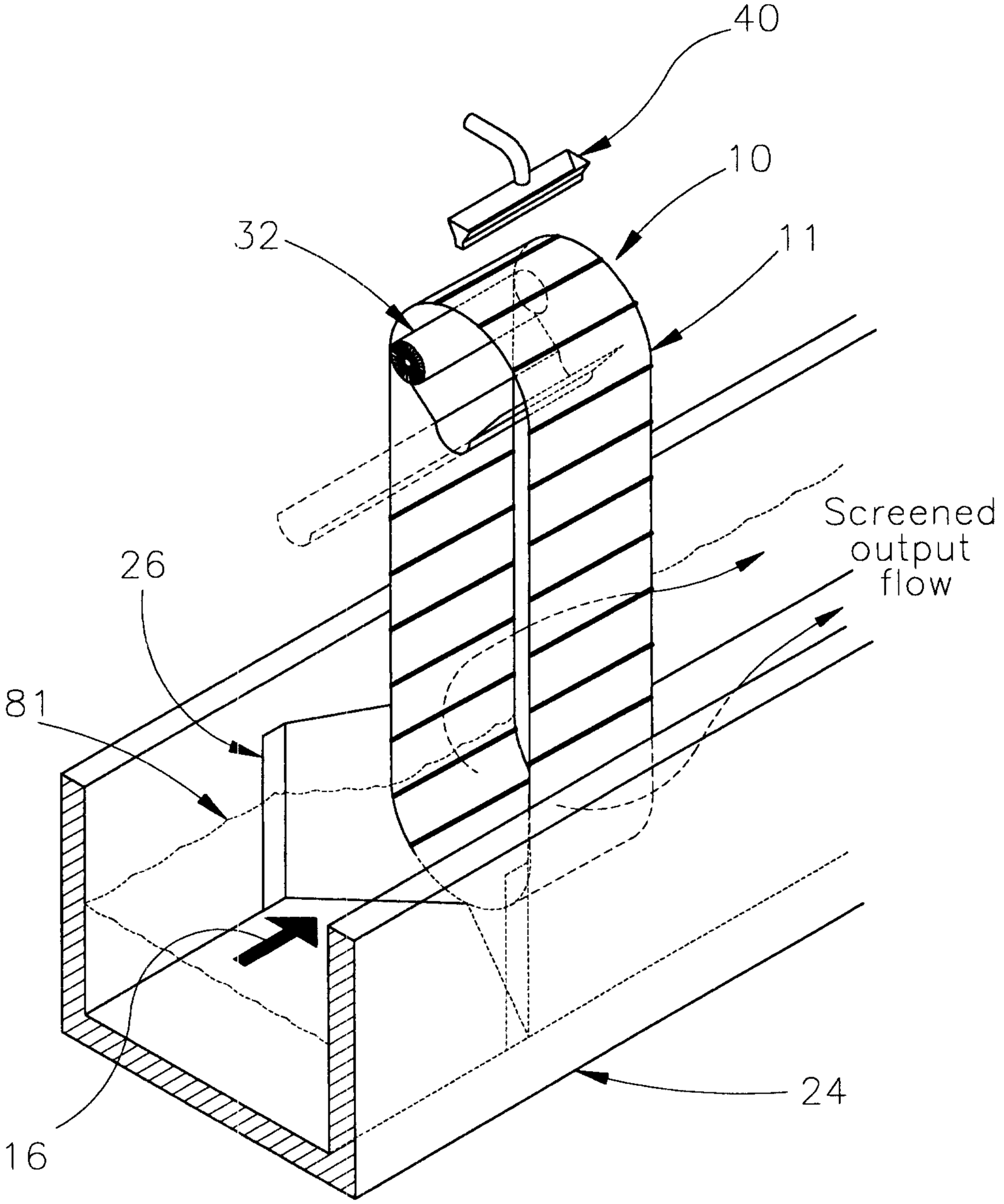


FIG.5

