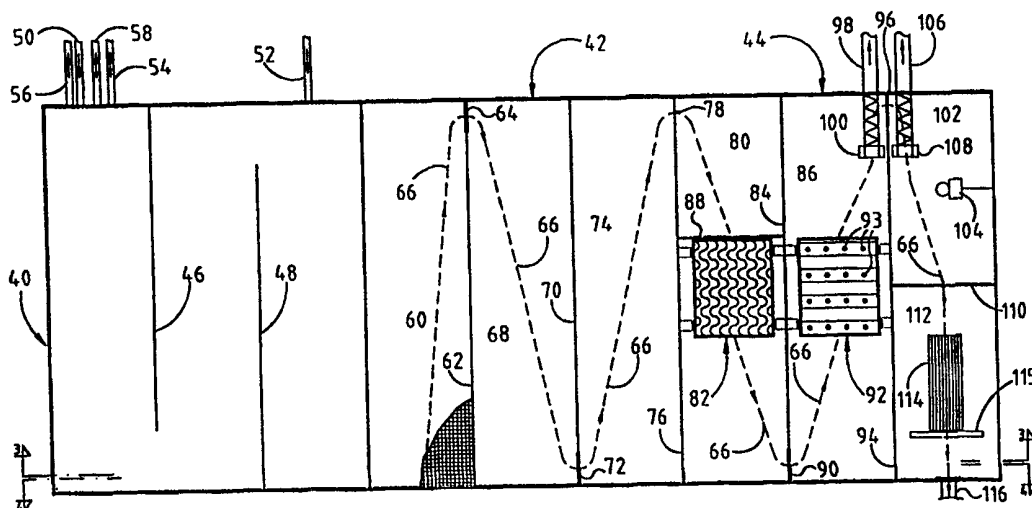




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(54) Title: TANKS FOR TREATING WATER USED FOR WASHING MOTOR VEHICLES AND EQUIPMENT



(57) Abstract

Tanks for treating water used for washing motor vehicles and equipment, with elimination of sand, sludge and lubricating oils therefrom, formed by at least three sections, a first one of which (40, 120) serves as means for storing purified water or residual purification sludge, a second one of which (42), intended for treating water, serves as a decantation section both for sand and other coarse residue and for fine sludge, and a third one of which (44), also intended for treating water, serves for separating lubricating oils from the mass of water used for washing motor vehicles and, if necessary, for final filtering of the same water. The separated lubricating oils flow out from at least a first discharge outlet (98) towards collection means (107), while the treated waste water flows out from a second discharge outlet (116).

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TANKS FOR TREATING WATER USED FOR WASHING MOTOR VEHICLES AND EQUIPMENT

This invention is an improvement to the invention relating to a self-sufficient station for washing motor vehicles, composed of transportable units, as described and
5 claimed in Italian Patent No. 01,256,147 filed on 17 September 1992 in the name of the Company Swiss Wash S.r.l. belonging to the owner of the present patent application.

More precisely, the present invention relates to tanks, installed underneath parking bays of the said station or system for washing motor vehicles, housing means
10 for storing both purified water and purification sludge, as well as means for treating the water used for washing, which in particular remove from the said water sand and similar coarse residue, sludge in the form of more or less fine particles and with a substantially colloidal consistency, lubricating oils and waxes, leaving a waste water which has already been treated sufficiently such that it may be purified completely in
15 a water purifier of the commercial type, or else leaving, with the addition of a reverse-osmosis filter, completely purified water. More simply, the invention relates to a bay, to be installed in the ground and/or courtyards, containing only the abovementioned water treatment means. The means for storing purified water store water which is used to supply the service installations in the said bays of the washing
20 systems, while the means for storing the purification sludge are intended to keep this sludge in a form which is as fully concentrated as possible pending removal thereof, for example, by means of a special drainage tanker.

The motor-vehicle washing systems of the type described in the abovementioned Italian Patent No. 01,256,147, when installed in zones where water
25 supplies are scarce, must be able to recycle as far as possible the water used for

washing motor vehicles and discharge, when necessary, water which is purified such that it has a minimum impact on the environment.

Since, when recycling the water used for washing motor vehicles, it often happens that the volume of the purified water supplied by a purifier installed in the assembly of the washing-water production plant exceeds the volume of water which may at the moment be used for washing, the need arises to store this purified water so that it may be used at the time when required. Moreover since any commercial purifier, during its function of purifying water already used for washing, produces purification sludge, which is classified as special industrial waste which cannot be disposed of in ordinary refuse dumps, but which requires special processing treatment which can be performed only in special treatment and disposal plants, the need arises to store this sludge as far as possible so that, as already mentioned, it may be removed and taken away to said plants.

The present invention is intended for this purpose and consists of tanks for treating washing water, formed by at least three sections, a first one of which serves as means for storing purified water or residual purification sludge, a second one of which serves as a section for treating water by means of decantation both of sand and other coarse residue and of fine sludge, and a third one of which serves as a treatment section for separating lubricating oils and waxes from the mass of water used for washing motor vehicles and for discharging the treated water, these tanks being designed with dimensions so as to minimise the speed of flow of the water therein so as to assist the abovementioned decantation and separation processes.

Preferably the speed of flow of the water is such as to ensure laminar flow conditions in all of the said tanks.

In particular, the section for storing purified water receives purified water

supplied from a purifier, combines it, where necessary, with water supplied from a water mains and finally conveys it to means for heating and adding detergents for use during washing of the motor vehicles.

5 In particular, moreover, the sludge storage section receives sludge from the water purification means, distributes it gradually and as uniformly as possible on its bottom, signals to the exterior the level reached by said sludge so as to indicate the need for drainage of the said section and transfers into a following water treatment section all the water which may be extracted from the sludge which is decanted and compacted in the said storage section.

10 Then, a first water treatment section receives water falling through a grating during the washing of vehicles parked in the bay and allows deposition, by means of decantation, firstly of the heavier and coarser materials such as grit, sand and metal particles and then of the sludge or silt, in flocculated form, such as the sludge produced by the reaction of the detergents used during washing with the oils, grease
15 and bituminous substances which have accumulated on the bodywork and in the engine compartments of the washed motor vehicles.

Then a second water treatment section uses means, which are slightly raised from the bottom of the section, for slowing down the stream of water which passes through the said section so as to cause the adhesion of smaller and lighter particles of
20 sludge to the walls of said slowing-down means, with the result that the particles of sludge fall onto the bottom of the section, while the light droplets of oil rise towards the surface of the water.

In particular, these slowing-down means consist of an assembly of immersed parallel plates which are arranged vertically in the same direction as the water stream,
25 the distance between the plates being of the same order of magnitude as the thickness

of the said plates.

Preferably, the plates of the assembly are undulated and arranged with the undulations substantially parallel.

5 The plates of the assembly must not be prone to deterioration by the water present in the sections, being made of stainless steels or plastics which are resistant to attack by the said water.

Preferably, the assembly of undulated plates is mounted on a frame which may be removed for periodic cleaning.

10 Then, a third water treatment section performs separation of the residue of free lubricating oils, causing it to float to the surface of an expanse of water present in a tank, using means for slowing down the stream of water, located underneath the surface of the water, so as to reduce the effect of entrainment of the oil droplets by the water and favour rising, to the surface, of the oil by means of floating.

15 Preferably, the means for slowing down the stream of water consist of an assembly of immersed undulated plates, arranged so as to be oriented horizontally and positioned above one another, where the peaks and the troughs of the undulations are arranged perpendicularly with respect to the direction of the water stream and the peaks of the undulations are provided with holes having the function of causing rising of the oil which accumulates underneath the said peaks of the undulated plates.

20 The plates of this assembly must also not be prone to deterioration by the water present in the sections, being made of stainless steel or plastics which are resistant to attack by the oil and the said water.

25 In addition, the oil which floats on the surface of the water in this section is retained in the same section by an immersed blocking baffle, extending from the surface of the water down to a certain depth, while a first discharge pipe kept level

with the surface of the water by a float performs discharging of the oil separated from the water.

Then, the water which has passed through the immersed baffle concentrates its residual particles of oil, where present, in a zone confined between the said first
5 immersed baffle and a second immersed baffle, the said zone being served by a second discharge pipe kept level with the surface of the water by a float so as to discharge the residual oil from the said confined zone.

In addition, in this confined zone, an ultrasound probe is used to upset the equilibrium between suspended microscopic particles which have accumulated
10 between light droplets of oil or particles of wax and residual particles of sand and sludge which may be present in this zone, causing the particles to precipitate onto the bottom and the oil to rise to the surface.

In addition, moreover, it is possible to use a reverse-osmosis filter in order to filter definitively the water thus treated, transferring substantially pure water to a
15 discharge outlet of the last treatment section.

Preferably, the reverse-osmosis filter comprises ceramic cartridges, which are resistant to attack by chemical products or deterioration by hydrocarbons and which may be regenerated by means of simple backwashing, the residue which has accumulated on them being discharged into the sludge storage section.

20 In addition, the water filtered by the reverse-osmosis filter may then be sterilised by physical or chemical means, such as germicide lamps or using ozone produced in an ozone generator, thereby becoming bacteriologically pure.

Obviously, both the sections for storing pure water or sludge and the sections for treating the washing water are provided with manholes for access to the said
25 sections so as to allow operations of maintenance, cleaning and periodic drainage of

the said sections.

Obviously, moreover, the purification of the waste water by means of a reverse-osmosis filter is particularly preferred because it avoids the use of a commercial water purifier, with the consequent formation of large volumes of purification sludge, which sludge is simply reduced to that resulting from backwashing of the filters.

