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(54) In-line pumping unit

(57) The pumping unit (10) is usable in liquid distribution systems and comprises an electric pump (12) of submerged or submersible type inserted in a booster (14) provided with an inlet port (30) and an outlet port (28) for the liquid, both (30, 28) being located at that end of the booster (14) closer to the electric pump (12) delivery, and being mutually opposite and aligned (along 36).

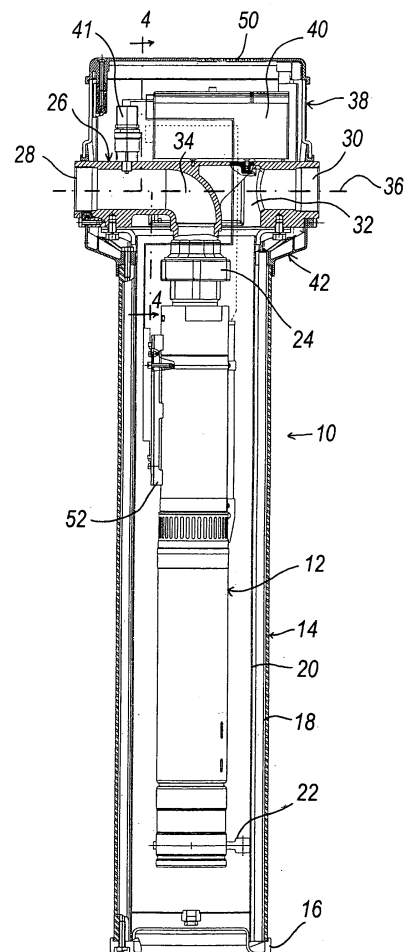


FIG. 3

Description

[0001] The present invention relates to a pumping unit usable in liquid distribution systems, such as drinking water distribution systems, fire-fighting systems, garden or agricultural irrigation systems and vehicle wash systems.

[0002] For the aforesaid uses electric pumps of so-called surface type are currently used. These electric pumps present various drawbacks. In particular, their electric motor is provided with a cooling fan which is particularly noisy and can disturb those in the vicinity of the room in which these pumps are located. Moreover, for evident reasons the said room has to be aerated, hence non-aerated rooms cannot be used. Again, these pumps require a bed on which they are fixed. A further drawback derives from the fact that the electric motor is provided with so-called pre-lubricated bearings which, however, after a determined time period have to be replaced.

[0003] Electric pumps of the aforesaid type are known having an intake port and a delivery port positioned coaxially one opposite the other (i.e. "in line"), hence these pumps can be inserted directly into a straight pipe without using elbow connectors.

[0004] Submerged electric pumps in which the motor does not require a cooling fan have also been known for some time. For this reason they are considerably less noisy than surface electric pumps, and do not require aeration or maintenance. However they have to be located in a sump or be kept immersed in the liquid to be pumped.

[0005] It is also known to encase a submerged electric pump in a so-called booster, i.e. a pipe piece acting as a container for the liquid in which the pump has to be immersed. The booster is vertical and needs a suitable bed. The liquid inlet is directed horizontally and lies in the lower part of the booster, while the outlet is provided at its upper end and is directed vertically. In this case it is evidently not possible to mount the booster in line with the relative submerged pump.

[0006] Arrangements are known in which the booster is disposed horizontally, supported by suitable saddles or support rings. The liquid inlet and outlet are provided mutually coaxial at the two ends of the booster, so that in this case in-line mounting is possible. There remains however the drawback of the need for suitable supports and the fact that the booster has a horizontal size equal to its length.

[0007] The object of the present invention is to provide a pumping unit which is decidedly less noisy than conventional surface pumps, can be located in non-aerated rooms, does not require a bed or support, can be mounted "in-line", and virtually requires no maintenance.

[0008] This object is attained by the pumping unit of the present invention, comprising an electric pump of submerged or submersible type inserted in a booster provided with an inlet port and an outlet port for the liquid, these two ports both being located at that end of the booster closer to the electric pump delivery, they facing

opposite directions and being aligned.

If the booster is disposed vertically, its lower end is conveniently shaped to be able to rest directly on any floor, hence eliminating the need for a specific bed or other support. However the booster can evidently be disposed horizontally if this is preferable. Such an arrangement would require a support only at that end of the booster opposite that in which the inlet and outlet ports are present.

