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(54) Dishwasher

(57) Dishwasher, comprising a first wash circulation system (7) with a wash circulation pump (6) to circulate washing liquid from a sump (5) to at least one spray device (3, 4) arranged in a wash tank (2), wherein a second circulation system (10) comprising a further pump and a filtration device (11) is provided to filter washing liquid independently from actuation of the circulation pump (6) of the first circulation system (7).

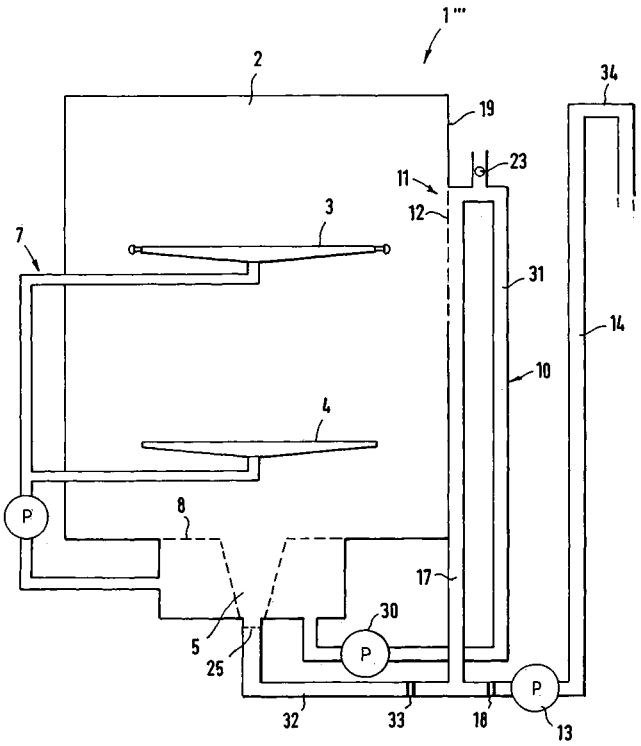

FIG. 6

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Description

[0001] The invention concerns a dishwasher, comprising a first wash circulation system with a wash circulation pump to circulate washing liquid from a sump to at least one spray device arranged in a wash tank.

[0002] In known dishwashers, washing liquid is normally drawn from a sump at the bottom of a wash tank, pumped by a circulation pump into spray arms distributing the wash liquid within the wash tank to remove soils from dishes located in dish baskets in the tank.

[0003] To prevent the redistribution of soil onto the dishes, various filter devices are known. These filters separate soil out of the circulating wash liquid. Two basic solutions are known in the art.

[0004] In one solution, a filter screen or filter mesh is deposited on the outlet side of the circulation pump. A fine filter or even a micro fine filter can be used. However, the risk of clogging of the filter exists. Typically, backwash jets are directed against the filter in an attempt to clear the filter and prevent clogging. However, to drive these backwash jets, the circulation pump itself needs to be actuated so that the backwash jets work against a high pressure so that cleaning may be incomplete. Additionally, behind a clogged filter increasing pressure builds up so that soil is pressed into the filter and embedding itself fixedly, so that it cannot be easily removed.

[0005] Another known solution is to arrange a filter in the sump, normally comprising a fine filter surrounding the final drain inlet where only a coarse filter is provided. Backwashing or cleaning filter is very complex and sophisticated in such a case, so that usually no micro-fine filters are used. Water or washing liquid passing the circumferential fine filter is recirculated again by the circulation pump.

[0006] In general, filter clogging can adversely effect the dishwashers' cleaning ability, causing poor washability and indirectly increased water and energy consumption.

[0007] An additional drawback of these filtering solutions is that filtering and; if applicable, filter cleaning, all depend on the actuation of the circulation pump. The design of the washing cycles is therefore limited as the filtration process is not independently controllable. Moreover, soil particles are recirculated through the circulation system causing clogging not only of the filter device.

[0008] It is therefore the object of the present invention to provide a dishwasher with an improved filtration system essentially obviating the aforementioned drawbacks of the state of the art.

[0009] According the present invention, such an aim is reached in a dishwasher of the above mentioned type, wherein a second circulation system comprising a further pump and a filtration device is provided to filter washing liquid independently from actuation of the circulation pump of the first circulation system.

[0010] In the' dishwasher according to the invention, a second circulation system is provided, which is dedicated to the process of filtering the washing liquid. The circulation pump of the first circulation system and the further pump driving the second circulation system can be controlled independently. Filtration and filter cleaning no longer effect the washing cycle itself, so that the freedom for cycle design is increased. Phases with 100 % filtration and/or 100 % filter cleaning are now possible.

[0011] Additionally, less soil particles are depositioned in the first circulation system, causing clogging or the like. The separation of the circulation of the washing liquid and the filtering also allows an improved dirt handling. Soil can be pumped out of the dishwasher without actuating the circulation pump of the first circulation system.

[0012] Another advantage of the current invention is that a flat sump design can be achieved, since the filtration device no longer needs to be positioned in the sump itself, as well as backwashing devices. A reduction of the total water volume in the sump is possible.

[0013] The filtration device can comprise a micro fine filter and/or a fine filter. 100 % micro fine filtering is now possible without the risk of adversely effecting the dishwashers cleaning ability.

[0014] Preferably, at least one filter of the filtration device forms part of the wall of the wash tank. This filter can for example be a filter screen or a filter mesh and is preferably a micro fine filter. In this manner, a visible clue to the improved filtering is given to the customer. Additionally, easy replacement of the filter is possible and space is effectively used.

[0015] In such a configuration, a device for backwashing the filter can advantageously be provided in the wash tank. In one variation, the device for backwashing the filter comprises nozzles located at the outwardly facing ends of at least one spray arm. The device for backwashing the filter is preferably driven by the circulation pump of the first circulation system, while the further pump is not active. Cleaning of the filter forming part of the wall of the wash tank can this manner be effected at the same time the dishes are washed.

[0016] It is to be noted that in the dishwasher according to the invention no high pressure needs to be built up against the filter of the.filtration device. If, for example, a micro fine filter forms part of the wall of a wash tank, washing liquid containing soil particles only needs to be pumped up at a pressure which allows the washing liquid to run through the filter being part of the wall of the wash tank. Consequently, minimal pressure is exerted on the micro fine filter itself.

[0017] Soil particles therefore do not tend to be embedded into the filter and can for example easily be backwashed by a device for backwashing the filter. This contrasts be aforementioned state of the art, wherein the filtration device is part of the first circulation system and is subject to high pressure.

[0018] It is, however, possible that the first circulation system also comprises a filtration device. Typically, this additional filtration device will only comprise coarse filters and/or fine filters, so that micro fine filtering remains the

domain of the second circulation system.

[0019] Such an additional filtration device or part of the filtration device of the second circulation system may be located in the sump. For example, the already known fine filter placed in the sump can be used for the first as well as for the second circulation system. In other embodiments, the additional filtration device or the part of the filtration device located in the sump only apply to the first or the second circulation system. Such an additional filtration device, or part of the filtration device, can, if assigned to the second circulation system, act as a prefiltering stage for a micro fine filter, for example forming part of the wall of the wash tank.

[0020] In a first embodiment of the invention, the further pump is the drain pump. This means, the drain pump not only drives the draining of water out of the dishwasher, but also the second circulation system. Advantageously, no additional pump is needed in this configuration. A control unit of the dishwasher may then independently control operation of the drain pump so that either draining or filtration/cleaning of the filter or the filters is effected. To prevent the backflow of water containing soil particles into the sump from the filtration device, a backflow valve can be provided upstream of the drain pump.