The features of the present invention will emerge from the claims forming the conclusive portion of this description.

However, other features and advantages will become evident from the following detailed description of an embodiment thereof with reference to the enclosed drawings, in which:

- Figure 1 is a plan view of a parking bay for washing motor vehicles of the type housing a means for storing purified water followed by means for removing sand, sludge and oil from washing water;
- Figure 2 is plan view of the same bay for washing motor vehicles according to Figure 1, with the floor covering removed, except for part of a grating for draining the washing water from vehicles;
- Figure 3 is a cross-sectional view of the same bay according to Figure 2, along a line 3-3 shown in Figure 2;
- Figure 4 is a cross-sectional view of the same bay according to Figure 2, along a line 4-4 shown in Figure 2;
- Figure 5 is a plan view of a bay for washing motor vehicles of the type housing a means for storing purification sludge followed by means for removing sand, sludge and oil from the washing water;
- Figure 6 is a plan view of the same bay for washing motor vehicles

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according to Figure 5, with the floor covering removed, except for part of a grating for draining the washing water from vehicles;

- Figure 7 is a cross-sectional view of the same bay according to Figure 6 along a line 7-7 shown in Figure 6;

5 - Figure 8 is a cross-sectional view of the same bay according to Figure 6, along a line 8-8 shown in Figure 6;

10 - Figure 9 is a plan view of a simplified bay, comprising only the sections for treating the washing water in order to eliminate the polluting substances, to be installed underground or partly underground in any location, such as residential courtyards, car-body workshops, repair workshops or similar areas, where the occasional washing of vehicles or equipment may be required;

- Figure 10 is a plan view of the same washing bay according to Figure 9, with the floor covering removed, except for part of a grating for draining the washing water from motor vehicles;

15 - Figure 11 is a cross-sectional view of the same bay according to Figure 10, along a line 11-11 shown in Figure 10;

- Figure 12 is a cross-sectional view of the same bay according to Figure 10, along a line 12-12 shown in Figure 10;

20 - Figure 13 is a general diagram of a system for washing motor vehicles, using three bays provided with water treatment tanks according to the invention, which illustrates the connections and the interactions between the tanks and a central service installation designed to provide washing water and, if necessary, purify completely the waste water from the purification tanks;

25 - Figure 14 is a plan view of a well for mixing purified water and mains water to be used in the washing system according to Figure 13;

- Figure 15 is a cross-sectional view of the same well, along a line 15-15 shown in Figure 14;

- Figure 16 is a plan view of a well for storing treated water to be transferred to the washing system according to Figure 13; and

5 - Figure 17 is a cross-sectional view of the same well, along a line 17-17 shown in Figure 16.

Let us consider first all Figures 1 to 4 which show a first type of bay which houses a tank for storing purified water, having, arranged alongside, tanks for treating water which is used for the washing of motor vehicles and which falls onto
10 the ground within the said bay.

Looking at Figure 1, it can be seen that a first type of bay 10 is formed by a first floor zone 12 covering a purified-water storage tank, a second floor zone 14 covering a first tank for decantation sand and sludge or silt, and a third floor zone 16 covering, in a first area, a tank for eliminating the finer particles of sludge and, in a
15 second area, a tank for separating oily residue and for discharging waste water. The first floor zone 12 comprises a surface 18 which is inclined so as to cause the washing water to flow as indicated by the arrows 20a and 20b and which has three manholes 22a, 22b and 22c allowing access to the purified-water storage tank 40 for maintenance, as can be seen in particular in Figures 2, 3 and 4 to which reference
20 should be made. The second floor zone 14 comprises a grating 24, which has the function of collecting the washing water from all three floor zones 12, 14 and 16, and a surface 26, which is inclined towards the grating 24 so as to cause flowing of the said washing water as indicated by the arrows 28a and 28b and which has two manholes 30a and 30b allowing access for drainage, cleaning and maintenance of the
25 tanks for deposition and decantation of sand and sludge. The third floor zone 16

comprises a surface 32 which is inclined towards the surface 26 so as to cause the washing water to flow as indicated by the arrows 34a and 34b and which has three manholes 36a, 36b and 36c allowing access for cleaning and maintenance of the sludge separation tank and the oily-residue separation and waste discharge tanks.

5 If we now consider Figures 1 to 4 it can be seen that the bay 10 is formed by three modular tanks 40, 42 and 44 housing a reserve supply of purified water, a section for separating sand and sludge and a section for separating oily residue and discharging purified water, respectively.

10 The tank 40 is basically divided into three compartments by two dividing baffles 46 and 48 and is served by a duct 50 for replenishing with water from an external water mains, a duct 52 for replenishing with water from an internal purifier, a duct 54 for drawing purified water intended for installations in the washing station, a bottom discharge outlet 56 for completely emptying the tank 40 and an overflow duct 58 for preventing the maximum level of water inside the said tank from being
15 exceeded. Obviously, the tank 40 serves merely as a reserve store for purified water and, consequently, may not have any direct connection with the other tanks 42 and 44 which collect and treat falling water resulting from the washing of motor vehicles.

20 The tank 42 for separating the sand and washing sludge, by means of decantation from a suitably slowed-down stream of water, comprises a first section 60 which is covered by the grating 24 and inside which a mass 61 of coarser particles of sand is collected, said section being bounded by a wall 62 which terminates in a spillway 64 which moderates the speed of the water and allows only the upper portion of a stream of water 66 to flow out of the section 60. The stream of water 66 then passes into a second tank section 68 which is defined between the preceding
25 wall 62 and a following wall 70 and where a following spillway 72 allows only the

upper portion of the stream of water 66 to flow out, keeping the water at a particularly low speed which favours further decantation of a mass 73 of increasingly finer and lighter particles of sand and washing sludge. The same stream of water 66 then passes into a third tank section 74, defined between the wall 70 and a wall 76, where it deposits, by means of decantation, a mass 75 of even finer and lighter particles 75. Then the stream 66 passes through a following spillway 78, which allows only the upper portion thereof to pass through, and enters into a first section 80 of the next tank 44 performing definitive separation of lighter and finer particles of sludge by means of the principle of adhesion of the said particles to a plurality of undulated plates of a plate assembly 83 installed between the wall 76, dividing the two tanks 42 and 44, and a following wall 84 dividing the first section 80 from a second section 86. A baffle 88 is positioned in front of the plate assembly 82 and forces all the water to pass through the plate assembly 82.

The operating principle of the plate assembly 82 is particularly simple and effective. Since the speed of the stream of water 66 is kept low to the point where the water may be regarded as moving in a laminar flow condition, this means that, in each space separating the plates of the assembly 82, the speed of the water wetting the plates - which are constructed so as to be easily wettable, for example being made of stainless steel with a fine grained finish, or more cheaply, but more effectively, being made of plastic substances which are resistant to attack by chemical substances present in the water - is practically zero at the interface with the surface of the said plates so that any finer particles coming into contact with the plates would end up adhering thereto. This would result in the extraction of particles from the water and the particles thus extracted from the water and adhering to the plates of the plate assembly 82 would form an increasingly effective barrier for other particles in the

water, which would be stopped with increasing ease. However, in order to prevent complete blockage of the plate assembly 82, it is necessary to remove periodically the particles deposited in the said assembly 82 by means of simple washing thereof using, for example, a jet of pressurised water, even though in normal working conditions any materials which have become "attached" to the plate surfaces, since they are increasing in size, if heavier than the water, would fall to the bottom and, if lighter, would float, leaving the assembly, which is raised with respect to the bottom of the tank, substantially free and clean.

The stream of water 66 flows out from the first section 80 via a spillway 90, entering into the section 86 which acts as a first section for separating oil, more particularly separating oily residue from the mass of water which is performed using the floating effect of the same oily residue. For this purpose, the section 86 has, installed in it, a plate assembly 92, which is formed, in a similar manner to the plate assembly 82 already mentioned, by undulated plates made of stainless steel or even better of plastic materials of the same kind as those of the plate assembly 82, and the plates of which, however, are arranged horizontally with the peaks and the troughs of their undulations being arranged perpendicular to the direction of the stream of water 66 which passes through the section 86, said peaks being provided with holes 93 for allowing the oil trapped underneath the plates of the plate assembly 92 to rise to the surface. The operating principle of the plate assembly 92 is similar to that of the plate assembly 82 since it again involves, as happens in a laminar flow condition, attaining a substantially zero speed at the interface between the water and the plates of the plate assembly 92, although, in this case, the zero speed favours rising, as a result of floating, of the oil inside the peaks of the undulations in the plates where it accumulates and from where it flows out through the holes 93 so as to reach the

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surface of the water inside the section 86. This section 86 is defined between the wall 84 and a following wall 94 and terminates in an immersed baffle outlet 96 which basically blocks all the floating oil present in the section 86 from where it is removed by a discharge pipe 98 which is kept at the height of the water surface by a float 100.

The stream of water 66, emerging from underneath the immersed spillway 96, enters into a penultimate section 102 of the tank 44 inside which the last oil residue which may have overcome the immersed baffle 96 surfaces. An ultrasound generator 104 detaches any oil which may have adhered to heavy particles of sand and/or sludge, or silt, causing it to surface on the water, while the heavy particles fall onto the bottom. The oil on the surface of the water is removed by a discharge pipe 106 which is kept at the height of the water surface by a float 108. The stream of water 66 then passes over a second immersed baffle 110, entering into a last section 112 which contains a reverse-osmosis filter 114 of the ceramic type and which may therefore be regenerated using simple methods, such as backwashing, heating, or both, and which is able to block any remaining hydrocarbons or similar substances which may be present at the end of treatment of the water inside the tanks 42 and 44. The filter 114 then discharges the water, which is now purified, into a discharge pipe 116 so as to transfer it, after any treatment using germicide means 115, such as lamps or ozone generators, directly or indirectly, to the storage tank 40 or to the sewage discharge outlet. Alternatively, if the reverse-osmosis filter were not present, for example being already present, for example, in the plant of a purifier outside the tanks, the discharge pipe 116 would be connected to a water storage well 220 which would send this water to the said purifier, as will be illustrated in detail hereinbelow in Figures 13, 16 and 17.