[0009] Preferably the booster comprises a double jacket with the two jackets spaced apart. The space between the two jackets can be filled with a sound-absorbent material.

[0010] From the foregoing it is already apparent that the invention provides a pumping unit which can be mounted directly "in-line", is extremely silent and, if the booster is vertical, is of minimum plan dimensions. Known pumping units do not enable all these results to be obtained simultaneously.

[0011] The invention will be more apparent from the ensuing description of one exemplifying embodiment thereof. In this description reference will be made to the accompanying drawings, in which:

Figure 1 is an elevation of a pumping unit of the present invention, shown in "in-line" installation;

Figure 2 is a partly cut-away plan view from above showing the pumping unit alone;

Figure 3 is a vertical section therethrough on the line 3-3 of Figure 2;

Figure 4 is a partial vertical section therethrough on the line 4-4 of Figure 3;

Figure 5 is a plan view of a pumping assembly formed from a determined number of modular pumping units identical to that of the preceding figs;

Figure 6 is an elevation of the pumping assembly in the direction of the arrow 6 of Figure 5.

[0012] As can be seen from Figures 1-4, the pumping unit 10 comprises a conventional submerged electric pump 12 (Figure 3) positioned coaxially within a booster 14. This latter has an overall parallelepiped shape with a support foot 16 which closes its lower end.

[0013] As can be seen from Figure 1, specific supports or a bed are not required for the pumping unit 10 as it is simply rested on a floor 54, it being maintained in position by the pipe 55 in which it is inserted "in-line". Even in the case of the pumping assembly of Figures 5 and 6, it is sufficient simply to rest the various pumping units 10 directly on the floor 54, the connectors 56 and 58 plus the system headers 62 and 64 (provided with their supports 60) then being sufficient to maintain the individual units 10 in position.

[0014] The lateral wall of the booster comprises two jackets, of which the outer 18 is for example of anodized duralumin and the inner 20 is of stainless steel. The interspace between the two jackets 18 and 20 can be filled with a conventional sound-absorbent material, although

good silencing levels are already obtained even if the interspace is empty (i.e. containing air). From Figure 3 it can be seen that an anti-vibration ring 22 is fixed to the internal jacket 20 to retain the lower end of the electric pump 12, the rest of which is suspended by a connector 24 from a headpiece indicated overall by 26 and fixed by screws to a connector element 42, itself fixed by screws to the top of the booster 14. The headpiece 26 comprises, in one piece therewith, both the inlet port 30 and the outlet port 28, with the relative connection channels.

[0015] With the electric pump 12 in operation, the liquid entering from the inlet port 30 flows through the inlet channel portion 32 which deviates it downwards, so that the liquid flows between the outer lateral surface of the electric pump 12 and the inner lateral surface of the booster 14, reaching the lower end of the electric pump 12, to be then drawn through its intake port and leave through the said delivery connector 24, to flow through the outlet channel 34 which deviates the liquid in a horizontal direction until it leaves from the outlet port 28. As can be seen, the inlet port 30 and the outlet port 28 are aligned on the same axis 36 and opposite to each other, forming (considering that the electric pump is vertical) a T-shaped path of the liquid. This enables the pumping unit 10 to be directly inserted into a pipe without having to provide connection bends.

[0016] In the specific example illustrated, the pumping unit 10 also comprises a control unit indicated overall by 44 located below the headpiece 26. The control unit 44 comprises an electronic card 46 and a display 48, all enclosed in a casing 38 provided with a removable cover 50. The casing 38 also contains an inverter 40 supported by the headpiece 26 and connected to a pressure transducer 41. This latter enables the delivery pressure to be measured and a signal to be fed to the inverter 40 to regulate the operation of the motor of the electric pump 12, this enabling electrical energy to be saved.

[0017] The unit 10 also comprises a level sensor 52 preventing the electric pump 12 from operating under dry conditions.

From Figures 1-4 and from the preceding description it will be apparent that, in addition to the aforespecified advantages, the pumping unit 10 is very compact, is of very small overall plan dimensions, and presents a "clean" appearance, and in any event a decidedly more acceptable appearance than known pumping units with the same type of use.

[0018] The pumping unit 10 can represent a modular unit with which the said pumping assembly shown in Figures 5 and 6 can be formed, and which in this specific example comprises five pumping units 10 and relative connectors 56 and 58, with the two headers 62 and 64. This arrangement makes it possible to provide a pilot pumping unit and arrange that, if this latter develops a fault, another pumping unit of the assembly automatically takes over as the pilot. The number of pumping units can obviously be different, according to specific requirements and design choices.