[0021] Preferably, the second circulation system comprises a sedimentation chamber located downstream of the drain pump and having a filter, in particular a micro fine filter, in its upper part. In this configuration, water is pumped into the sedimentation chamber by the drain pump, at a pressure such that the water level just reaches the filter arranged in the upper part of the sedimentation chamber wall. The filter can, like already mentioned, form a part of the wall of the wash tank. The soil particles, which cannot pass the filter, remain in the sedimentation chamber. Once actuation of the drain pump is stopped, due to the backflow valve, washing liquid may remain in the sedimentation chamber and the soil particles slowly begin to sediment, i.e. sink down to the bottom of the sedimentation chamber, where they can be simply drained away.

[0022] Washing liquid should not be drained through the sedimentation chamber, because in this case it would simply flow back into the wash tank through the filter. Therefore, the dishwasher may comprise a junction having at least one inlet connected to the outlet side of the drain pump and at least two outlets, wherein a first outlet is connected to the sedimentation chamber and a second outlet is connected to a drain tube for final drainage of washing liquid. To prevent the draining of washing liquid during filtration, a u-like bend of the drain tube for finally draining washing liquid can be located higher than the highest point of the second circulation system, in particular the sedimentation chamber. In such a configuration, if washing liquid is pumped by the drain pump at a low pressure, the water level can only be raised to reach the filter located in the sedimentation chamber, but no water is drained. If driven at a higher speed, water can be drained. Still, the possibility exists that washing liquid may flow back into the wash tank during draining.

[0023] Thus, preferably a switch is provided at the junction, wherein the switch is adapted to selectively connect at least the inlet and the first outlet and the inlet and the second outlet. The at least two positions of the switch correspond to "filtration", i.e. use of the second circulation system, and "draining". If the switch is in a first position, connecting the inlet with the first outlet, washing liquid is circulated through the second circulation system, passing the sedimentation chamber and the filter. Please note that when the pump is turned off, soil particles begin to sink down to the bottom of the sedimentation chamber, which can preferably be adjacent to the junction and the switch. To drain water from the dishwasher, the switch is in the second position, connecting the inlet with the second outlet. On actuation of the pump, water is drained from the dishwasher. At this time, water can be reloaded from the sedimentation chamber by turning the pump off and switching the switch back to the first position, so that water and soil particles residing at least in the lower part of the sedimentation chamber flow into the tub section between the backflow valve or the drain pump and the junction. Then again, the switch is actuated into the second position and the soil-laden washing liquid can easily be drained. Depending on how much washing liquid can flow back from the sedimentation chamber, this process can be repeated one or more times. In this manner, at least in multiple steps, the sedimentation chamber can be fully drained. Even heavy dirt can be handled. If the filter of the sedimentation chamber is formed as part of the wall of the wash tank and a device for backwashing the filter is used to clean the filter, the water accumulating in the sedimentation chamber can also be drained in this manner.

[0024] In another variant, an outlet in the upper part of the sedimentation chamber can be connected to the drain'tube such that an overflow for a completely filled sedimentation chamber is formed. In this manner, if the filter is clogged or the drain pump is driven at a too high speed, washing liquid can be drained. However, such an overflow can also be used to effect a tangential cleaning of the filter. Thus, preferably, if such an overflow is provided, the drain pump is controllable to effect a tangential cleaning of the filter. This means, the drain pump is driven at a high speed so that the water passes tangentially along the filter in the sedimentation chamber, taking along the soil particles which are drained through the overflow and subsequently through the drain tube.

[0025] Additionally, if such an overflow is provided and, especially when the u-like bend of the drain tube is located higher than the' highest point of the overflow, a backflow valve can be provided downstream of the outlet of the sedimentation chamber.

[0026] In a third variant of the first embodiment of the invention, the junction can comprise a second inlet connected to an outlet in the upper part of the sedimentation chamber such that an overflow for a completely filled sedimentation chamber is formed and the switch can be ac-

tuated so that the first inlet is connected to the first outlet and at the same time the second inlet is connected to the first outlet, and so that the first inlet is connected to the second outlet. The first position of the switch, connecting the first inlet to the first outlet and the second inlet to the second outlet allows for filtration of the washing liquid at a low speed of the drain pump. Even if the filter is clogged in such a situation, overflowing washing liquid can simply be drained through the final drain tube. If the pump is driven at a higher speed, tangential cleaning of the filter can be effected and the washing liquid is directly drained to the drain tube. If the switch is in the second position, connecting the first inlet to the second outlet, washing liquid can be directly be drained.

[0027] In a further development of this third variant of the first embodiment, the switch can additionally be actuated so that the first inlet is connected to the first outlet and at the same time the second inlet and the second outlet are closed. This third position is especially preferable if a sensor device adapted to sense a clogging of the filter is used, for example a hydrostatic sensor connected to the upper end of the sedimentation chamber. If during filtration of the washing liquid the filter is clogged, washing liquid filling the overflow is not drained,through the drain tube, but confined to the overflow so that a strong increase in pressure can be measured. Adequate measures can be taken in such- a case, like notifying the user that the filter is to be cleanned. Cleaning or draining of the filter is again effected in the first position of the switch, when the second inlet is connected to the second outlet.

[0028] In a second embodiment of the invention, the further pump can be an additional pump. This means, the dishwasher comprises the circulation pump of the first circulation system, the drain pump and an additional pump dedicated to drive the second circulation system. The advantage of this configuration is that the filtration process is now even decoupled from the draining process. A switch that might be clogged is also not needed.

[0029] The additional pump may also' draw washing liquid to be filtered from the sump. Preferably, the additional pump draws washing liquid from an area of the sump separated by a filter, in particular a fine filter, from which area also the circulation pump draws washing liquid. In this case, both circulation systems share the fine filter, while the second circulation system's filtration device preferably comprises a micro fine filter.

[0030] Drawing washing liquid from the sump, the outlet of the additional pump can be connected to an inlet located in the upper part of a sedimentation chamber, wherein a part of the sedimentation chamber's wall is formed as a filter, in particular a micro fine filter, and the lower part of the sedimentation chamber has an outlet connected to a feeding tube leading from the sump to a drain pump, the backflow of water from the sedimentation chamber to the sump being prevented by a backflow valve. In this preferred configuration, washing liquid can be fed into the sedimentation chamber from its upper part. Through the.filter, which may be formed as a part of the wall of the wash tank, filtered washing liquid can re-enter the wash tank. The lower part of the sedimentation chamber remains filled with washing liquid, so that soil particles sediment, i.e. sink downwards. The soil filtered out during the filtration of the washing liquid can now easily be drained by actuation of the drain pump through the feeding tube, so that only a small amount of water needs to be drained. Additionally, if a device for backwashing the filter is provided in the wash tank, washing liquid or water from the backwash jets cleaning the filter can also be easily drained, removing all the soil from the sedimentation chamber and the filter.

[0031] To prevent the drainage of washing liquid during the filtration process, an u-like bend of the drain tube for finally draining washing liquid can be located higher than the highest point of the second circulation system, in particular the sedimentation chamber. The additional pump, in the following also named filter pump, is driven at a speed such that washing liquid enters the sedimentation chamber and passes through the filter, but is not drained through the drain tube.

[0032] In both embodiments, a flat sump can be realised, possibly comprising a flat fine filter acting as a prefiltering stage for the filtration system.

[0033] It should be noted that in the second embodiment, if washing liquid is drawn directly from the sump without passing a fine filter, a two layer filter can be used in the wall of the sedimentation chamber. In this case, the water would first pass a fine filter and afterwards a micro fine filter to prevent clogging of the micro fine filter by bigger soil particles.

[0034] In any of the two embodiments, a sensor device adapted to sense a clogging of the filter can be provided. This sensor device can be hydrostatic sensor, which, in case a sedimentation chamber is provided, can be connected to the upper end of the sedimentation chamber. Advantageously, clogging of the filter can be detected in such a configuration and countermeasures can be taken and/or a warning can be output to a user to exchange or manually clean the filter.