Let us now consider Figures 5 to 8 which show a second type of bay 120 which houses a tank for storing purification sludge, with, arranged alongside, tanks for treating water which is used during the washing of motor vehicles and which falls onto the ground of the said bay. In these Figures 5 to 8, elements which are identical or similar to those shown in Figures 1 to 4 will be indicated by the same reference numbers.

Looking at Figure 5, it can be seen that a second type of bay 120 is formed by a first floor zone 122 covering a tank for storing purification sludge, a second floor zone 14 covering a first tank for decantation sand and sludge, and a third floor zone 16 covering, in a first area, a tank for eliminating the finer particles of sludge or silt and, in a second area, a tank for separating oily residue and discharging waste water. The first floor zone 122 comprises a surface 128 which is inclined so as to cause the washing water to flow as indicated by the arrows 130a and 130b and which has three manholes 132a, 132b and 132c allowing access, for maintenance purposes, to a tank for storing purification sludge which can be seen in particular in Figures 6, 7 and 8, to which reference should be made. The second floor zone 14 comprises a grating 24, which has the function of collecting the washing water from all three floor zones 122, 14 and 16, and a surface 26 which is inclined towards the grating 24 so as to cause the said washing water to flow as indicated by the arrows 28a and 28b and which has two manholes 30a and 30b allowing access for drainage, cleaning and maintenance of the tanks for deposition and decantation of sand and sludge. The third floor zone 16 comprises a surface 32 which is inclined towards the surface 26 so as to cause the washing water to flow as indicated by the arrows 34a and 34b and which has three manholes 36a, 36b and 36c allowing access for cleaning and maintenance of the sludge separation tank and the tanks for separation of the oily

residue and discharging waste.

If we now consider Figures 5 to 8, it can be seen that the bay 120 is formed by three modular tanks 150, 42 and 44 which house a mass of purification sludge, a section for separating sand and sludge, and a section for separating oily residue and
5 for discharging treated or purified water, respectively.

The tank 150 is basically divided into three compartments by two dividing baffles 152 and 154 which help deposition of the sludge 155 supplied by a discharge duct 156 of a water purifier so that it gradually occupies the whole tank 150 in the most uniform and complete manner possible. The sludge 155, having entered via the
10 duct 156, is deposited onto the floor of the tank, releasing a certain quantity of water which is destined for the same treatment as the water used for washing the motor vehicles. For this purpose the right-hand wall of the tank 150 is provided with a spillway opening 158 which allows the water released by the sludge to flow out and enter into the next tank 42. The tank 150 also has a sensor 160 which is capable of
15 signalling the level of the sludge 155 inside the said tank so as to request in time the intervention of a drainage tanker for removal of the said sludge.

The remainder of the tanks 42 and 44 are composed and operate in an identical manner to the tanks 42 and 44 already described with reference to Figures 2 to 4, to which reference should be made.

20 Let us now consider Figures 9 to 12 which illustrate a simplified bay 10a operating as a passive plant for treating washing water, performing the removal of sand, sludge and oil therefrom, so as to allow discharging thereof into the municipal sewage system.

This simplified bay 10a is similar to the bay 10 depicted in Figures 1 to 4,
25 except that it does not have the floor zone 12 formed by the inclined surface 18 and

the tank 40 for storing purified water, which are replaced respectively by a floor zone 12a formed by a simple inclined surface 18a which is constructed as a simple slab on the ground. The remainder of the tanks 42 and 44 is identical to the tanks 42 and 44 of the bay 10, except that the penultimate section 102 of the tank does not have the
5 ultrasound generator 104 and the last section 112 of the said tank does not have the reverse-osmosis filter 114 and the germicide means 115 so as to avoid any component which is active or needs regeneration as is the case, respectively, with the ultrasound generator 104, the reverse-osmosis filter 114 and the germicide means 115. The tank 44 is simply provided with discharge outlets 98 and 106 for the oil,
10 which are connected to a storage well 107 provided with an access manhole 107a, and with a discharge outlet 116 for the waste water to be conveyed directly into the municipal sewage system. The grating 24 and the manholes 30a, 30b, 36a, 36b and 36e present on the respective floor zones 14 and 16 have the same function described for the bay 10 according to Figures 1 to 4.

15 Looking at Figure 13, which shows for example the general layout of a washing plant for motor vehicles using three bays 10, 120a and 120b provided with purification tanks according to the invention and considering that each washing plant of this type with a number of bays different from that illustrated here is substantially equivalent, it can be seen that a washing plant 180 comprises a so-called
20 "technological module" 182 which may be similar to the technological module or plant assembly illustrated in Figure 6 of the abovementioned Italian Patent No. 01.256,147, comprising a reverse-osmosis water softener 184, a washing machine 186 comprising a water-heating boiler and detergent metering/mixing devices capable of supplying water and, for example, washing spray guns which are present
25 above each of the bays 10, 120a and 120b and, if necessary, a commercially available

water purifier 188, such as the known powder purifiers, having the function of purifying the treated water discharged from the three bays 10, 120a and 120b by means of the ducts 116 and conveying it to the reserve tank 40 for purified water which is present in the bay 10 via the pipe 52. Obviously the water purifier 188, if of the powder type, produces sludge which is conveyed via a double duct 156 to the
5 sludge storage tanks present in the bays 120a and 120b.

This plant 180, in addition to recycling as far as possible the purified water which is retained inside the tank 40 of the bay 10, automatically draws water from an external water mains 190 when it is noticed that there is an excessive reduction in
10 purified water in the plant, for example owing to an excessive reduction in the water pressure inside the apparatus of the technological module 182, such as the water softener 184 and the washing machine 186. For this purpose, a well 192 contains the necessary equipment, depicted in detail in Figures 14 and 15, for recirculating and automatically replenishing purified water and mains water. In particular, the well
15 192 contains a pump 194 which draws, via a manually operated valve 196, water supplied, via a duct 54, from the purified-water storage tank 40 illustrated in Figures 2 to 4 and conveys it to a pressure compensation tank 198. The water leaving the tank 198 then passes through a filter 200 able to block very fine particles, such as a filter with openings of 20 μm , an anti-limescale filter 202 and a non-return valve 204
20 to a pipe 206 supplying the technological module 182 where it supplies water to the softener 184 and, possibly, to the purifier 188. The water mains 190 also has an inlet into the well 192 and, via a manually operated valve 208, a filter 210 able to block very fine particles, such as a filter with openings of 90 μm , an anti-limescale filter 212 and an optional pressure regulator 214, if necessary, reaches a non-return valve
25 216 for introducing mains water into the pipe 206 should the water pressure in the

technological module 182 fall below a value fixed by the regulator 214. A manual valve 218 allows the water of the water mains 190 to be sent directly to the duct 50 for replenishing the tank 40 for the reserve supply of purified water should the level of the water inside the tank 40 decrease excessively.

5 As can be seen in Figures 16 and 17, the treated and purified waste water supplied via the ducts 116 from the tanks 44 of the bays 10, 120a and 120b flows into a waste water storage well 220 from where a raising pump 224 conveys it to the duct 52 for supplying the tank 40 storing purified water. A float device 228 periodically operates the pump 224 each time the level of the waste water in the well 220 exceeds
10 a predetermined height. In order to disinfect the water, if germicide means 115 are not provided in the last sections 112 of the tanks 44, it is possible to provide, inside the well 220, a germicide lamp 230 which irradiates ultraviolet rays onto the mass of water present in the well 220. Alternatively, if the technological module 182 should envisage a water purifier 188, treated water discharged from tanks 44, devoid of
15 reverse-osmosis filters 114 and germicide means 115, would be sent, again via the ducts 116, to the well 220 and from here the pump 224 would send it via an alternative duct 226 to the purifier 188 from where it would emerge purified via a duct 227 connected to the duct 52 for supplying the tank 40 storing purified water.

Obviously, should purification of the water be completed inside the tanks 44
20 with the intervention of the reverse-osmosis purifiers 114, the problem, which would arise, would be that of disposing of filter backwashing sludge which, being special waste, would have to be stored in at least one tank 150 from where it would be periodically removed. For this purpose ducts 117 which could convey this sludge into the storage tank 150 would have an effective function. At least one of the ducts
25 117 could have, associated with it, ducts 117a and 117b for discharging backwashing

sludge from the water softener 184 and, if necessary, from the washing machine 186.

Any excess quantity of water which is of an environmentally acceptable quality may be discharged into a sewerage well 231 into which there flows: the water from the overflow duct 58 of the purified-water storage tank and any excess quantity of purified or softened water supplied, via a duct 232, from the technological module 182.

The oil separated from the water treated in the tanks 44, which flows out via the ducts 98 and 106, is collected in wells 107 from where it may be extracted by opening a tap and causing it to flow into a central reservoir which, in view of the quantities of oil treated, may be a simple bucket or jerry can, from where it may be removed manually for transfer to disposal plants when other drainage operations are carried out. Moreover, in an even simpler case, it is possible to even dispense with the oil discharge pipes 98 and 106 provided with the respective floats 100 and 108, by envisaging using the upper space of the oil extraction sections 86 and 102 as volumes for collecting oil which depend on the depth of the two immersed spillways 96 and 110 and may reach values of about 1 cubic metre, so that removal of the oil becomes an operation which must be performed very rarely, for example once a year, during maintenance and overhaul of the plant. This discharge operation may be performed simply by means of ducts provided with taps positioned at heights which allow drainage of substantially all the oil present.

