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(54) **Procedure and means in collecting comestible liquids.**

(57) The invention concerns a procedure in collection of comestible liquids and particularly in milk collection with the aid of tank lorries from milk producers. The comestible liquid is conducted through a suction tube or equivalent to an air separator, where the air in the comestible liquid is separated, and from the air separator (9) the comestible liquid is conducted to a metering device (18), which meters the quantity of comestible liquid that has been caused to flow. The comestible liquid is then conducted along a passage (16) to a tank (1). In the procedure of the invention the comestible liquid is caused to flow from the air separator (9) to the volumetric metering device (18) along the flow line (16) without any pump means inserted in said flow line (16). The flow of comestible liquid in said flow line (16) is controlled with the aid of a valve means (14) inserted in said flow line (16) in a manner known in itself in the art, the liquid level height of the comestible liquid in the air separation tank (9) having been arranged to control said valve means. The invention also concerns apparatus applying the procedure.

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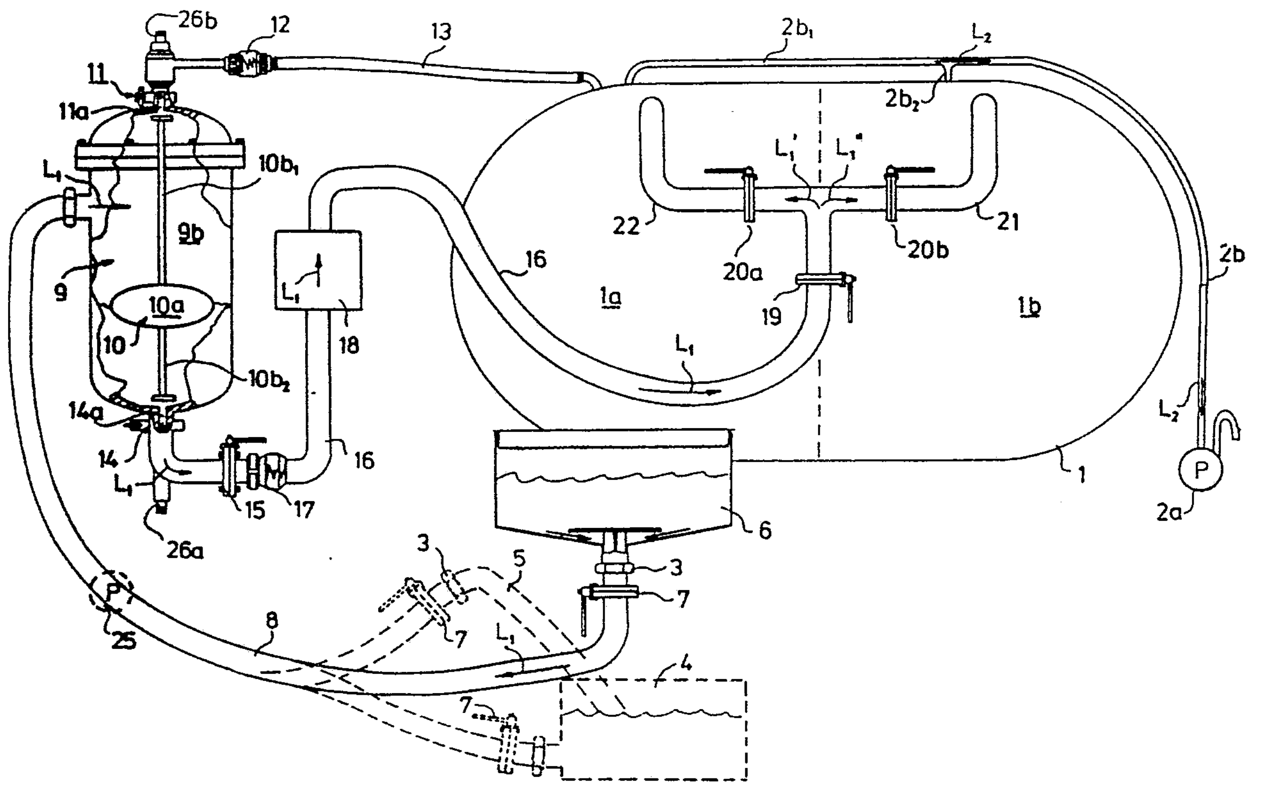
Fig. 1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Procedure and means in collecting comestible liquids

The present invention concerns a procedure in collecting comestible liquids, particularly in milk collection from milk producers effected with the air of tank lorries, in said procedure the comestible liquid being conducted through a suction tube to an air separator, where the air present in the comestible liquid is separated, and from said air separator to a metering means which meters the quantity of comestible liquid that is caused to flow through.

The invention also concerns a means for implementing the procedure.