[0035] Please note that the first wash circulation system, filtration devices as such, especially filters located in the sump, are considered well-known by the person skilled in the art and will not discussed in detail in this description.

[0036] Further advantages and details of the current invention can be learned from the following description of preferred embodiments in connection with the drawings, wherein:

Fig. 1 is a schematic diagram of a dishwasher according to the first variant of the first embodiment of the invention,

Fig. 2 is a schematic diagram showing a dishwasher according to the second variant of the first embodiment of the invention,

Fig. 3 is a schematic diagram of a dishwasher according to a third variant of the first embodiment of the invention,

Fig. 4 is a view showing a switch used in the dishwasher of Fig. 3,

Fig. 5 shows different positions of the switch of Fig. 4,

Fig. 6 is a schematic view of a dishwasher according to the second embodiment of the invention, and

Fig. 7 is a schematic diagram of a variation of the dishwasher of the second embodiment.

[0037] Fig. 1 shows a dishwasher 1 according to the first variant of the first embodiment of the invention. It comprises a wash tank 2 wherein soiled dishes can be loaded in dish baskets (not shown) to be washed. Two spray arms 3, 4 are provided in the wash tank 2. During operation of the dishwasher 1, washing liquid is drawn from a sump 5 by a circulation pump 6 and recirculated into the wash tank 2 via the spray arms 3, 4. While circulating in this first circulation system 7, the washing liquid passes a flat fine filter 8 located in the sump 5. In this variant, the fine filter 8 is part of a filtration device 9 of the first circulation system 7. However, filtration in the first circulation system 7 depends on the actuation of the circulation pump 6, and no micro fine filtering is available. A coarse filter 25 can be provided in the sump 5 where washing liquid is drained.

[0038] According to the invention, the dishwasher 1 comprises a second circulation system 10 comprising a filtration device 11 with a micro fine filter 12 to filter washing liquid independently from actuation of the circulation pump 6 of the first circulation system 7. The second circulation system 10 is driven by the drain pump 13, by which usually water is drained from the sump 5 to a drain tube 14. To effect draining of washing liquid as well as filtering of washing liquid by the same drain pump 13, the dishwasher 1 comprises a junction 15 with a switch 16. The junction 15 has one inlet connected to the outlet side of the drain pump 13 and two outlets, namely a first outlet connected to a sedimentation chamber 17 and a second outlet connected to the drain tube 14. The switch 16 can be actuated between two positions. In a first position, the inlet is connected to a first outlet, in a second position the inlet is connected to the second outlet. Also provided are backflow valves 18 preventing the flowback of water into the sump 5 or the sedimentation chamber 17. Please note that the narrow, lower portion 24 is also a part of the sedimentation chamber 17.

[0039] The micro fine filter 12 is arranged so that it forms part of the wall 19 of the wash tank 2. Washing liquid passing through the micro fine filter 12 from the sedimentation chamber 17 is directly recirculated into the wash tank 2.

[0040] Additionally, the micro fine filter 12 can easily be cleaned by backwashing using a device 20 for backwashing the filter 12 located in the wash tank 2. The device 20 comprises nozzles 21 arranged circumferentially around the upper spray arm 3 facing outwardly, so that backwash jets ejected from the nozzles 21 hit the micro fine filter 12, thereby cleaning it.

[0041] Of course, additional nozzles aimed at the filter 12 can be provided at the lower spray arm 4 or other spray devices.

[0042] In this configuration, a filtration process or phase is independent from actuation of the circulation pump 6. The filtration process will now be described in more detail.

[0043] If the washing liquid is to be filtered, the switch 16 is actuated into the first position, connecting the inlet to the first outlet and therewith the sedimentation chamber 17. The drain pump 13 is now actuated at a speed which raises the washing liquid level in the sedimentation chamber to a height in which washing liquid can just pass the filter 12. In this manner, the pressure exerted on the filter 12 is as low as possible, preventing soil particles from being pressed into the filter mesh or screen. This means, soil particles at or in the filter 12 can usually still be removed by actuation of the device 20 for backwashing the filter 12. At the end of the filtration phase the drain pump 13 is stopped and the switch 16 is actuated to the second position, now connecting the inlet to the second outlet and therewith the drain tube 14. Meanwhile, the soil particles in the remaining column of washing liquid filling the sedimentation chamber 17 begin to sink down to the bottom of the sedimentation chamber 17, i.e. the lower portion 24. There, the sedimented particles remain close to the switch 16.

[0044] With the switch 16 in the second position, washing liquid can be drained from the sump 5 to the drain tube 14. Now, the portion 22 between the sump-side backflow valve 18 and the switch 16 can at least partly be emptied. In this condition, the switch 16 is again actuated into the first position so that at least part of the washing liquid column in the sedimentation chamber 17, in particular the lower part containing the soil particles, flows into the portion 22. The switch 16 is then again actuated into the second position, so that the washing liquid reloaded from the sedimentation chamber 17 containing the soil particles can be drained through the drain tube 14. This process of draining the sedimentation chamber 17 can, if required, be repeated one or several times, for example, if it cannot be completely drained in one step. In this case, after the portion 22 has been at least partly emptied, the switch is again actuated into the first position, washing liquid from the sedimentation chamber 17 containing soil particles is drained into the portion 22, the switch is again actuated into the second position, and the washing liquid is drained.

[0045] After or during the actuation of the device 20 for backwashing the filter 12, this process of draining the sedimentation chamber 17 is also effected.

[0046] In this manner, the soil filtered out from the

washing liquid can easily be drained without consuming too much washing liquid. Additionally, a smaller sump can be realised as the filtration of the washing liquid takes place in the filtration device 11.

[0047] The micro fine filter 12 as part of the wall 19 of the wash tank 2 can be seen by the user looking into the dishwasher, assuring him of a good cleaning performance wherein soil particles are less often recirculated through the first circulation system 7. Additionally, the micro fine filter 12 can easily be disassembled and cleaned by hand.

[0048] The dishwasher also comprises a hydrostatic sensor 23, located at the upper end of the sedimentation chamber 17. In the rare case of a clogged filter 12, the hydrostatic sensor 23 measures a high pressure and therefore countermeasures and/or warnings to the user can be effected.

[0049] Fig. 2 shows a dishwasher 1' according to the second variant of the first embodiment, wherein like parts are designated by like numerals.

[0050] In particular, the first circulation system 7 and the part of a filter device 9 located in the sump 5 are similar in all embodiments, thus, the description is omitted in the following.

[0051] In the' variant of fig. 2, the' drain pump 13 also acts as a further pump, having a switch 16 at a junction 15 downstream. However, differing from the variant in fig. 1, an outlet 26 is provided in the upper part of' the sedimentation chamber 17. This outlet 26 is connected to the final drain tube 14 so that an overflow 27 of a completely filled sedimentation chamber 17 is formed. To prevent washing liquid from flowing back from the drain tube 14 through the overflow 27 into the sedimentation chamber 17, a backflow valve 28 is' provided along the overflow 27.

[0052] Apart from acting as an overflow 27 for the sedimentation chamber 17, thus preventing an excess pressure on the filter 12, the overflow 27 may be used in a tangential cleaning step for the filter 12. During tangential cleaning, the switch 16 is in a first position, so that the inlet on the drain pump 13 side and the first outlet leading to the sedimentation chamber are connected. The drain pump 13 is then driven at a high speed, so that washing liquid passes tangentially upwards along the filter 12, which again can be a micro fine filter, taking with it soil particles sticking to the filter or sedimented in the sedimentation chamber 17. The soil-laden washing liquid then passes through the overflow 27 and is discharged through the drain tube 14.