The above description illustrates only a particular embodiment of the present invention, in connection with which a person skilled in this technical sector may, from a reading of the above description, devise logical changes and variations which are to be regarded as all covered by the claims which form the conclusive part of the present description. For example, the number of bays containing the tanks with the

reserve supplies of purified water may be different from one, as shown here, a number greater than one being equally possible. The number of bays containing the sludge storage tanks may be less than two in the case where all the reverse-osmosis filters are used because the purification sludge, produced in this case, would be of a smaller quantity compared to that which is produced when using a water purifier 188 (Figure 13) of the powder or liquid-reagent type, so that a single sludge storage tank could be more than sufficient, with the tanks of the other bays being used for storing purified water.

CLAIMS

1. Tanks for treating water used for washing motor vehicles, characterized in that they comprise at least two sections, a first one of which (42) serves as a section for treating water by means of decantation both of sand and other coarse residue and of fine sludge, and a second one of which (44) serves as a treatment section for separating lubricating oils from the mass of water used for washing motor vehicles and for separate discharging of the lubricating oils and the water treated.

2. Tanks according to Claim 1, characterized in that a first section (42) for treating the water receives falling water from the washing of motor vehicles parked in the bay via a grating (24) and allows deposition, by means of decantation, firstly of the heavier and coarser materials such as grit, sand and metal particles and then of the sludge in flocculated form, such as sludge resulting from the reaction of the detergents, used during washing, with the oils, grease and bituminous substances which have accumulated on the bodywork and in the engine compartments of the washed motor vehicles.

3. Tanks according to Claim 2, characterized in that a second water treatment section uses means (82) for slowing down the stream of water (66) which flows through the said section so as to cause adhesion of the smaller and lighter particles of sludge to the walls of the said slowing-down means (82).

4. Tanks according to Claim 3, characterized in that these slowing-down means (82) consist of an assembly of parallel plates arranged vertically in the same direction as the stream of water (66), the distance between the plates being of the same order of magnitude as the thickness of the said plates.

5. Tanks according to Claim 4, characterized in that the plates of the

assembly (83) are undulated and arranged with the undulations substantially parallel.

6. Tanks according to Claim 5, characterized in that the plates of the assembly (82) are made of materials resistant to the chemical agents present in the water.

5 7. Tanks according to Claim 6, characterized in that the assembly of undulated plates (82) is mounted on a frame which may be removed for the purposes of periodic cleaning.

8. Tanks according to the preceding claims, characterized in that a third water treatment section performs separation of the residue of free lubricating oils,
10 causing it to float on the surface of an expanse of water present in a tank (44), using means (92) for slowing down the stream of water so as to reduce the effect of entrainment of the oil droplets by the water and favour rising, to the surface, of the oil by means of floating.

9. Tanks according to Claim 8, characterized in that the means (92) for
15 slowing down the stream of water consist of an assembly of undulated plates arranged so as to be oriented horizontally and positioned above one another, where the peaks and the troughs of the undulations are arranged perpendicularly with respect to the direction of the water stream and the peaks of the undulations are provided with holes (93) having the function of causing rising of the oil which
20 accumulates underneath the said peaks of the undulated plates.

10. Tanks according to Claim 9, characterized in that the plates of the assembly (92) are made of material resistant to the chemical agents present in the water.

11. Tanks according to Claims 8 to 10, characterized in that the oil which
25 is made to float on the surface of the water in this section is retained in the same

section by an immersed blocking baffle (96), extending from the surface of the water down to a certain depth, while a first discharge pipe (98) kept level with the surface of the water by a float (100) performs discharging of the oil separated from the water.

12. Tanks according to Claim 11, characterized in that the water which
5 has passed through the immersed baffle (96) concentrates its residual particles of oil, where present, in a zone (102) confined between the said first immersed baffle (96) and a second immersed baffle (110), the said zone being served by a second discharge pipe (106) kept level with the surface of the water by a float (108) so as to discharge the residual oil from the said confined zone (102).

10 13. Tanks for treating water used for washing water motor vehicles and equipment, characterized in that it comprises at least three sections, a first one of which (40, 150) serves as means for storing purified water or residual purification sludge, a second one of which (42) serves as a section for treating water by means of decantation both of sand and other coarse residue and of fine sludge, and a third one
15 of which (44) serves as a treatment section for separating lubricating oils from the mass of water used for washing motor vehicles and for discharging the treated water.

14. Tanks according to Claim 13, characterized in that the section (40) for storing purified water receives via a first pipe (52) purified water from a purifier (188), combines it, where necessary, with water supplied, via a second pipe (50),
20 from a water mains and finally conveys it to means (186) for heating and adding detergents (186) for use during washing of the motor vehicles.

15. Tanks according to Claim 13, characterized in that the sludge storage section (150) receives sludge (155) from the water purifier (188), distributes it gradually, and as uniformly as possible, on its bottom, signals to the exterior, by
25 means of a sensor (160), the level reached by said sludge (155) so as to indicate the

need for drainage of the said section (15) and transfers into a following water treatment section, via a pouring means, such as a spillway (158), all the water which may be extracted from the sludge (155) which is decanted and compacted in the said storage section (150).

5 16. Tanks according to Claims 13 to 15, characterized in that a first water treatment section (42) receives water falling through a grating (24) from the washing of vehicles parked in the bay and allows the deposition, by means of decantation, firstly of the heavier and coarser materials such as grit, sand and metal particles and then of sludge, in flocculated form, such as the sludge resulting from the reaction of
10 the detergents used during washing with the oils, grease and bituminous substances which have accumulated on the bodywork and in the engine compartments of the washed motor vehicles.

 17. Tanks according to Claim 16, characterized in that a second water treatment section uses means (82) for slowing down the stream of water (66) which
15 passes through the said section so as to cause the adhesion of smaller and lighter particles of sludge to the walls of said slowing-down means (82).

 18. Tanks according to Claim 17, characterized in that these slowing-down means (82) consist of an assembly of parallel plates arranged vertically in the said direction as the stream of water (66), the distance between the plates being of the
20 same order of magnitude as the thickness of the said plates.

 19. Tanks according to Claim 18, characterized in that the plates of the assembly (82) are undulated and arranged with the undulations substantially parallel.

 20. Tanks according to Claim 19, characterized in that the assembly of undulated plates (82) is mounted on a frame which may be removed for the purposes
25 of periodic cleaning.

21. Tanks according to Claims 13 to 19, characterized in that a third water treatment section performs separation of the residue of free lubricating oils, causing it to float on the surface of an expanse of water present in a tank (44), using means (92) for slowing down the stream of water so as to reduce the effect of entrainment of the oil droplets by the water and favour rising, to the surface, of the oil by means of floating.

22. Tanks according to Claim 21, characterized in that the means (92) for slowing down the stream of water consist of an assembly of undulated plates arranged so as to be oriented horizontally and positioned above one another, where the peaks and the troughs of the undulations are arranged perpendicularly with respect to the direction of the water stream and the peaks of the undulations are provided with holes (93) having the function of causing rising of the oil which accumulates underneath the said peaks of the undulated plates.

23. Tanks according to Claims 21 and 22, characterized in that the oil which is made to float to the surface of the water in this section is retained in the same section by an immersed blocking baffle (96), extending from the surface of the water down to a certain depth, while a first discharge pipe (98) kept level with the surface of the water by a float (100) performs discharging of the oil separated from the water.

24. Tanks according to Claim 23, characterized in that the water which has passed through the immersed baffle (96) concentrates its residual particles of oil, where present, in an area (102) confined between the said first immersed baffle (96) and a second immersed baffle (110), the said area being served by a second discharge pipe (106) kept level with the surface of the water by a float (108) so as to discharge the residual oil from the said confined area (102).

25. Tanks according to Claim 24, characterized in that, in this confined area (102), an ultrasound probe (104) is used to promote separation of oil droplets from residual particles of sludge which may be present in this area, causing the particles to precipitate onto the bottom and the oil to rise to the surface.

5 26. Tanks according to Claim 25, characterized in that a reverse-osmosis filter (114) is used to filter definitively the water thus treated, conveying it to a discharge outlet (116) of the last section for treating water which requires only a final treatment in a purifier (188) of the commercial type in order to eliminate any detergent residue, obtaining chemically pure water.

10 27. Tanks according to Claim 26, characterized in that the reverse-osmosis filter (114) comprises ceramic cartridges, which are resistant to attack by chemical products or deterioration by hydrocarbons and which may be regenerated by means of simple backwashing, the residue which has accumulated on them being discharged into the sludge storage section (150).

15 28. Tanks according to Claims 13 to 27, characterized in that the water filtered by the reverse-osmosis filter (114) may then be sterilised by physical means (115), such as germicide lamps.

20 29. Tanks according to Claims 13 to 27, characterized in that the water filtered by the reverse-osmosis filter (114) may then be sterilised by chemical means, for example using halogens or ozone.

 30. Tanks according to Claims 13 to 29, characterized in that both the sections for storing pure water or sludge (40, 150) and the sections (42, 44) for treating the washing water are provided with manholes (22a-c, 132a-c; 30a, 30b; 36a-c) for access to the said sections so as to allow operations of maintenance, cleaning
25 and periodic drainage of the said sections.