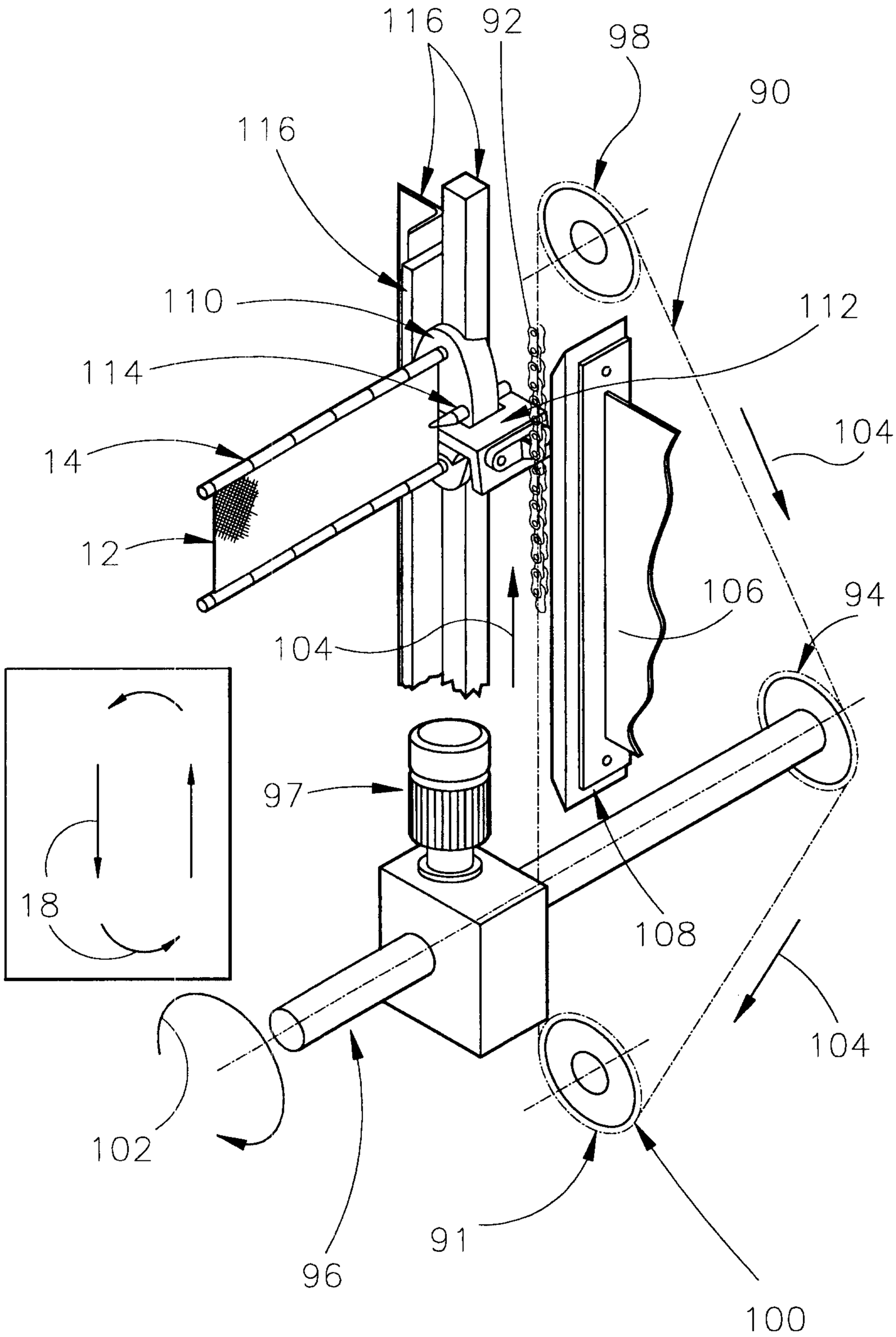

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