Through the Finnish Patent No. 64789 are known a metering procedure and apparatus employed in milk collection with the aid of tank cars in which an air separator is used, and therein a separate float arrangement for controlling the operation of a pump means disposed in relation to the air separator before same. Through the Finnish patent application No. 850640 is known a float governor employed in the air separator, and a separate exit valve arrangement. In the above-mentioned apparatus designs of prior art, the pump means has been disposed to be located between the air separation tank and the liquid collection tank. Any design of this type usually requires a complicated and expensive control system to control/stop the pump.

The object of the present invention is to provide a procedure and means which enable comestible liquids to be conducted from the air, separation tank to the volumetric metering device in a simple, yet reliable, manner. One of the aims of the invention is a procedure and means in which separation of air from the comestible liquid, e.g. from milk, can be implemented in a simple yet reliable manner, and in which starting and termination of metering can be accurately performed.

The procedure of the invention is mainly characterized in that the comestible liquid is caused to flow from the air separator to the metering device along a flow line without any pump means inserted in said flow line, and that the flow of comestible liquid in said flow line is controlled with the aid of a valve means inserted in a manner known in itself in the art in said flow line, the level of the comestible liquid in the air separation tank having been arranged to control said valve means.

The means of the invention is mainly characterized in that the means has been disposed to cause flow of the comestible liquid from the air separator to the volumetric metering device along a flow line without any pump means inserted in said flow line, and that the flow of comestible liquid in said flow line is controlled with the aid of a valve means inserted in a manner known in itself in the art in said flow line, the level of the comestible liquid in the air separation tank being arranged to control said valve means.

The invention is described in the following, referring to certain advantageous embodiments of the invention, presented in the figure of the drawing, but to which the invention is not meant to be exclusively confined.

In the figure is depicted an apparatus according to the invention, in elevational view and in part - schematically, and partly in sectional projection.

In the figure has been indicated with reference numeral 1, a tank in which the comestible liquid is collected. The tank 1 is advantageously a vacuum tank in which vacuum is produced with the aid of a vacuum pump 2a. The punp 2a has been disposed to produce vacuum along the passage 2b. The tank 1 may advantageously be bipartite, comprising parts 1a and 1b, in which different liquid are collected. In that case the pressure line 2b connecting with the pump 2a will branch off to tank 1a as well as tank 1b by the branches $2b_1$ and $2b_2$. The suction tube 8 is attached with a connector 3 to a tank 4, to a suction pipe 5 or to a pouring funnel 6. The suction tube connects at the other end with the air separator 9.

The air separator 9 comprises a control means 10, advantageously consisting of a float 10a and of shut-off parts $10b_1$ and $10b_2$ therewith connected. In the upper part of the air separator 9 is located a venting valve 11, a pressure limiting valve 12 being installed in the passage 13 connecting therewith. The air is disposed to go through the pressure limiting valve 12 to the tank 1, along the passage 13.

A valve means 14 is located in the lower part of the air separator 9. A float 10a with its shut-off member $10b_2$ has been disposed to close and open the valve means 14, its valve aperture 14a. The liquid is caused to flow further through a shut-off valve 15 and along a passage 16 to the tank 1. In the passage 16 has been inserted a liquid quantity metering means 18. The passage 16 branches, close to the tank 1, to form passages 21 and 22, and it is thus possible to make comestible liquid flow along the passage 16 either into the tank compartment 1a by the passage 22 when the shut-off valve 20b is closed and the shut-off valve 20a is open (arrow L_1'), and when the valves are in opposite positions, comestible liquid may be caused to flow along the passages 16 and 21 to the tank compartment 1b (arrow L_1''). The passage 16 has, in addition to the shut-off valve 15, also a shut-off valve 19 at the passage end adjacent to the tank 1.

The check valve 17 prevents back flow of liquid from the tank 1 to the separator 1. The pressure limiting valve 12 in the flow line 13 between the venting valve 11 and the tank 1 has the effect that there is sufficient gas pressure in the air separator 9 for the liquid from the air separator 9 to flow always to the tank 1.