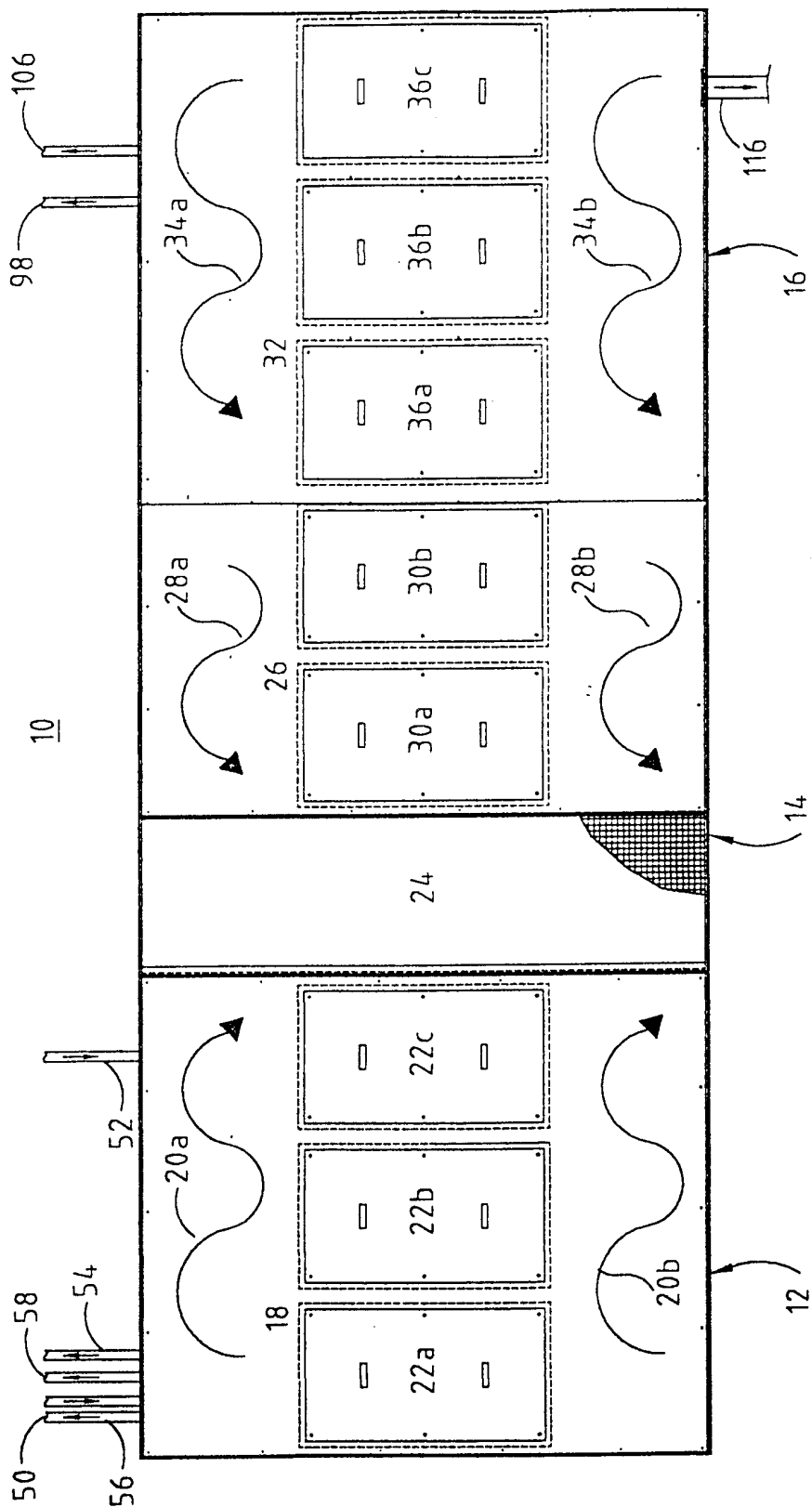


FIG. 1

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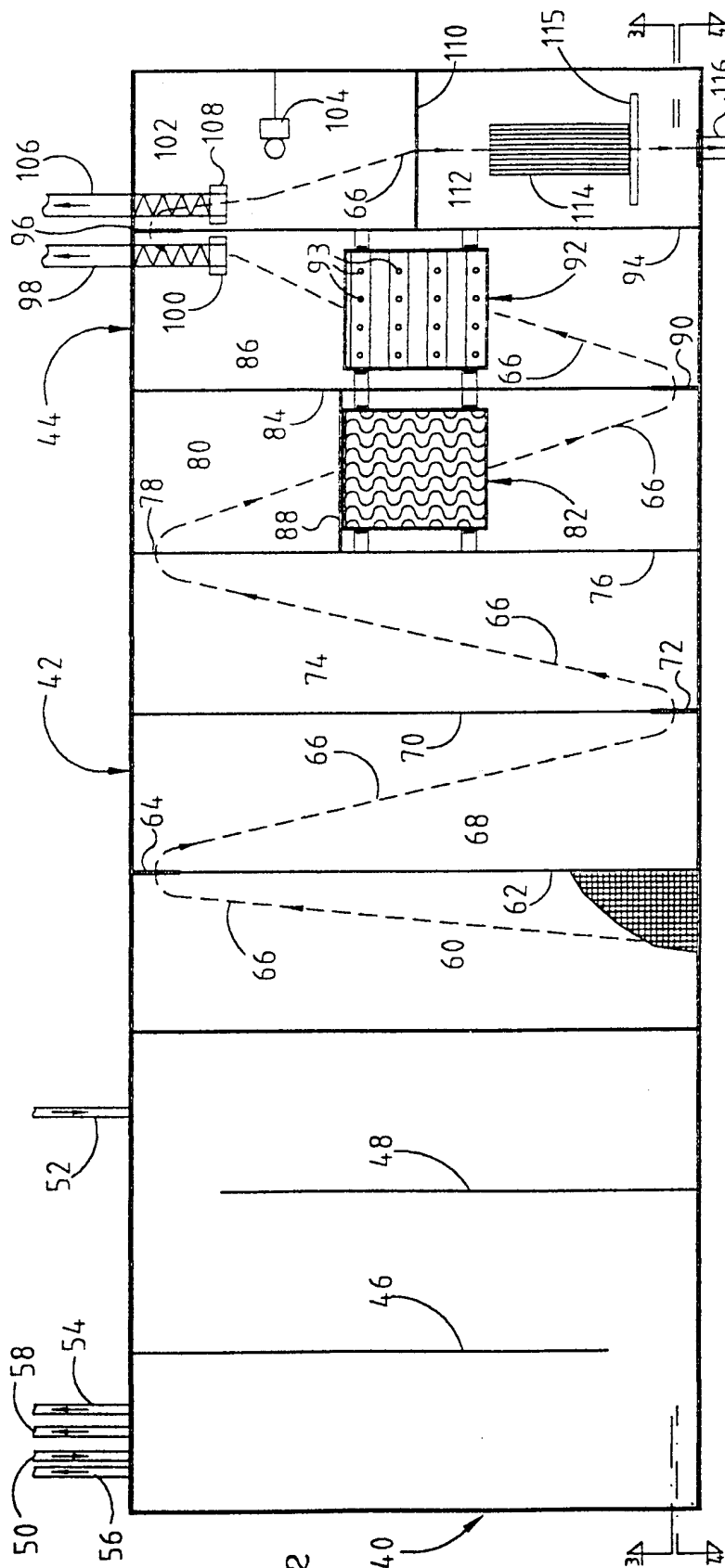