Claims

1. A pumping unit (10) usable in liquid distribution systems, comprising an electric pump (12) of submerged or submersible type inserted in a booster (14) provided with an inlet port (30) and an outlet port (28) for the liquid, both (30, 28) being located at that end of the booster (14) closer to the electric pump (12) delivery, and being mutually opposite and aligned (along 36).
2. A pumping unit (10) as claimed in claim 1, wherein the booster (14) is disposed vertically and has its lower end (16) shaped to be able to rest directly on a floor (54).
3. A pumping unit (10) as claimed in claim 1, wherein the booster (14) comprises a double jacket, the two jackets (18, 20) being spaced apart.
4. A pumping unit (10) as claimed in claim 3, wherein the interspace between the two jackets (18, 20) is filled with a sound-absorbent material.
5. A pumping unit (10) as claimed in claim 4, wherein the outer jacket (18) is of aluminium.
6. A pumping unit (10) as claimed in claim 4, wherein the inner jacket (20) is of stainless steel.
7. A pumping unit (10) as claimed in claim 1, wherein the booster (14) is of overall parallelepiped shape.
8. A pumping unit as claimed in claim 2, wherein an anti-vibration ring (22) is fixed to the inner jacket (20) to retain the lower end of the electric pump (12).
9. A pumping unit (10) as claimed in claim 2, wherein the electric pump (12) is suspended from a headpiece (26) fixed to the top of the booster (14), in the headpiece (26) there being provided in one piece therewith both the inlet port (30) and the outlet port (28), with the relative connection channels (32, 34).
10. A pumping unit (10) as claimed in claim 9, wherein a control unit (44) is provided.
11. A pumping unit (10) as claimed in claims 9 and 10, wherein the control unit (44) is located above the headpiece (26).
12. A pumping unit (10) as claimed in claim 10, wherein the control unit (44) comprises an electronic card (46) and a display unit (48).
13. A pumping unit (10) as claimed in claim 10, wherein a pressure transducer (41) and an inverter (40) are provided, the pressure transducer (41) being ar-

ranged to measure the delivery pressure and to feed a signal to the inverter (40) to hence regulate the operation of the motor of the electric pump (12).

14. A pumping unit (10) as claimed in claim 13, wherein the inverter is supported by the headpiece (26). 5
15. A pumping unit (10) as claimed in claim 2, wherein a level sensor (52) is provided connected to the control unit (44) to prevent the electric pump (12) from operating under dry conditions. 10

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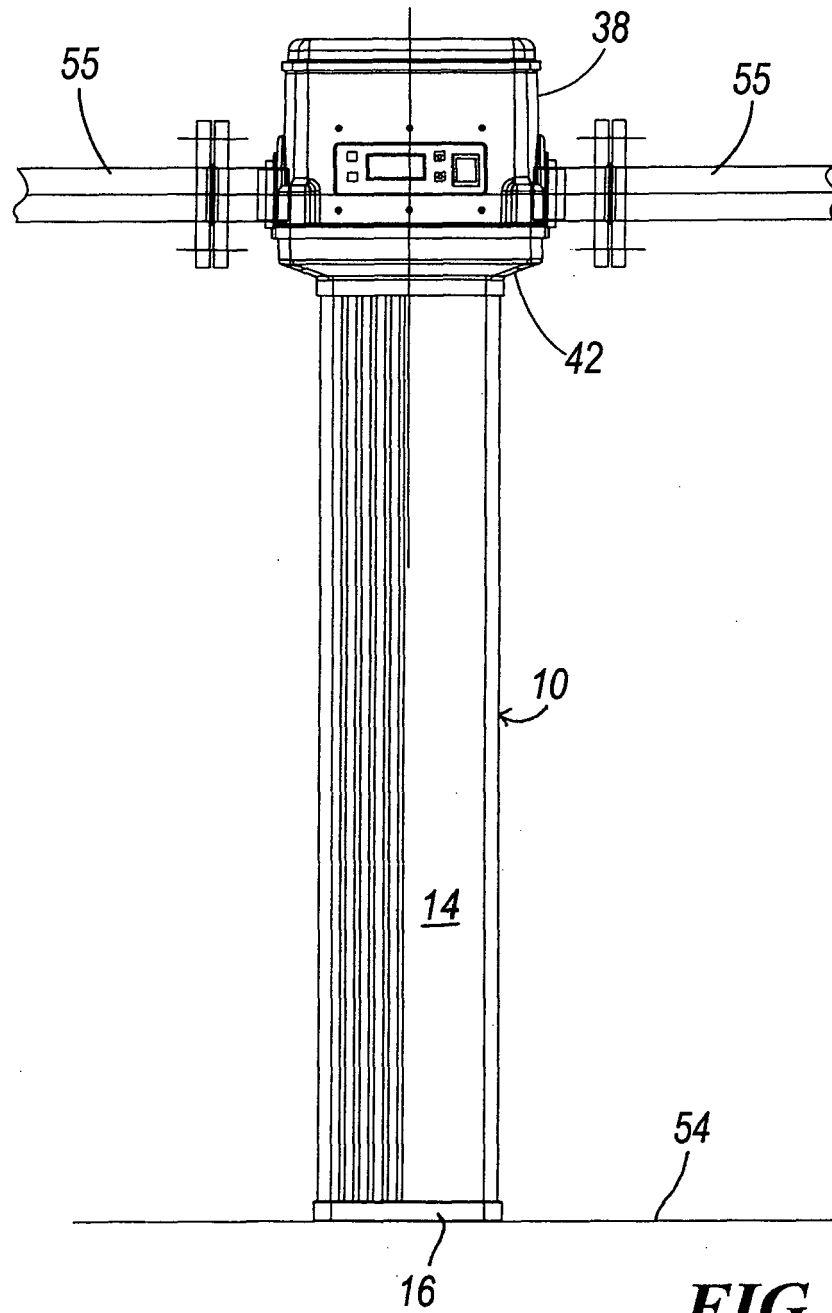