FIG.6

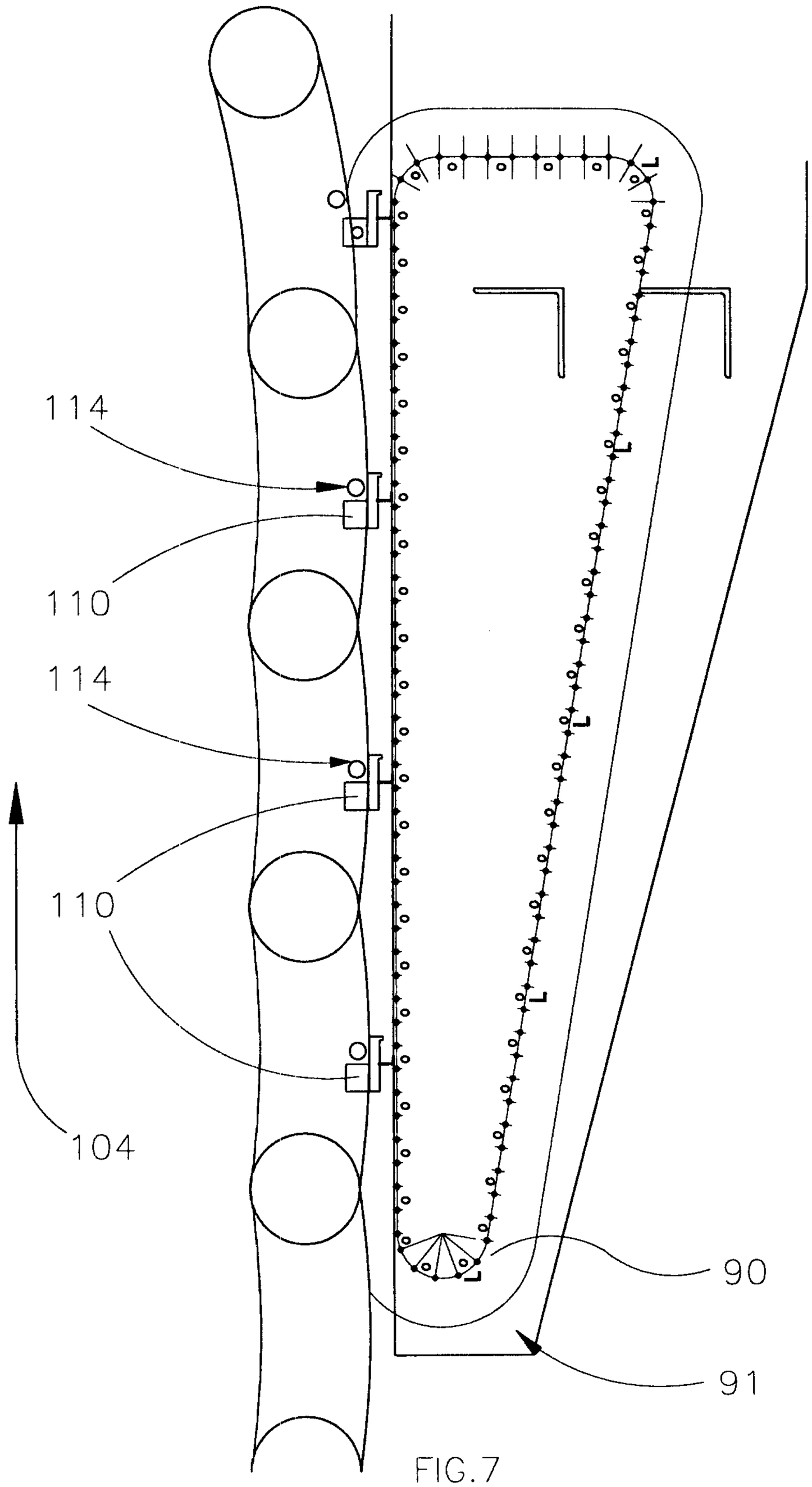