The float means 10, its shut-off member $10b_1$, has been disposed to open, respectively close, the valve aperture 11a of the valve 11. When liquid is flowing along the passage 8 to the air separator 9, the float 10a assumes a position consistent with the level of the liquid that is caused to flow in. When the liquid rises in the separator 9, the separator part 10 ascends and the shut-off member $10b_2$ goes into a position in which liquid flow along the passage 16 to the tank 1 is permitted. As the liquid level rises in the air separator 9, the float 10a therefore controls the valve 14 in such manner that it is fully opened when the liquid level in the air separator 9 reaches the highest level. Similarly, the operation of the venting valve 11 is controlled with the aid of the float 10a in such manner that when the liquid reaches the highest level in the separator 9 the venting valve 11 is closed, the shut-off member $10b_1$ of the control means 10 closing the valve aperture 11a. When the liquid level goes down again from its highest level, the venting valve 11 opens fully, and passage of air from the air separator to the tank 1, and in the embodiment indicated with solid lines in the figure advantageously to the vacuum tank, is then enabled. It is however, in this instance, a prerequisite for air flow that the pressure limiting valve 12 opens. It is thus understood that with said pressure limiting valve 12 compensation is effected for the hydrostatic differential pressure between the liquid levels in the air separator 9 and the comestible tank 1, and the liquid is in all and any circumstances in connection with collection caused to flow from the separator 9 to the tank 1. This arrangement also has the effect that the liquid is always caused to flow in the first place through the valve means 14 when this valve means is open.

In another advantageous embodiment of the means of the invention, the tank 1 is a normal tank. The comestible liquid is caused to flow with the aid of a pump means 25 inserted e.g. in the tube 8, not by suction effect of the vacuum in the tank 1. However, the operation, and instrumentation, of the apparatus is equivalent to that in the vacuum tank embodiment, except that in connection with the tank 1 no apparatus producing tank vacuum is needed and the flow line 13 should not connect with the tank 1, instead of which it may open into free atmosphere after the pressure limiting valve 12.

The control means 10 may in one embodiment consist of a means observing the liquid level, e.g. of a float which produces signals opening and/or closing the valves 11 and/or 14 and/or 12; said signals may advantageously be, for instance, electrical control signals or pneumatic signals.

In a first embodiment of the procedure of the invention, a vacuum is drawn (arrow L_2) in the tank 1 with the pump 2a. The vacuum is advantageously one of 0.4 to 0.6 bar. In a tank lorry design, the drive engine of the vehicle may serve as vacuum means 2a. Air is drawn from the tank 1, and thereby a vacuum created therein, by throttling the vehicle's intake air port in a manner known in itself in the art. When there is sufficient vacuum in the tank 1, the actual metering of liquid that is being collected is commenced. The connector 3 of the suction tube 8 is connected either to a tank 4, to a suction pipe 5 or to a pouring funnel 6, or to another container containing liquid which is to be metered and collected. The valve 7 is next opened, and liquid will start to flow through the suction tube 8 or equivalent to the air separator 9 because lower pressure prevails there. The air which has separated in the air separator 9 flows, guided by a control means 10, advantageously a float 10a, through the venting valve 11 and further through the pressure limiting valve 12, along the flow line 13, to the tank 1. The liquid level begins to rise in the air separator 9. The float 10a slowly opens the valve means 14, whereby the liquid is allowed to flow further when the shut-off valve 15 is open, therethrough and through the check valve 17 and along the pipe system 16 or equivalent to the meter 18, which meters the comestible liquid quantity that has been made to flow into the tank 1. The flow of comestible liquid has been indicated with arrows L_1.

When the liquid level rises in the air separator 9, the float 10a with its shut-off part $10b_2$ controls the valve 14 and opens it fully and ultimately controls the venting valve 11 to be fully closed, doing this with the aid of the shut-off part $10b_1$. Likewise, after separation of the air from the liquid the liquid level goes down in the air separator 9 and the float 10 opens the air venting valve 11 and closes the valve 14 accordingly as the liquid level descends in the air separator 9. Finally, the valve 14 closes completely and the liquid level comes to rest at a level which is always the same in view of the measuring volume. Therefore the same characteristic volume of liquid remains in the apparatus in every instance. Moreover, when the apparatus is being drained of liquid, the valve 14 and the venting valve 11 may be secured in their fully open positions with the aid of screws 26a and 26b, and the same can be done in conjunction with circulatory washing.

As taught by the invention, the liquid flow from the air separator 9 to the metering device 18 is controlled by mediation of the liquid level sensing means 10 in the air separator 9 in such manner that when the liquid level tends to go down in the air separator the valve 14 is throttled, and when the liquid level rises the valve 14 is opened more. The metering device 18 meters the liquid quantity caused to flow through the device 18. Likewise, the same liquid level and float, or another float, is used to open and close the venting valve 11 so that when the liquid rises in the air separator 9 the valve 11 is closed as soon as the level has reached the highest operating level, and similarly it is opened when the liquid level descends from its highest level. In the procedure of the invention a pressure is established with the aid of the pressure limiting valve 12 in the air separation tank 9, in the air separation volume 9b, such that the liquid has been arranged to flow from the air separator 9 always towards the tank 1. This purpose is also served by the check valve 17, which only permits flow in the direction towards the tank 1.

In the other embodiment of the procedure of the invention the pressure causing liquid flow is produced with the aid of a means 25, advantageously disposed in the suction tube 8, and thus on the intake side of the air separator 9. In this case no vacuum is produced in the tank 1; the flow is instead exclusively produced with the means 25, advantageously a pump.