[0053] If tangential cleaning is effected, a device 20 for backwashing the filter 12 is in principle not needed, but may additionally be provided. Please note that soil accumulated in the lower portion 24 of the sedimentation chamber 17 can also be drained using the same process as described with reference to fig. 1, i.e. at least partly emptying the section 22, moving the switch 16 to the first position, moving the switch 16 to the second position and again driving the pump.

[0054] Thus, in this second variant of the first embodiment, cleaning of the filter 12 is improved as tangential cleaning becomes possible.

[0055] A third variant of the first embodiment of a dishwasher 1'' according to the invention is shown in fig. 3. The difference to the variant in fig. 2 is that in this case a second inlet connected to the overflow 27 is provided at the junction 15 and a different switch 16' is used which can be actuated into three positions.

[0056] An embodiment of the switch 16' is shown in fig. 4. The switch 16' comprises a rotatable actuator 29 having an expanded section 30 at one side. This configuration allows to dispense with the backflow valve 28.

[0057] The switch 16' can be actuated into three positions shown in fig. 5, each corresponding to a mode of function of the dishwasher 1''. In a first position I, the first inlet corresponding to the section 22 is connected to the first outlet corresponding to the sedimentation chamber 17, while the second inlet corresponding to the overflow 27 and the second outlet corresponding to the drain tube 14 are blocked. In this first position, the filter 12 of the filtration device 11 and the sedimentation chamber 17 are used for filtration of the washing liquid in the second circulation system 10. Washing liquid is pumped into the sedimentation chamber 17 by the drain pump 13 at a low speed such that at nearly zero pressure washing liquid may pass through the filter 12 into the wash tank 2, thereby being filtered. Please note that, as the connection between the overflow 27 and the drain tube 14 is blocked, a hydrostatic sensor 23 can again be used in this variant to detect clogging of the filter 12.

[0058] In the second position II a first inlet corresponding to the section 22 is connected to the second outlet corresponding to the drain tube 14. In this position, washing liquid can be directly drained from the dishwasher 1''.

[0059] The third position III connects a first inlet corresponding to the section 22 to the first outlet corresponding to the sedimentation chamber 17 and at the same time the second inlet corresponding to the overflow 27 to the second outlet corresponding to the drain tube 14. In this position, a tangential cleaning of the filter 112 as described above with reference to fig. 2 can be effected while the drain pump 13 runs at a high speed. Washing liquid-is pumped from the sump 5 through the section 22, then through switch 16' into the sedimentation chamber 17, passing the filter 12. Afterwards, the washing liquid passes the overflow 27, again flows through switch 16' to be drained through a drain tube 14.

[0060] Finally, fig. 6 shows a dishwasher 1''' according to the second embodiment of the invention. Again, the dishwasher 1''' comprises a first circulation system 7 as described with respect to fig. 1 as well as a drain pump 13 drawing washing liquid from a sump 5 to discharge it through a drain tube 14. In the sump, a fine filter 8 and a coarse filter 25 are provided. However, in this embodiment, the second circulation system 10 for filtration is not driven by the drain pump 13, but by an additional pump or filter pump 30. The filter pump 30 draws water

filtered by the flat fine filter 8 from the sump 5 through a tube 31 to the upper end of a sedimentation chamber 17. A micro fine filter 12 forms a boundary of the sedimentation chamber 17 in its upper part. The micro fine filter 12, which is a part of a filtration device 11, again is formed as a part of the wall 19 of the wash tank 2. The sedimentation chamber 17 is connected to a feeding tube 32 for the drain pump 13.

[0061] To prevent the draining of washing liquid during operation of the filter pump 30, the u-like bend 33 of the drain tube 14 is located.higher than the upper end of the sedimentation chamber 17. During filtration, the filter pump 30 is driven at a low speed so that washing liquid may enter the sedimentation chamber 17 from above, but no washing liquid is drained from the dishwasher 1''' through the drain tube 14. Advantageously, during filtering, soil particles sedimented at the bottom of the sedimentation chamber 17 are not swirled up again in the direction of the filter 12. Draining of the sedimentation chamber 17 is easily effected by actuation of the drain pump 13. Backflow valves 33, 18 prevent washing liquid from flowing back to the sedimentation chamber 17 or the sump 5.

[0062] Tangential cleaning of the filter 12 can also be effected by running the filter pump 30 at a higher speed so that washing liquid not only enters the sedimentation chamber 17, but is also drained through the drain tube 14. Additionally or alternatively, cleaning of the filter 12 can also be effected using a device 20 for backwashing the filter 12 as described with respect to fig. 1.

[0063] As can be seen, no switch that is subject to clogging is needed in this second embodiment of the invention.

[0064] In the example shown in fig. 6, both the circulation pump 6 and the additional pump 30 draw washing liquid from behind the flat fine filter 8 in the sump 5. However, as shown in the modified second embodiment in fig. 7, the filter pump 30 may also draw washing liquid from the feeding tube 32 upstream the backflow valve 33. In this embodiment, however, washing liquid is not yet fine filtered before entering the sedimentation chamber 17. Hence, a two-layer filter 12' is used instead of the micro fine filter 12. A first layer of the filter 12' acts as a fine filter, a second layer acts as a micro fine filter. Optionally, it is also possible to provide any additional filters in all described embodiments and variants.

[0065] In summary, in the second embodiment shown in figures 6 and 7, virtually no filter cleaning is needed since minimal pressure is exerted on the filter 12 or 12' and soil particles simply sink down in the sedimentation chamber 17. No switch is needed in the drainage network, and a low noise filter pump 30 can be used.

Claims

1. Dishwasher, comprising a first wash circulation system (7) with a wash circulation pump (6) to circulate washing liquid from a sump (5) to at least one spray device (3, 4) arranged in a wash tank (2), **characterised in that** a second circulation system (10) comprising a further pump and a filtration device (11) is provided to filter washing liquid independently from actuation of the circulation pump (6) of the first circulation system (7).

2. Dishwasher according to claim 1, **characterised in that** the filtration device (11) comprises a micro fine filter (12) and/or a fine filter.

3. Dishwasher according to claim 1 or 2, **characterised in that** at least one filter (12) of the filtration device (11) forms part of the wall (19) of the wash tank (2).

4. Dishwasher according to claim 3, **characterised in that** a device (20) for backwashing the filter (12) is provided in the wash tank (2).

5. Dishwasher according to claim 4, **characterised in that** the device (20) for backwashing the filter (12) comprises nozzles (21) located at the outwardly facing ends of at least one spray arm (3, 4).

6. Dishwasher according to one of the preceding claims, **characterised in that** the first circulation system (7) also.comprises a filtration device (9).

7. Dishwasher according to one of the preceding claims,
characterised in that an additional filtration device (9) or part of the filtration device (11) is located in the sump (5).

8. Dishwasher according to one of the preceding claims, **characterised in that** the further pump is the drain pump (13).

9. Dishwasher according to claim 8, **characterised in that** a backflow valve (18) is provided upstream of the drain pump (13).

10. Dishwasher according to claim 8 or 9, **characterised in that** the second circulation system (10) comprises a sedimentation chamber (17) located downstream of the drain pump (13) and having a filter (12), in particular a micro fine filter (12), in its upper part.

11. Dishwasher according to claim 10, **characterised in that** the dishwasher (1, 1', 1'') comprises a junction (15) having at least one inlet connected to the outlet side of the drain pump (13) and at least two outlets, wherein a first outlet is connected to the sedimentation chamber (17) and a second outlet is connected to a drain tube (14) for final drainage of washing liquid.