FIG.7

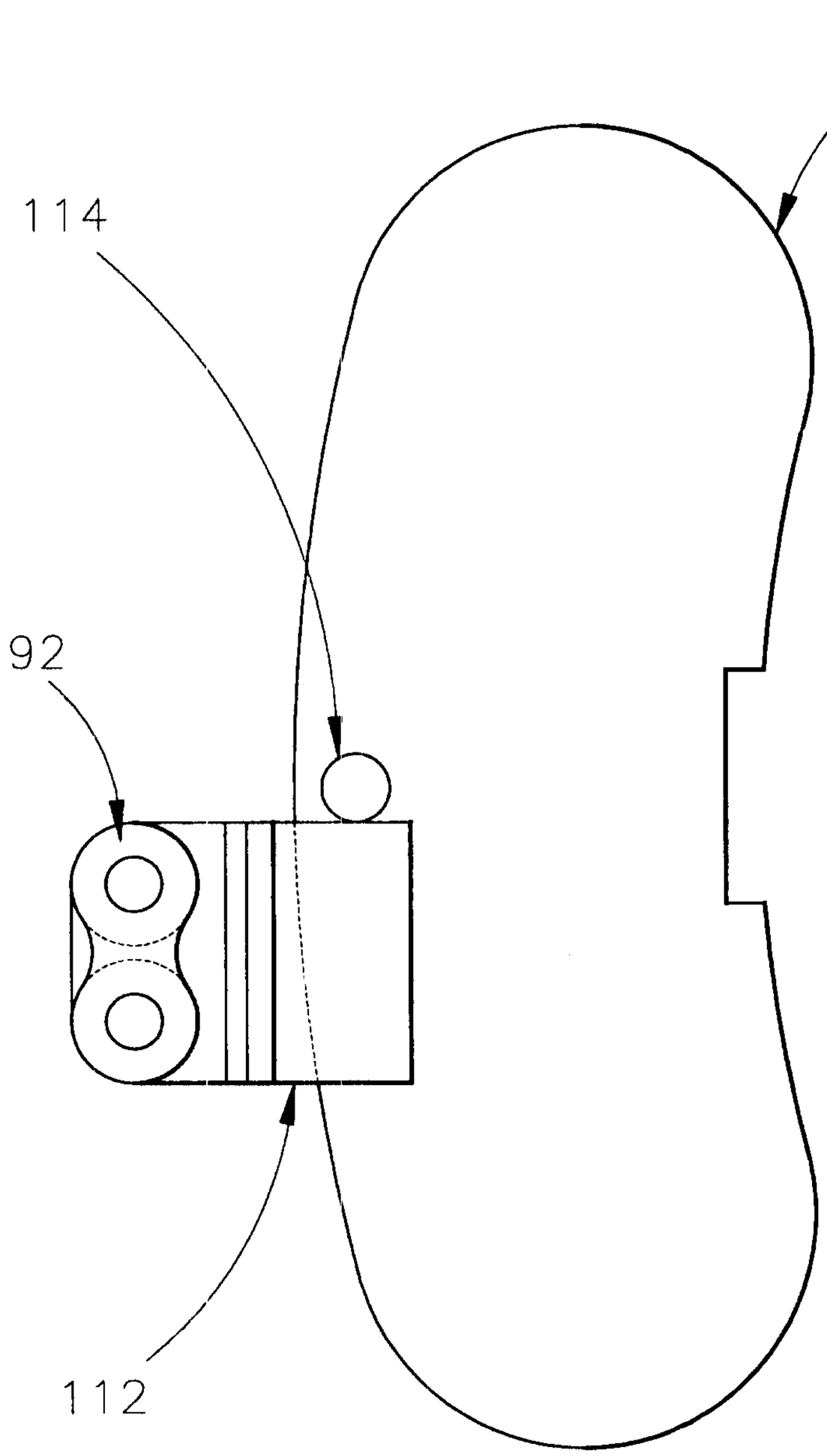