FIG. 2

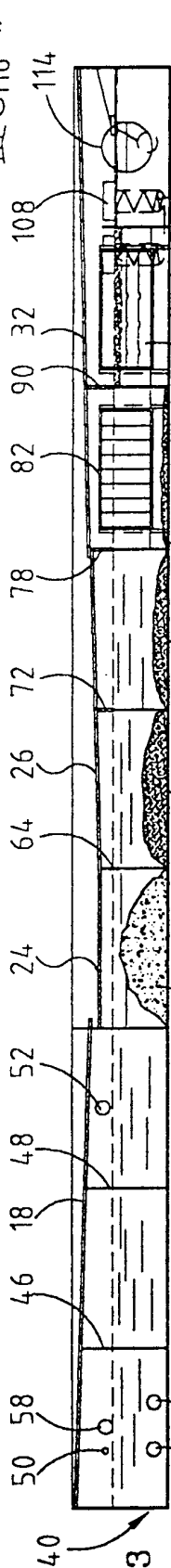


FIG. 3

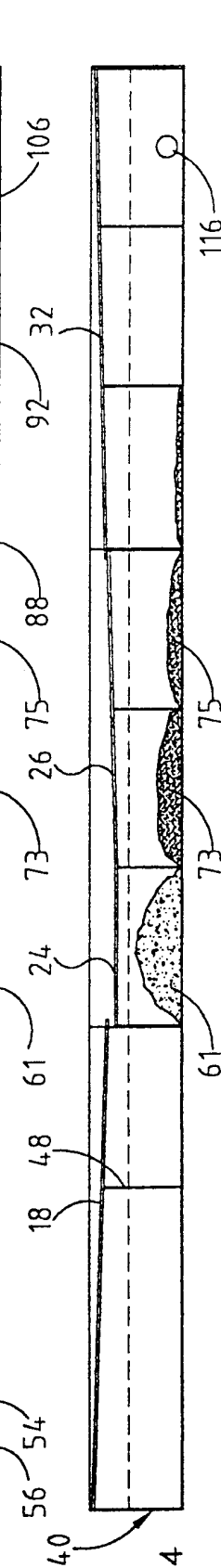


FIG. 4

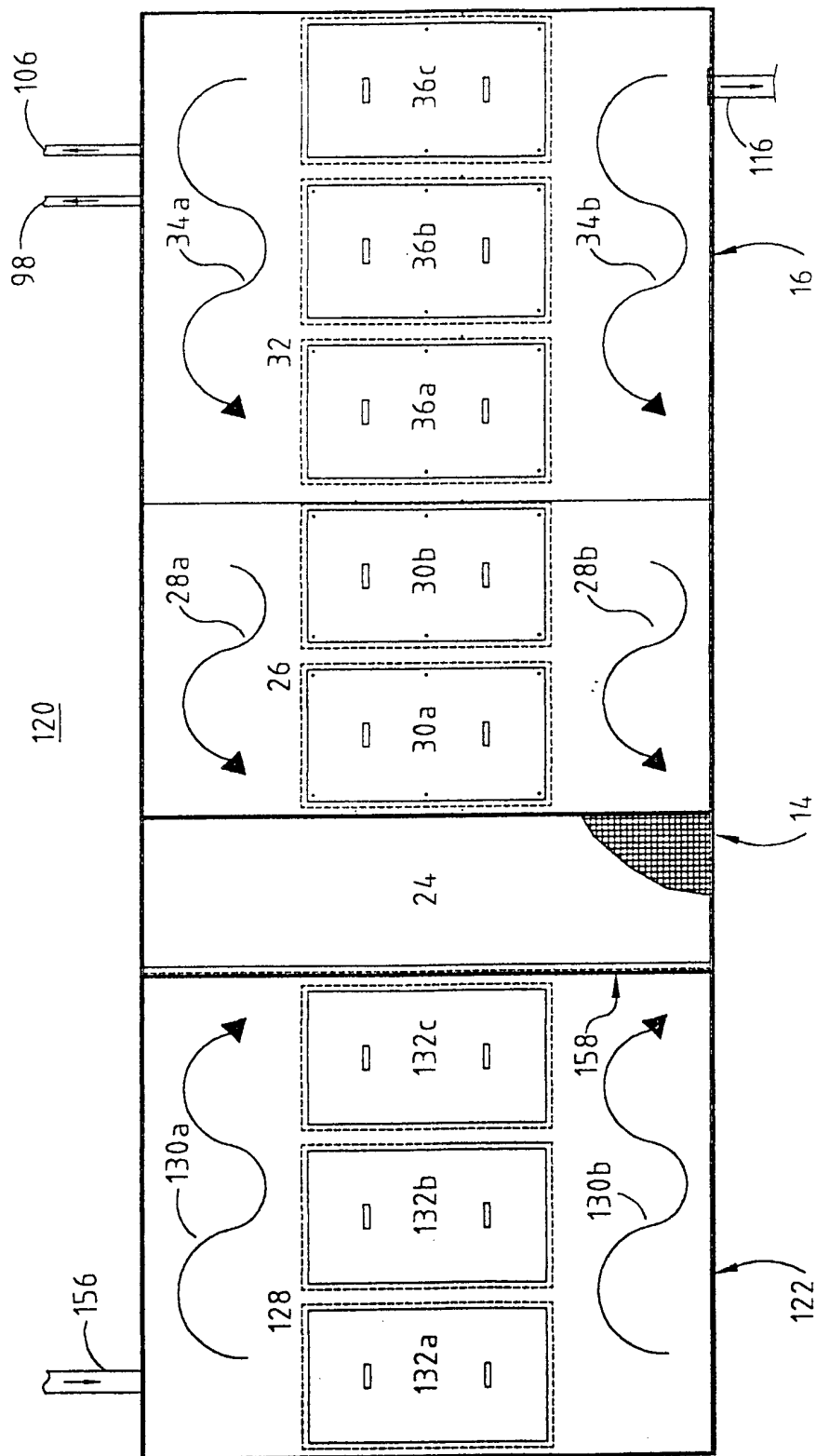


FIG. 5

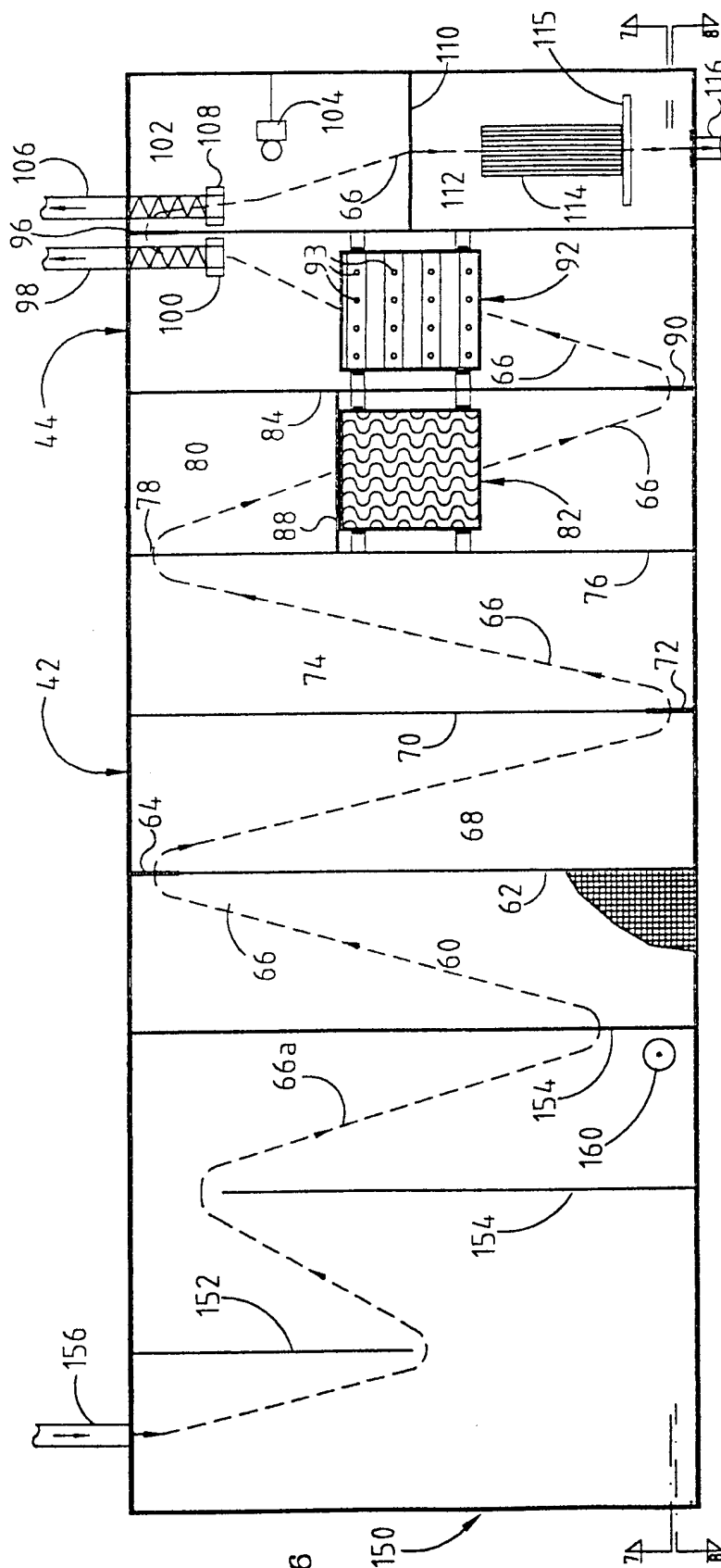


FIG. 6