12. Dishwasher according to claim 11, **characterised in that** a u-like bend (34) of the drain tube (14) for finally draining washing liquid is located higher than the highest point of the second circulation system (10), in particular the sedimentation chamber (17).

13. Dishwasher according to claim 11 or 12, **characterised in that** a switch (16, 16') is provided at the junction (15), wherein the switch (16, 16') is adapted selectively connect at least the inlet and the first outlet and the inlet and the second outlet.

14. Dishwasher according to claim 13, **characterised in that** an outlet in the upper part of the sedimentation chamber (17) is connected to the drain tube (14) such that an overflow (27) for a completely filled sedimentation chamber (17) is formed.

15. Dishwasher according to claim 14, **characterised in that** the drain pump (13) is controllable to effect a tangential cleaning of the filter (12).

16. Dishwasher according to claim 14 or 15, **characterised in that** a backflow valve (28) is provided downstream of the outlet of the sedimentation chamber (17).

17. Dishwasher according to claim 13, **characterised in that** the junction (15) comprises a second inlet connected to an outlet in the upper part of the sedimentation chamber (17) such that an overflow (27) for a completely filled sedimentation chamber (17) is formed and the switch (16') can be actuated so that the first inlet is connected to the first outlet and at the same time the second inlet is connected to the first outlet, and so that the first inlet is connected to the second outlet.

18. Dishwasher according to claim 17, **characterised in that** the switch (16') can additionally be actuated so that the first inlet is connected to the first outlet and at the same time the second inlet and the second outlet are closed.

19. Dishwasher according to one of the claims 1 to 7, **characterised in that** the further pump is an additional pump (30).

20. Dishwasher according to claim 19, **characterised in that** the additional pump (30) draws washing liquid to be filtered from the sump (5).

21. Dishwasher, according to claim 19 or 20, **characterised in that** the additional pump (30) draws washing liquid from an area of the sump (5) separated by a filter (8), in particular a fine filter (8), from which area also the circulation pump (6) draws washing liquid.

22. Dishwasher according to claim 20 or 21, **characterised in that** the outlet of the additional pump (30) is connected to an inlet located in the upper part of a sedimentation chamber (17), wherein a part of the sedimentation chamber's wall is formed as a filter (12), in particular a micro fine filter (12), and the lower part of the sedimentation chamber (17) has an outlet connected to a feeding tube (32) leading from the sump (5) to a drain pump (13), the backflow of washing liquid from the sedimentation chamber (17) to the sump (5) being prevented by a backflow valve (33).

23. Dishwasher according to claim 22, **characterised in that** a u-like bend (34) of the drain tube (14) for finally draining washing liquid is located higher than the highest point of the second circulation system (10), in particular the sedimentation chamber (17).

24. Dishwasher according to one of the preceding claims, **characterised in that** a sensor device adapted to sense a clogging of the filter (13) is provided.

25. Dishwasher according to claim 24', **characterised in that** the sensor device is a hydrostatic sensor (23).

26. Dishwasher according to claim 25, **characterised in that** the second circulation system (10) comprises a sedimentation chamber (17), wherein the sensor (23) is connected to the upper end of the sedimentation chamber (17).