FIG.8

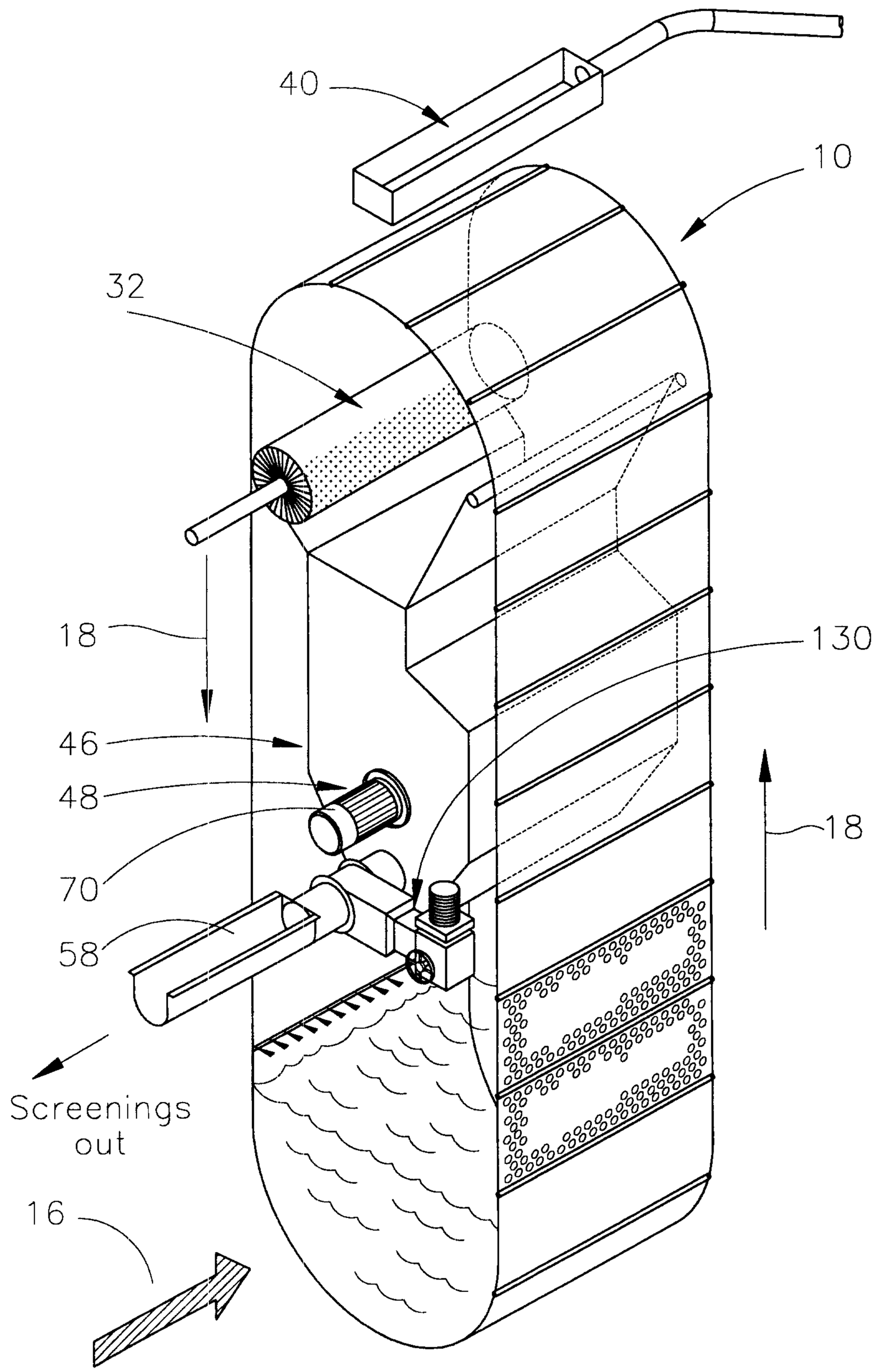


FIG.9