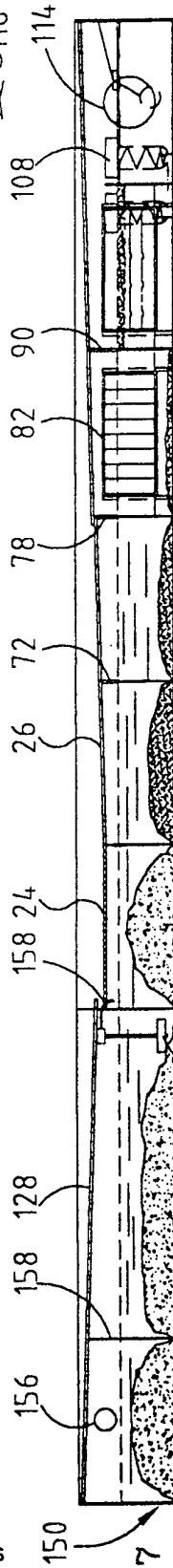


FIG. 7

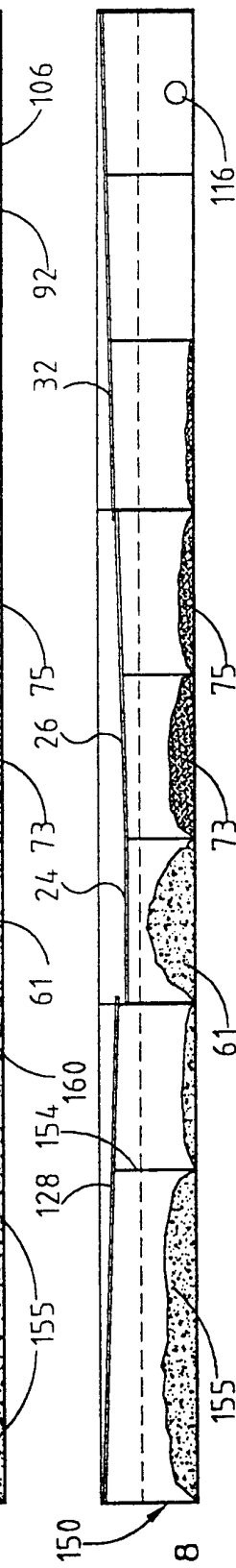


FIG. 8

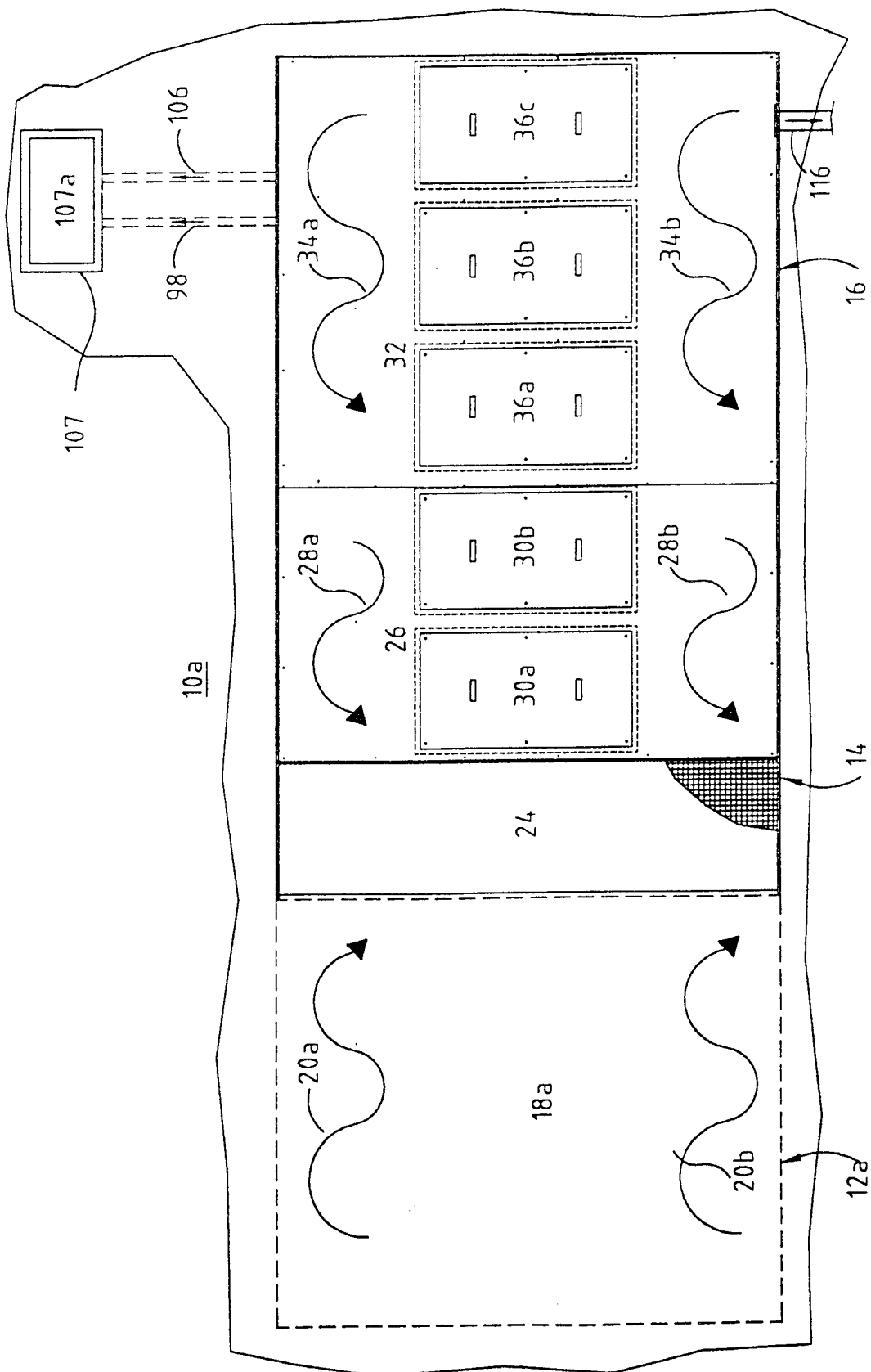


FIG. 9

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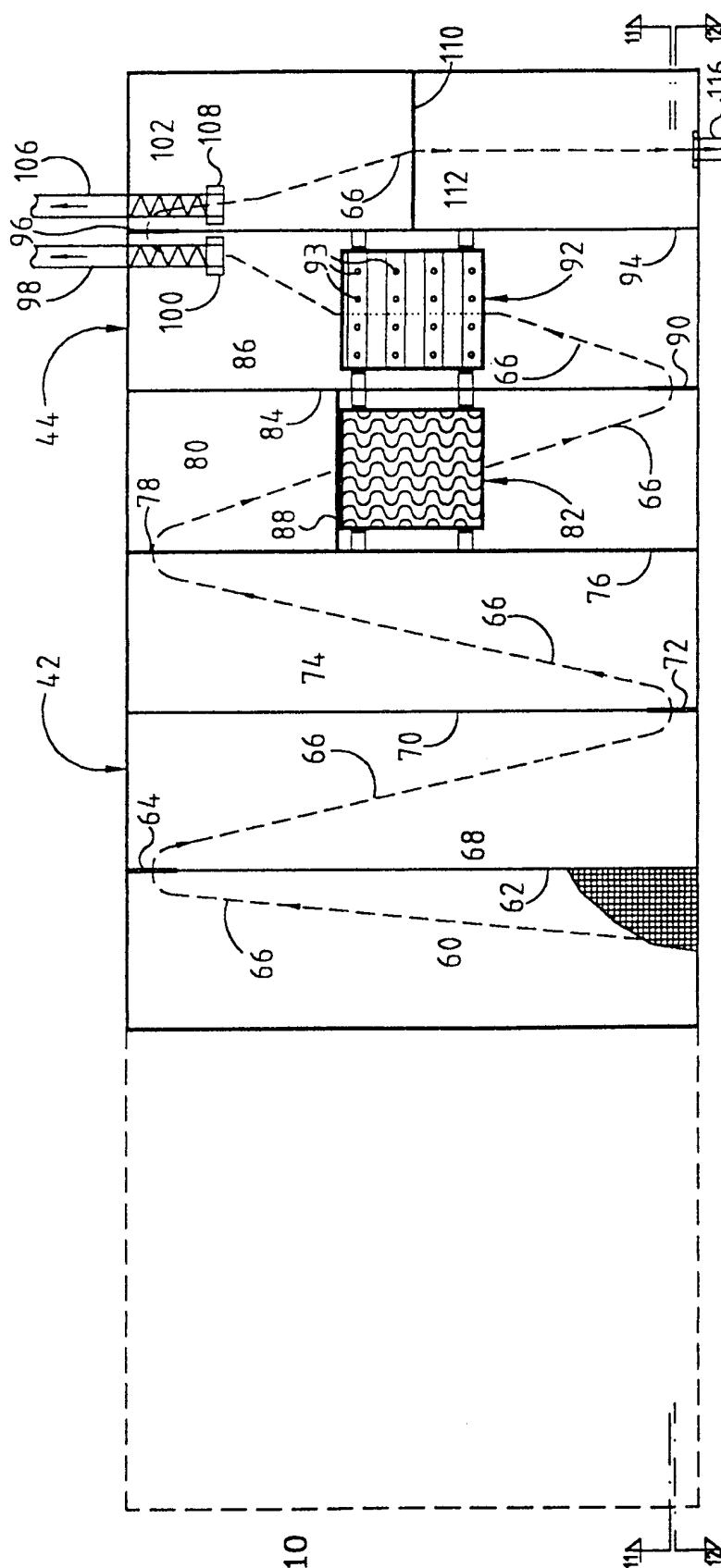