FIG. 1

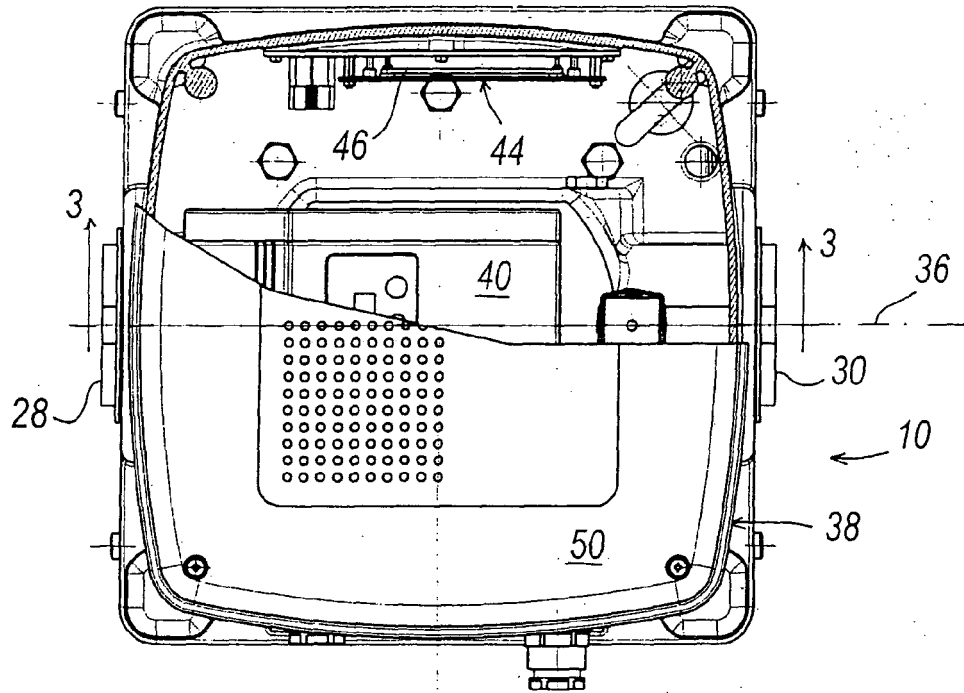


FIG. 2

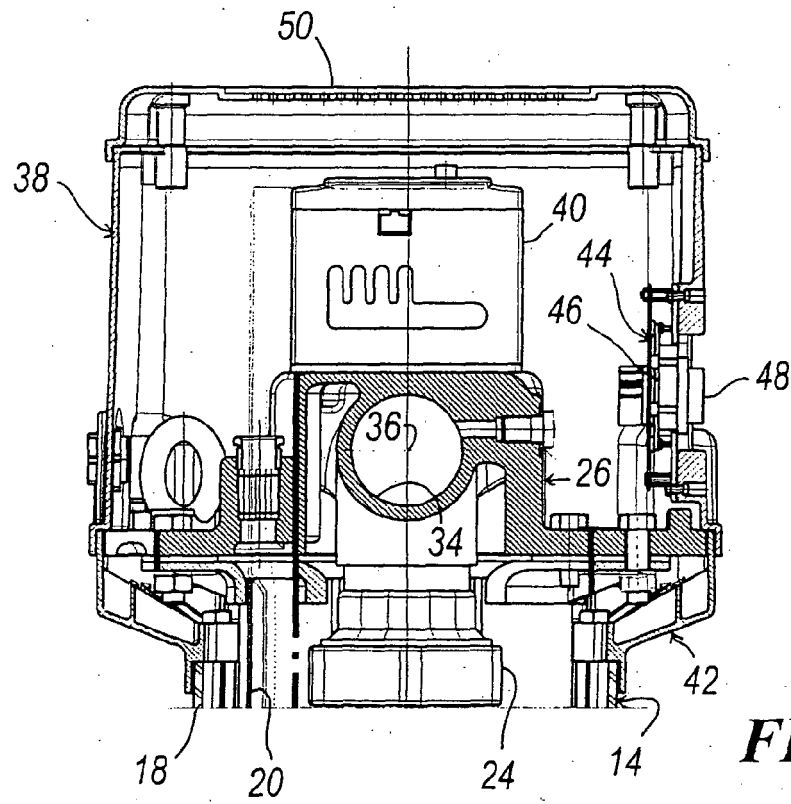


FIG. 4

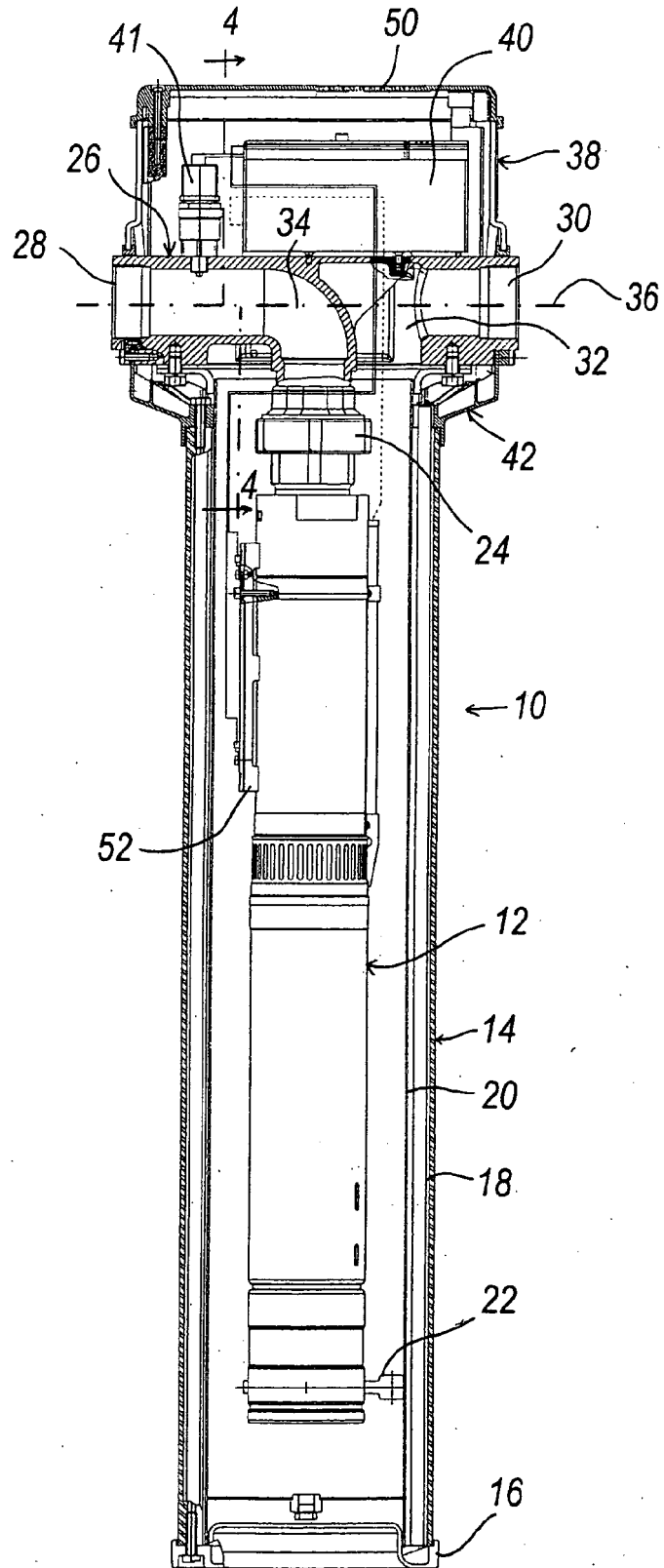