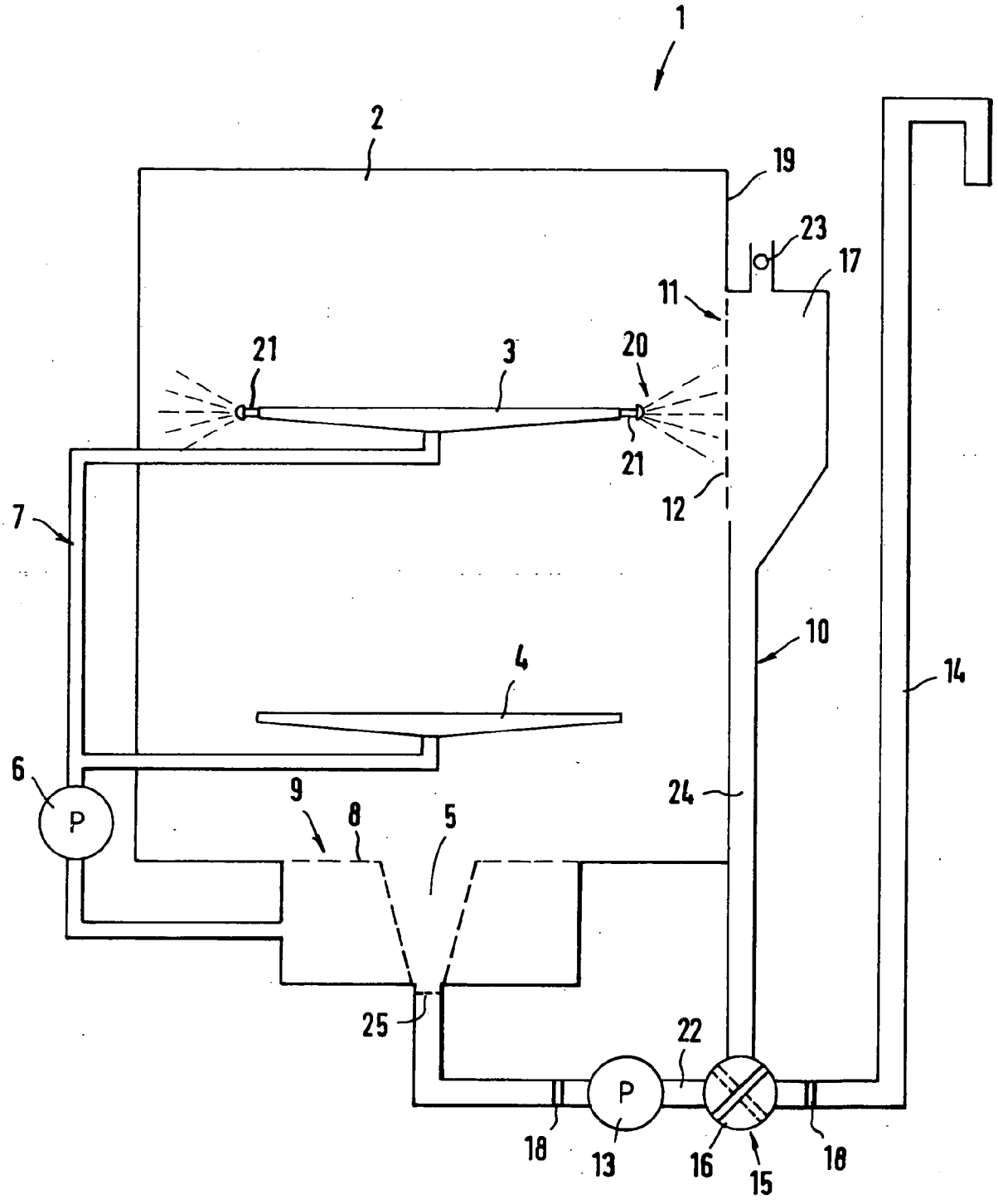


FIG. 1

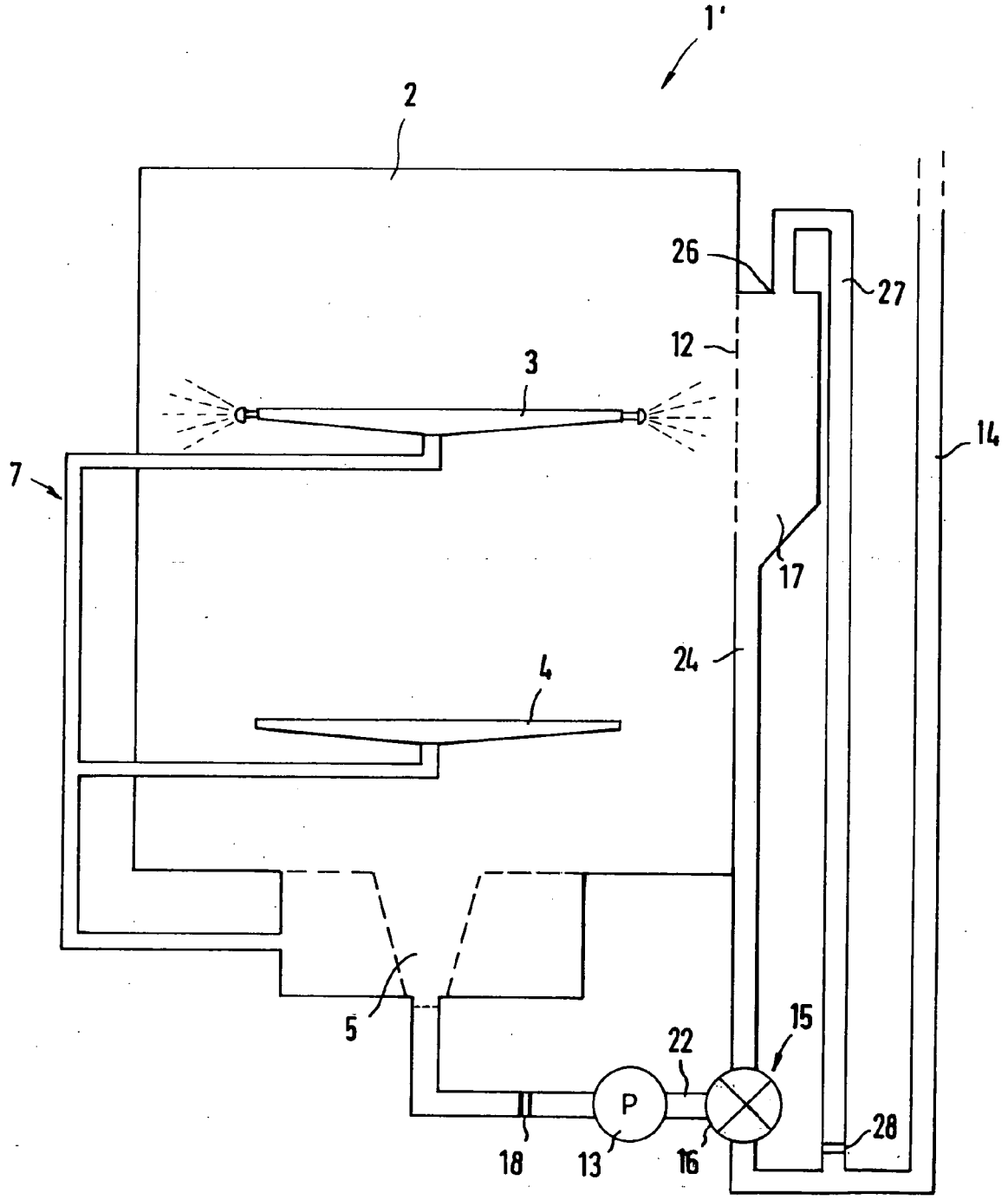


FIG. 2