FIG. 10

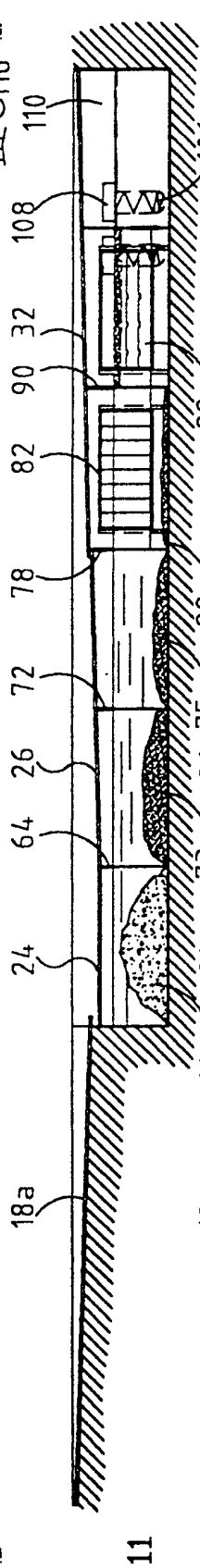


FIG. 11

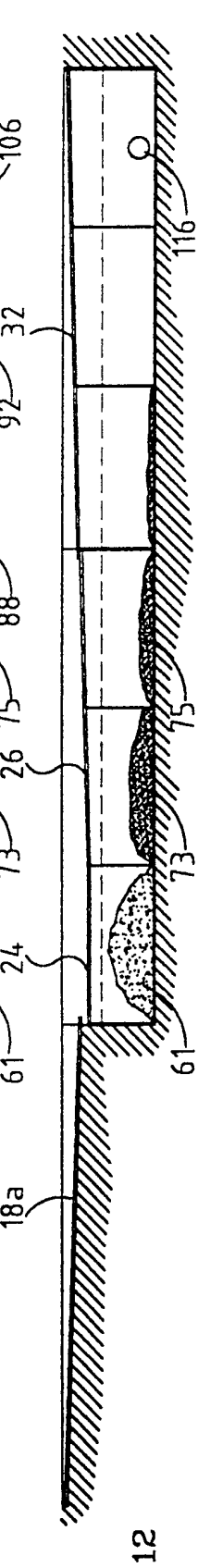


FIG. 12

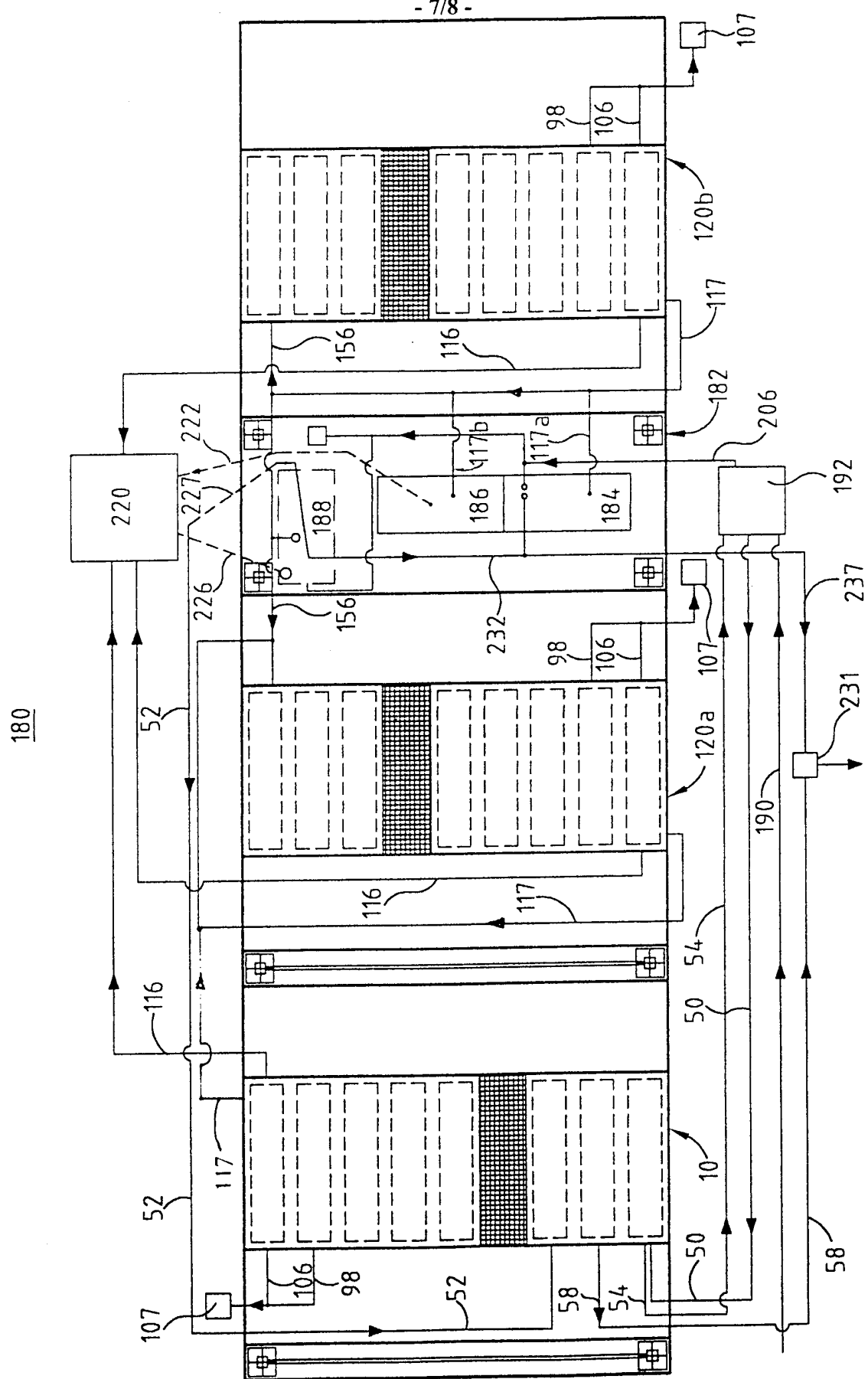


FIG. 13

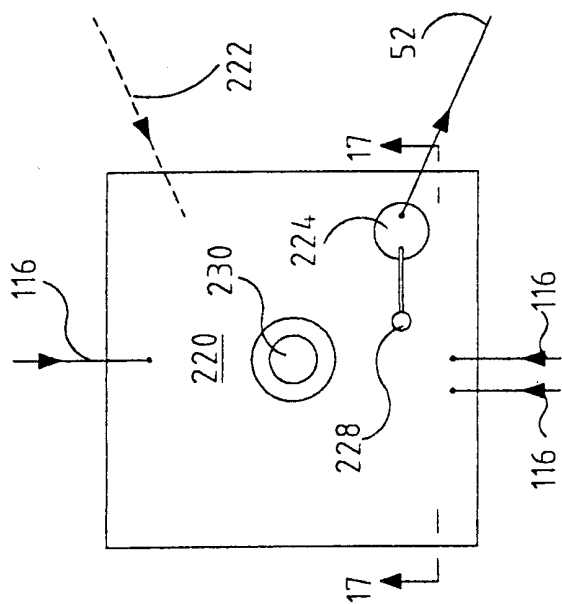


FIG. 16

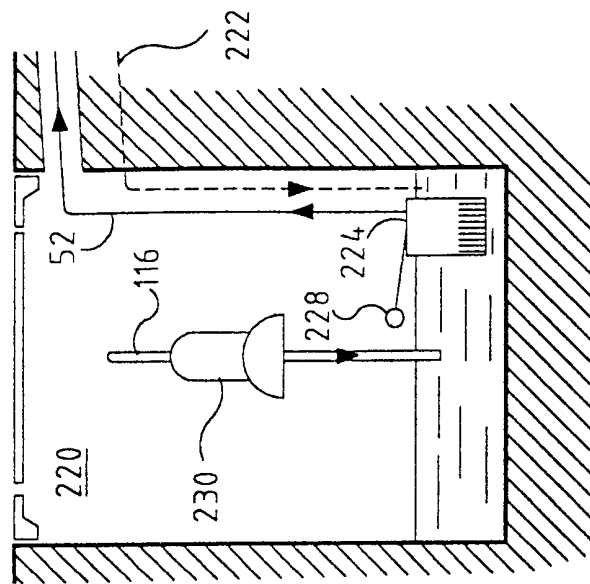


FIG. 17

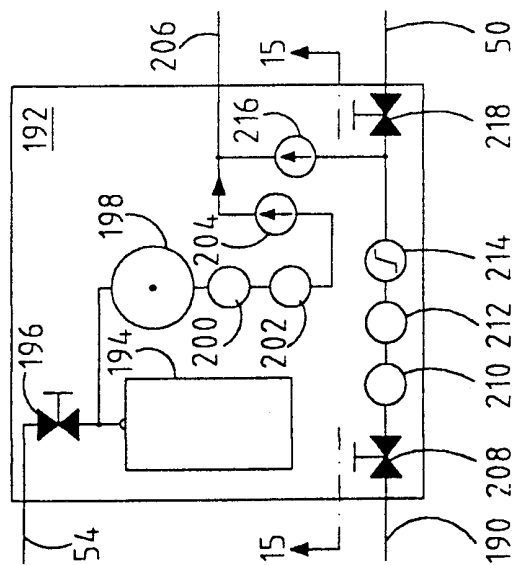


FIG. 14

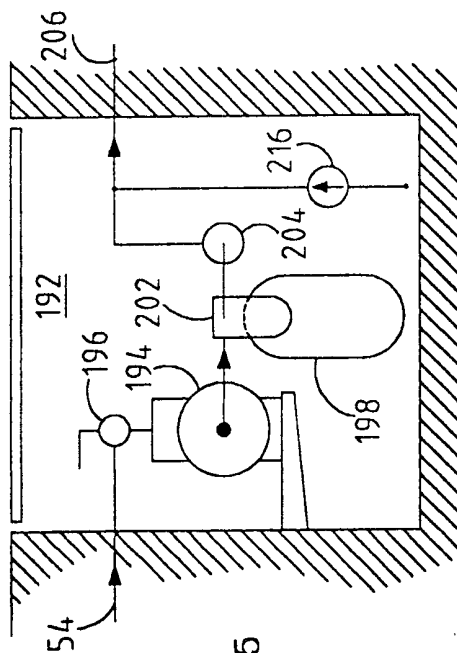


FIG. 15

INTERNATIONAL SEARCH REPORT

Intern. Application No

PCT/EP 99/09044

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C02F9/00 B01D21/28 B01D17/028 //C02F103:44

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C02F B01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	DE 40 40 007 A (POPPE ALFRED) 17 June 1992 (1992-06-17) column 6-9; figure 3	1,2,13, 14,16 3-11,13, 17-23 26,27
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X Y A	DE 93 03 243 U (KAEHMANN ANNEGRET ;SCHMIDT INGELORE (DE)) 14 July 1994 (1994-07-14) the whole document -/-	1,13 3,17 4-6,18, 19



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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"&" document member of the same patent family

Date of the actual completion of the international search

21 March 2000

Date of mailing of the international search report

30/03/2000

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Authorized officer

Gruber, M

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/EP 99/09044

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	US 5 242 604 A (YOUNG BOBBY W ET AL) 7 September 1993 (1993-09-07) figures 8,9	3-7, 17-21

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Information on patent family members

International Application No

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