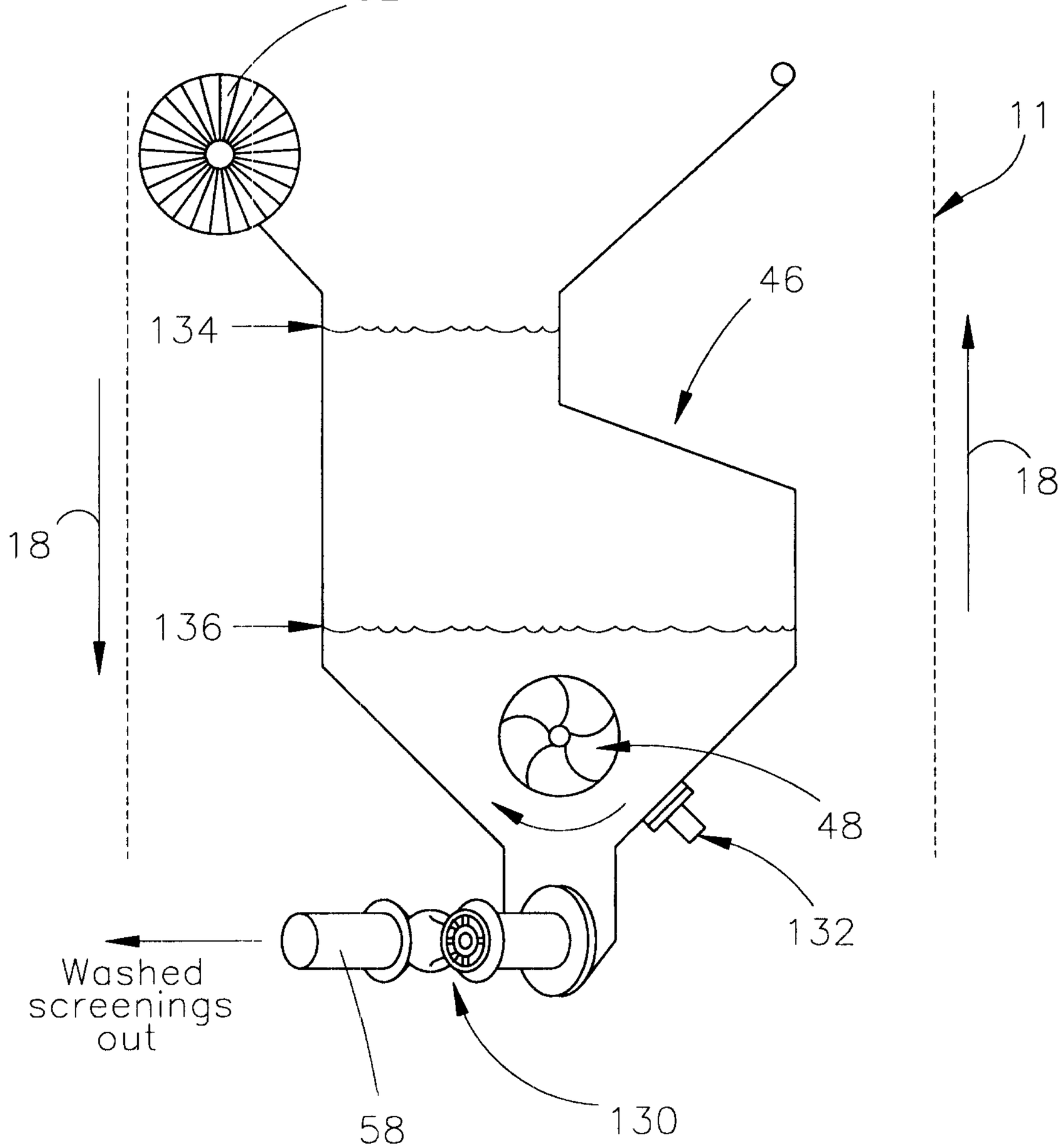


FIG.10