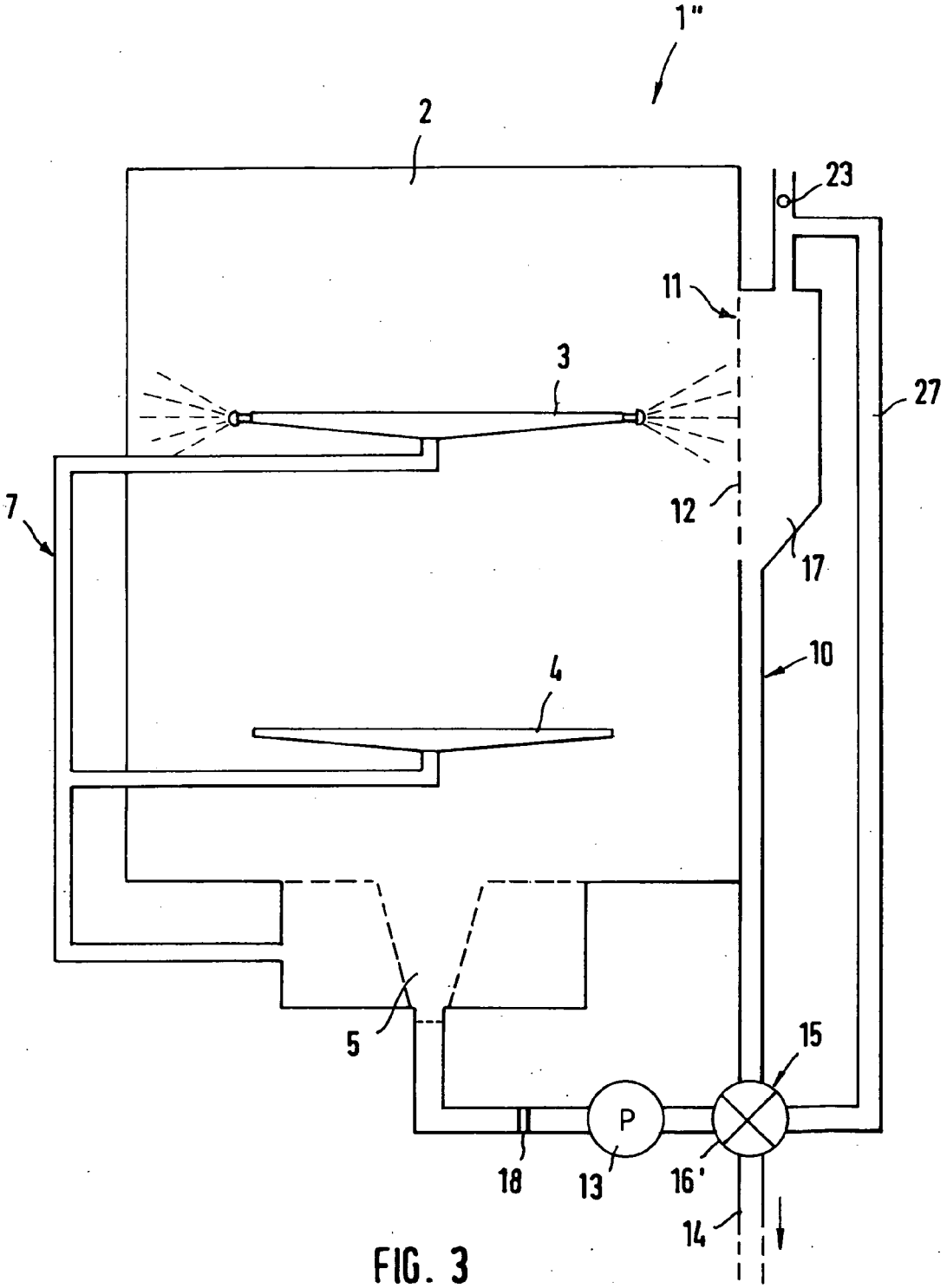


FIG. 3

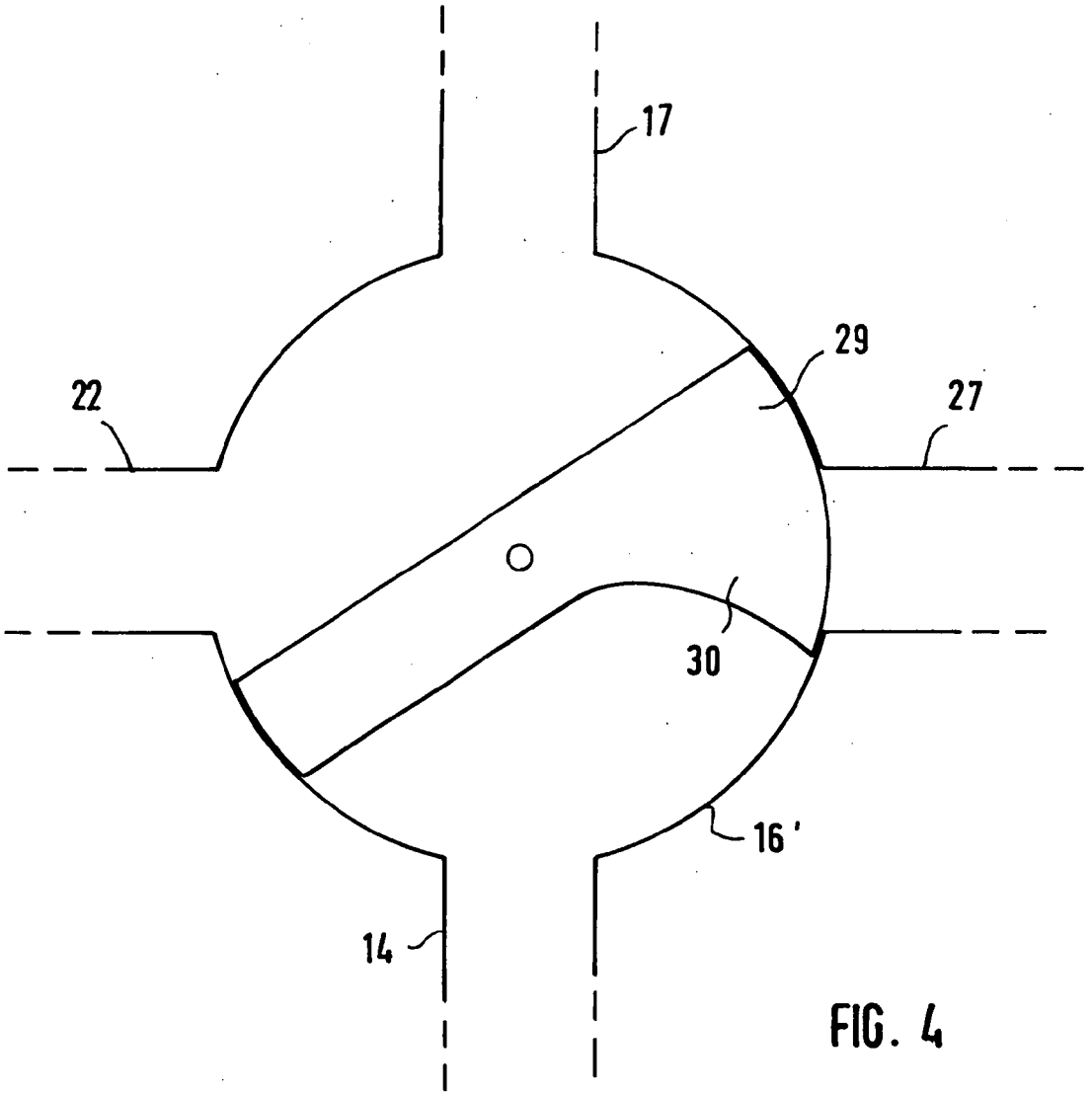
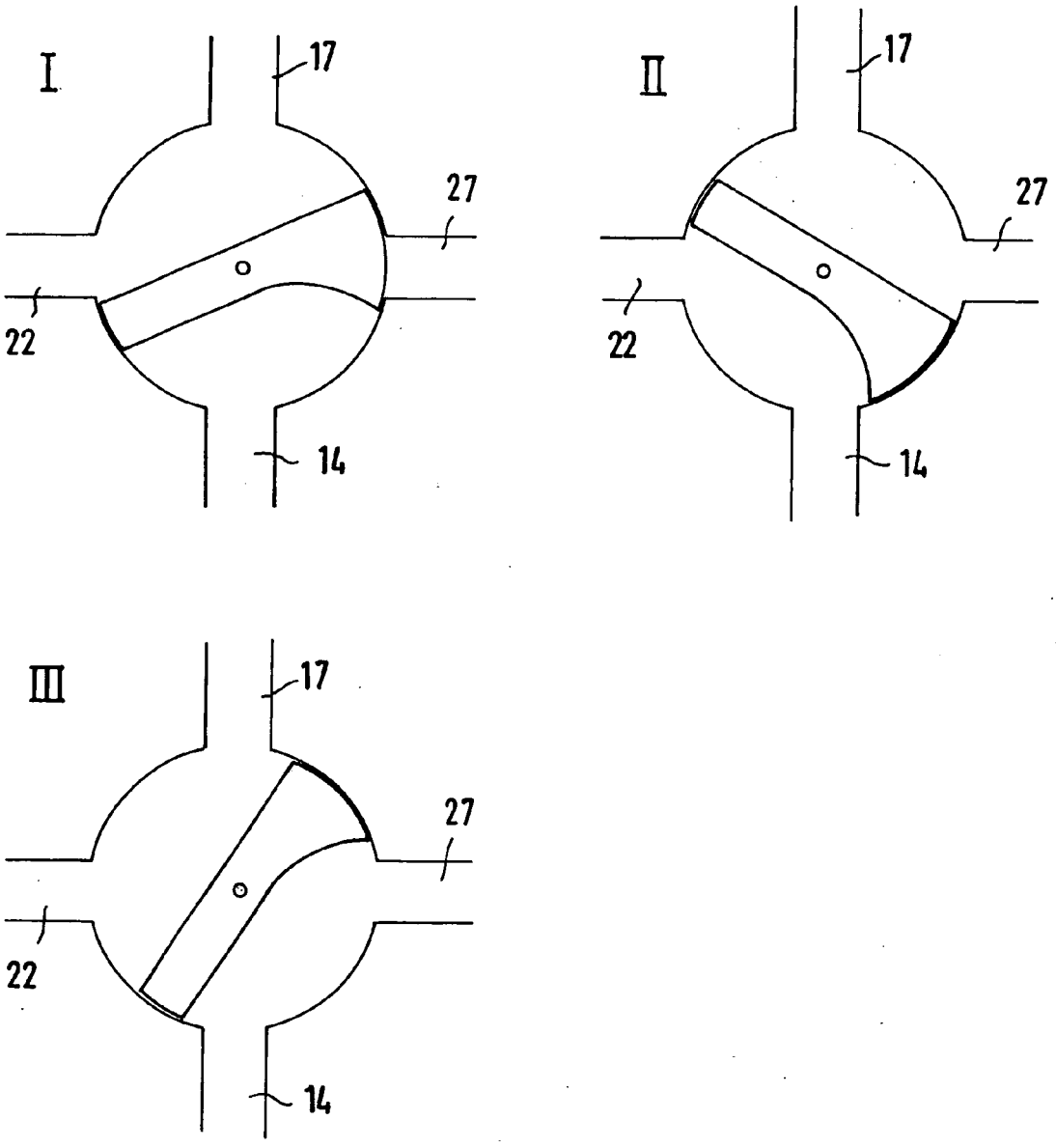