FIG. 3

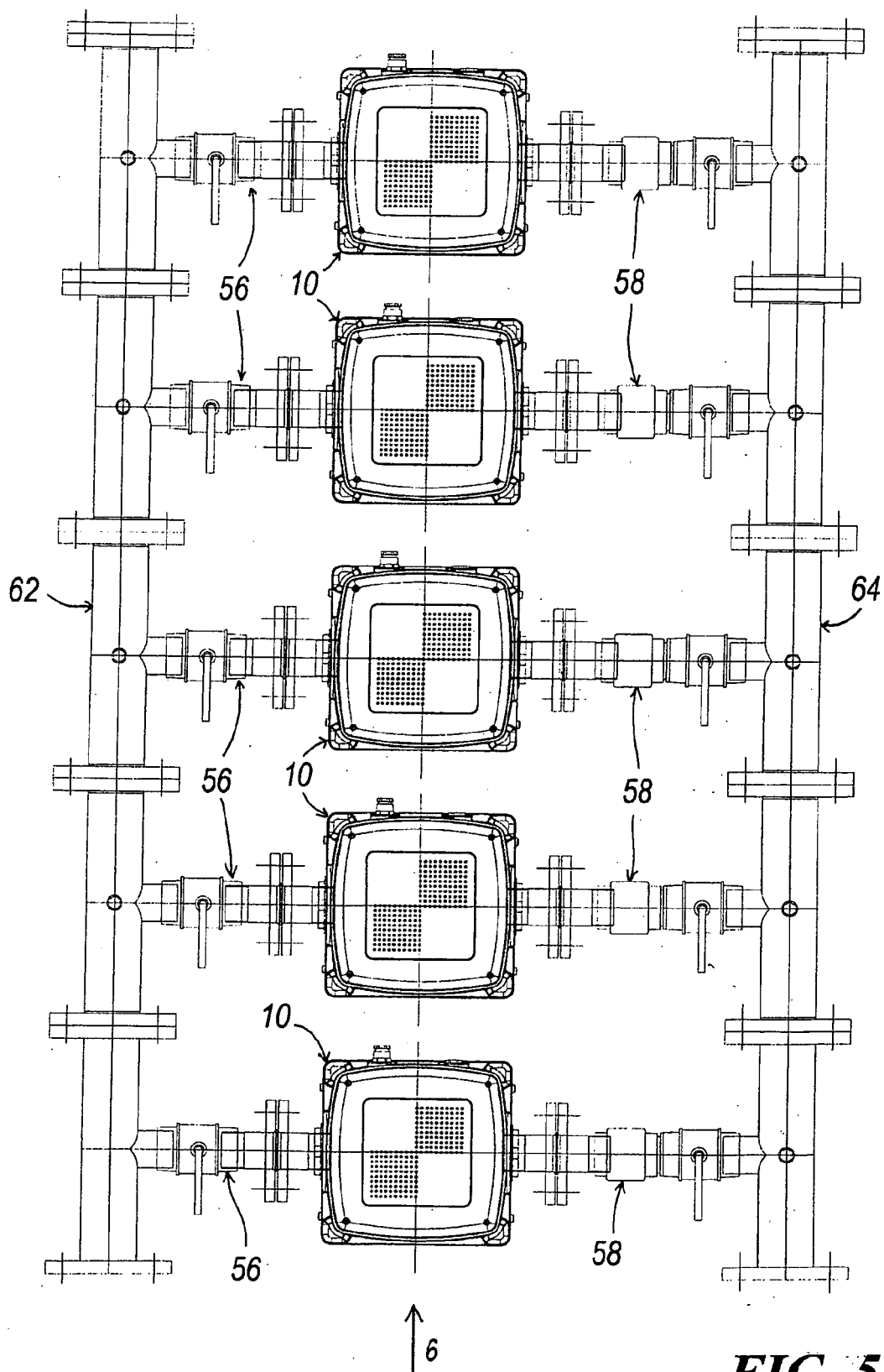


FIG. 5

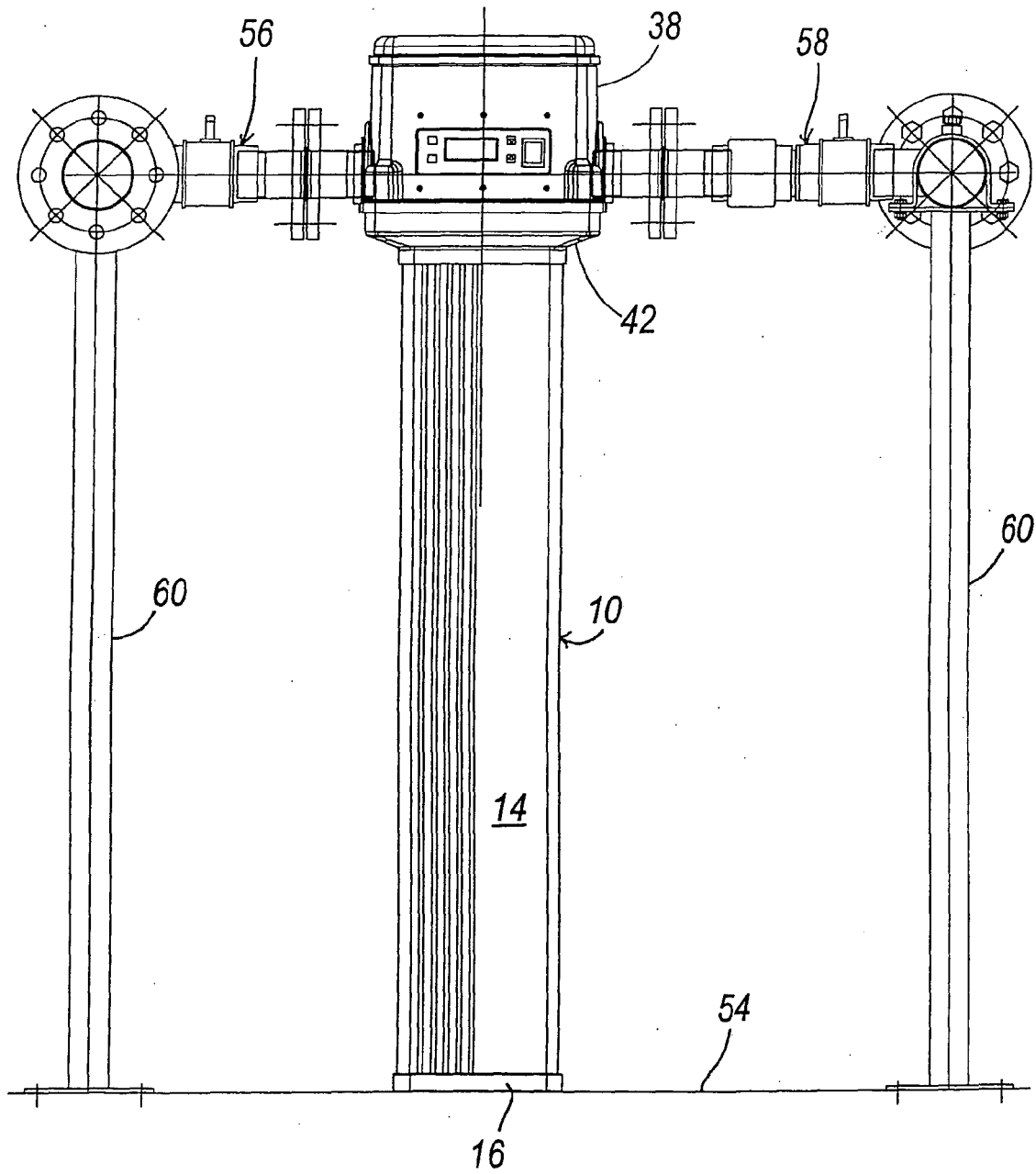


FIG. 6



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 00 9879

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 23 September 2005	Examiner Ingelbrecht, P
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 05 00 9879

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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