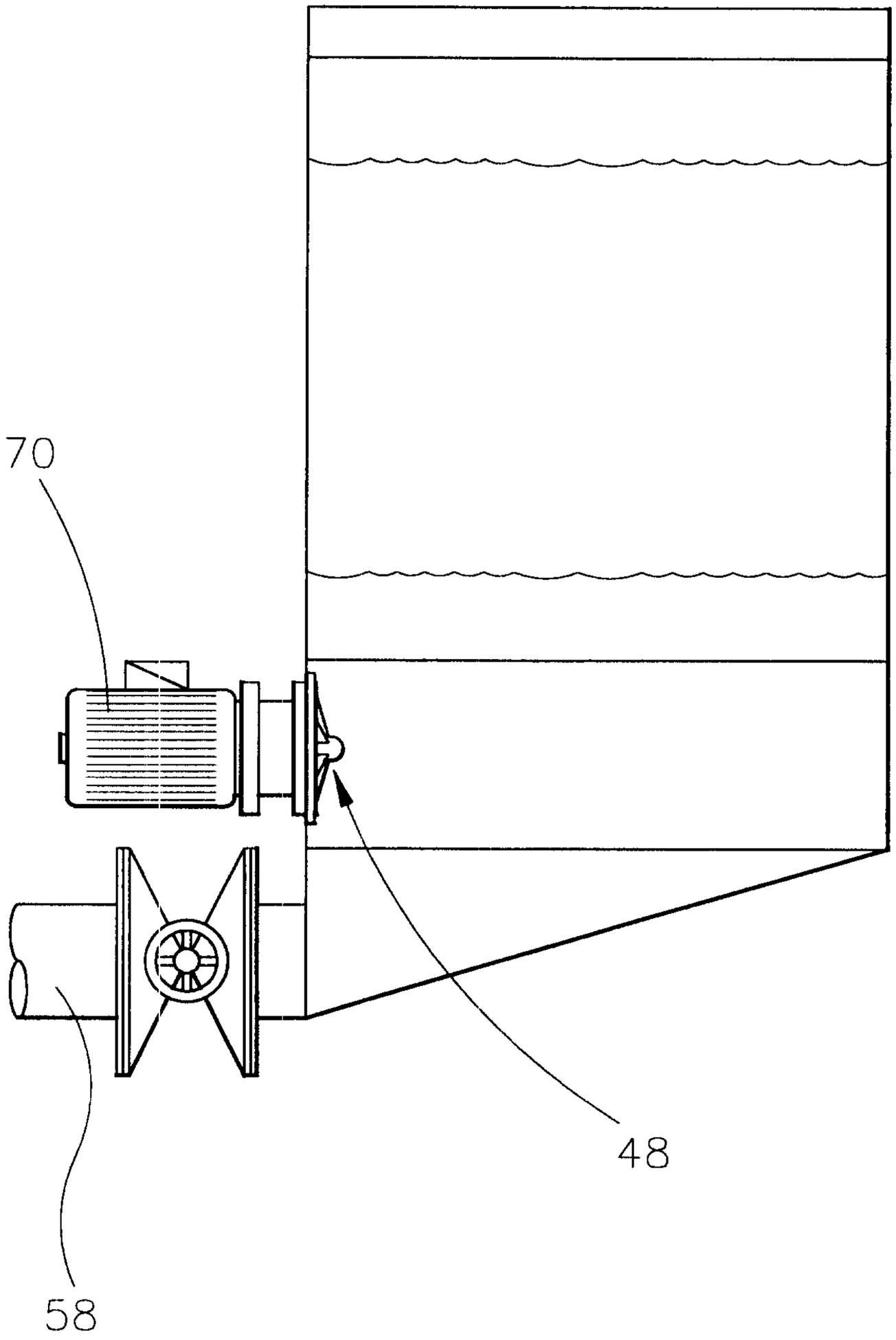
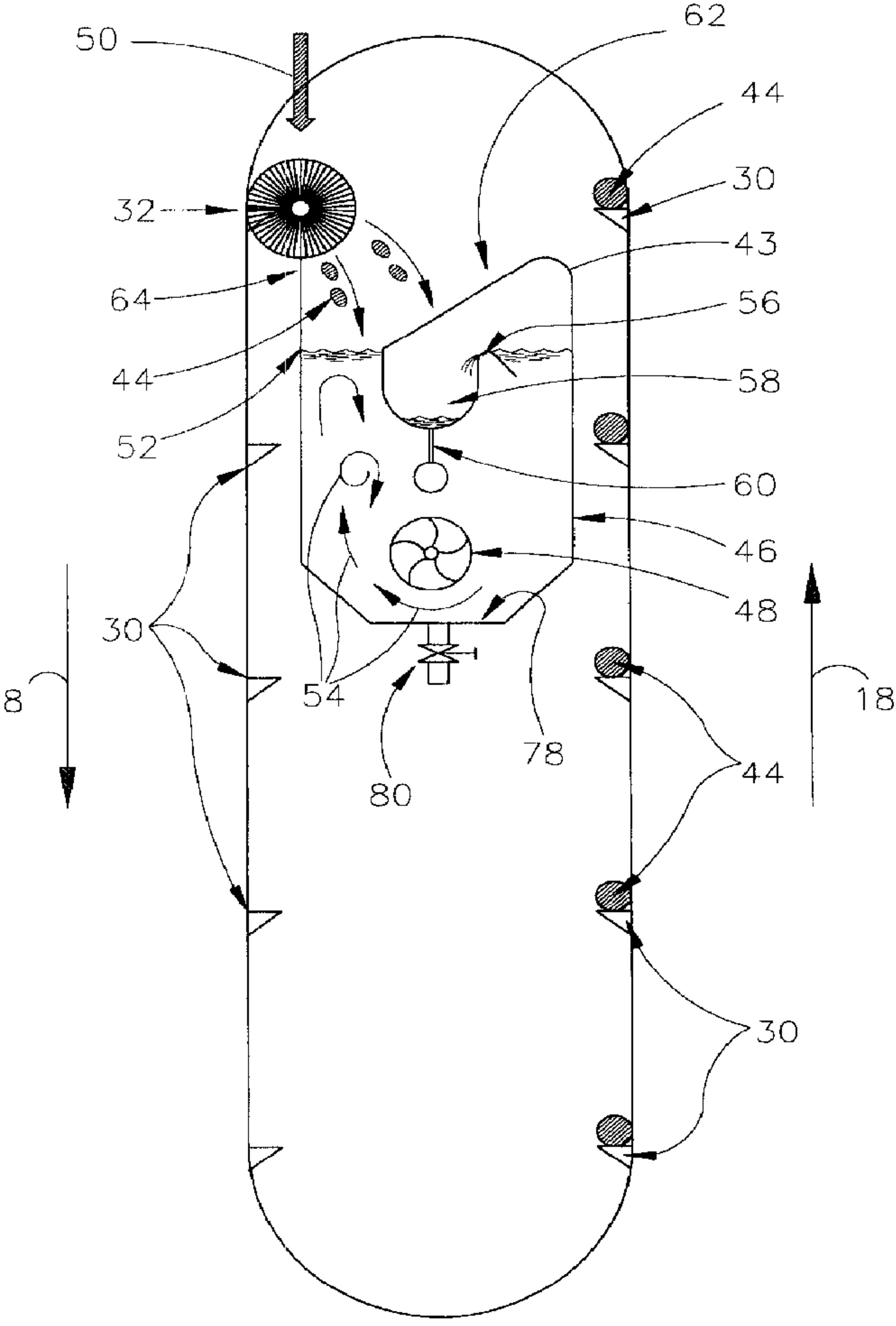


FIG.11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