FIG. 4

FIG. 5



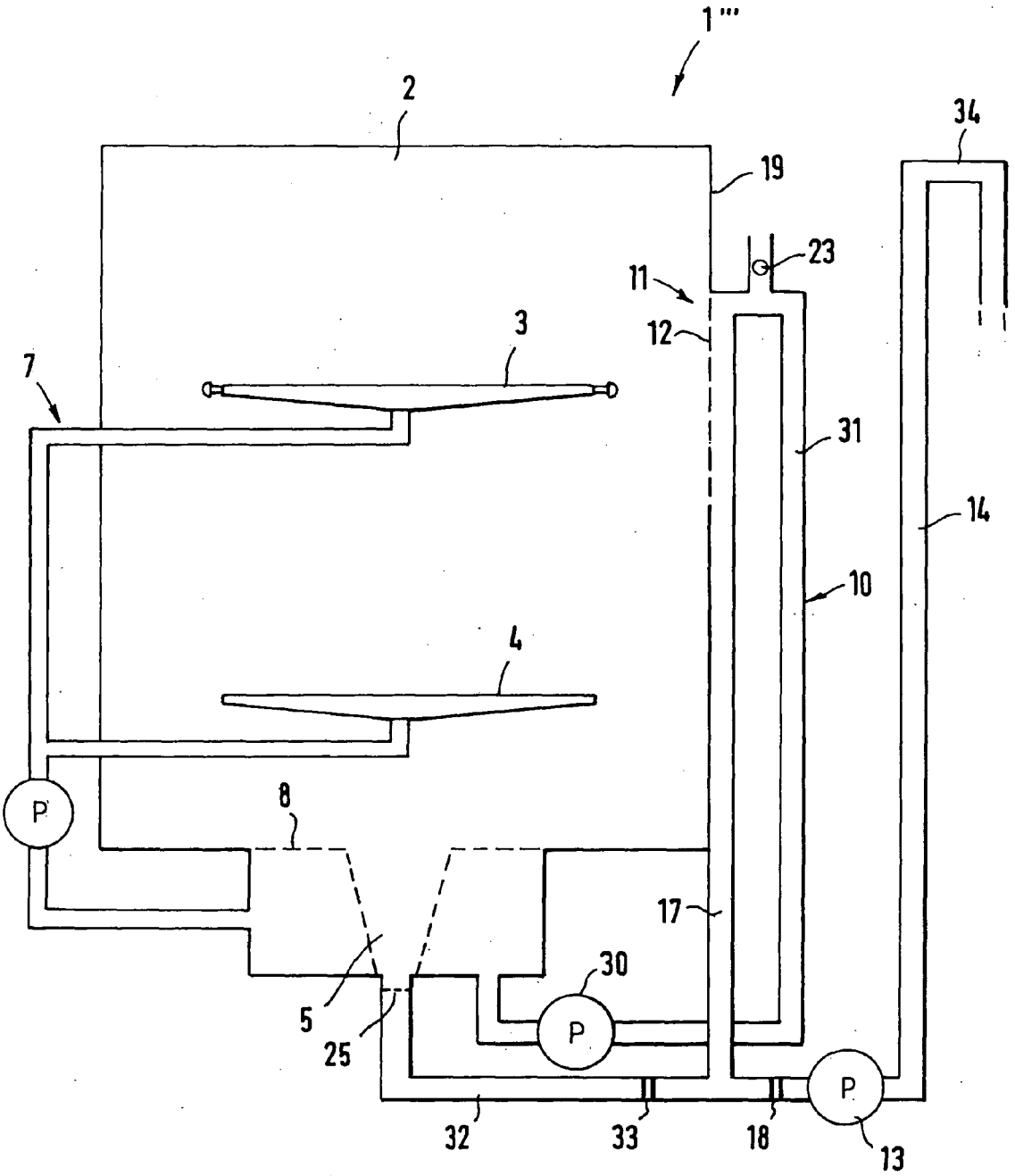


FIG. 6

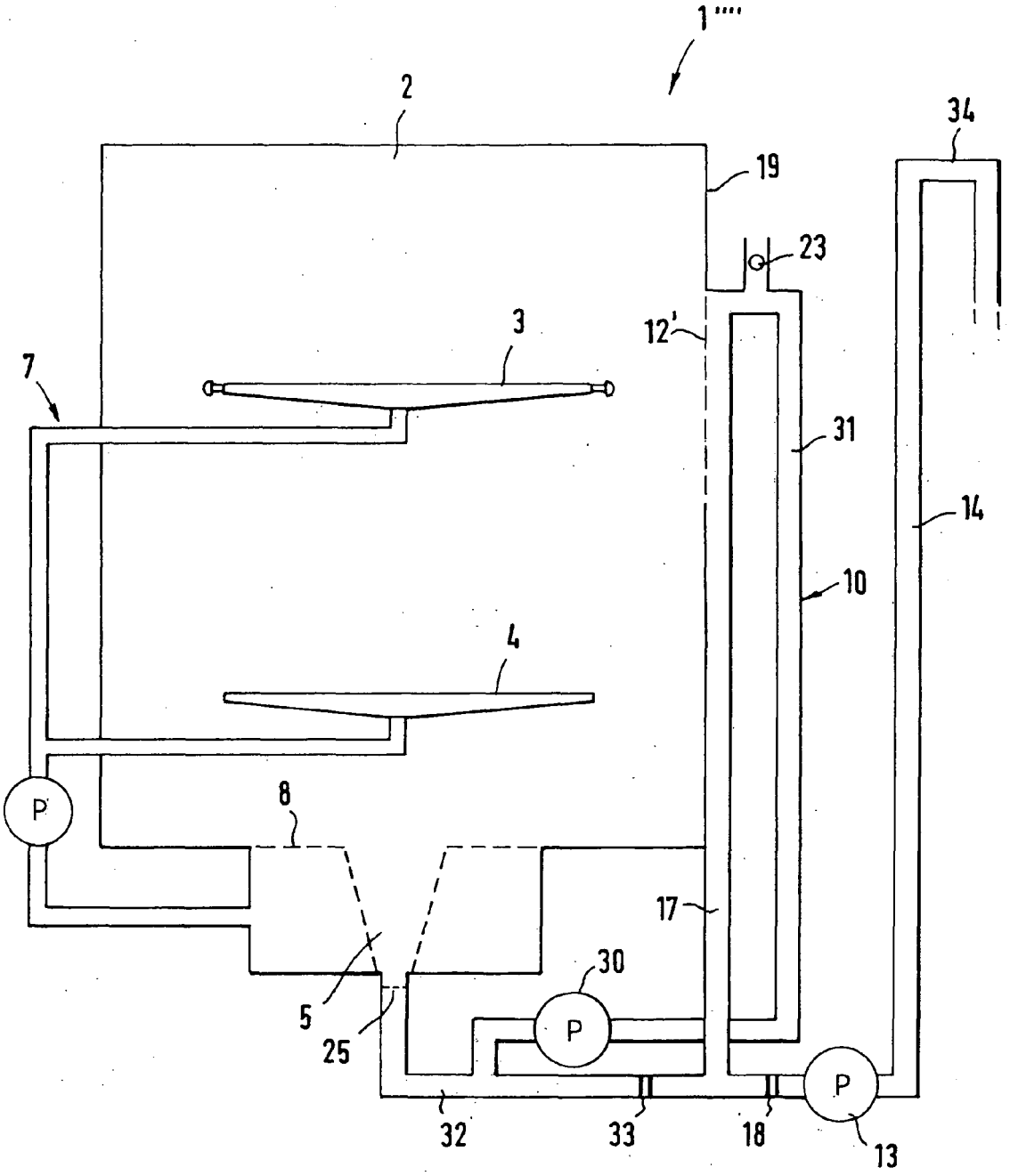


FIG. 7

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 01 5582

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 0 990 413 A (CANDY SPA [IT]) 5 April 2000 (2000-04-05) * the whole document * -----	1-4, 6-13, 19-21	INV. A47L15/42

TECHNICAL FIELDS SEARCHED (IPC)

A47L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	9 January 2008	Courrier, Gilles

CATEGORY OF CITED DOCUMENTS

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09-01-2008

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0990413 A	05-04-2000	DE 69820625 D1	29-01-2004
		DE 69820625 T2	11-11-2004

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82