Claims

1. A procedure in collection of comestible liquids, particularly in milk collection with the aid of tank lorries from milk producers, wherein the comestible liquid is conducted through a suction tube (8) or equivalent to an air separator (9), where the air in the comestible liquid is separated, and from the air separator (9) to a metering device (18), which meters the quantity of comestible liquid that has been caused to flow, characterized in that the comestible liquid is caused to flow from the air separator (9) to the metering device (18) along a flow line (16) without any pump means inserted in said flow line (16), and that the flow of comestible liquid in said flow line (16) is controlled with the aid of a valve means (14) inserted in said flow line (16) in a manner known in itself in the art, the liquid level height of the comestible liquid in the air separation tank (9) having been arranged to control said valve means.

2. Procedure according to the preceding claim, characterized in that the flow is established with the aid of vacuum.

3. Procedure according to claim 1, characterized in that the flow is established with the aid of a pump means disposed on the intake side of the air separator (9).

4. Procedure according to any one of the preceding claims, characterized in that the air separated in the air separator (9) is conducted through an air venting valve (11) further out of the air separator (9).

5. Procedure according to claim 2 or 4, characterized in that from the air separator (9) the air is voided to a collection tank (1), the vacuum in said collection tank (1) having been arranged to be transmitted to the separation space (9b) of the air separator (9).

6. Procedure according to any one of the preceding claims, charac terized in that air is separated in the air separator (9) with a control means (10) alternatingly opening and closing an air venting valve (11) and said valve means (14).

7. Procedure according to any one of the preceding claims, characterized in that for control means (10) is used a float means (10a) which is disposed to open and close the air venting valve (11) and/or the valve means (14).

8. Procedure according to any one of the preceding claims, characterized in that when the comestible liquid sinks in the air separator (9) to its lowest level the valve means (14) is controlled with the aid of the control means (10) in such manner that it closes fully, and when the liquid level rises in the air separator (9) the valve means (14) is controlled with the aid of the control means (10) in such manner that it opens and allows the liquid to flow into the tank (1).

9. Procedure according to any one of the preceding claims, characterized in that a pressure limiting valve (12) is used in the flow line (13) between the air separator (9) and the tank (1), with the aid of said valve the pressure prevailing in the air separator (9) being controlled for making the liquid flow in all and any collection circumstances from the air separator (9) to the tank (1).

10. A means used in a procedure according to any one of the preceding claims, comprising a collection tank (1) for comestible liquids, a suction tube (8) or equivalent for conducting the comestible liquid to an air separator (9), where the air in the comestible liquid is separated, and a metering device (18) disposed between the air separator (9) and the collecting tank (1), for metering the quantity of comestible liquid that has flown, characterized in that a means (1,25) has been arranged to cause flowing of the comestible liquid from the air separator (9) to the volumetric metering device (18) along a flow line (16) without any pump means disposed in said flow line (16), and that the flow of comest ible liquid in said flow line (16) is controlled

with the aid of a valve means (14) disposed in said flow line in a manner known in itself in the art, the liquid level height of the comestible liquid in the air separation tank (9) having been arranged to control said valve means.

11. Means according to the preceding claim, characterized in that there is a vacuum tank (1) which causes the flow of the comestible liquid.

12. Means according to claim 10, characterized in that there is a pump means (25) which has been disposed on the intake side of the air separator (9) in a suction tube (8) or equivalent and which causes the flow of the comestible liquid.

13. Means according to any one of the preceding claims 10-12, characterized in that the air separator (9) comprises means (10,11,14) for separating air from the liquid, the air being conducted through a venting valve (11) out of the air separator (9) and the liquid being conducted through said valve means (14) to a collecting tank (1).

14. Means according to any one of the preceding claims 10-13, characterized in that the air separator (9) comprises a control means (10) which has been arranged to open and close an air venting valve (11) and/or said valve means (14).

15. Means according to any one of the preceding claims 10-14, characterized in that the control means (10) comprises a float (10a) with a shut-off part ($10b_1$ and/or $10b_2$) for opening and closing the valves (11 and/or 14) when the float becomes positioned in accordance with the level of the liquid introduced in the air separator (9).

16. Apparatus according to any one of the preceding claims 10-15, characterized in that the means comprises a pressure limiting valve (12) disposed in the flow line (13) between the air separator (9) and the tank (1), said valve being arranged to produce in the air separator (9) a pressure such that in all and any collection circumstances the liquid will flow from the air separator (9) to the tank (1).

17. Apparatus according to any one of the preceding claims 10-16, characterized in that the control means (10) has been arranged to supply electrical or pneumatic control signals for opening and/or closing the valves (11) and/or (14) and/or (12).

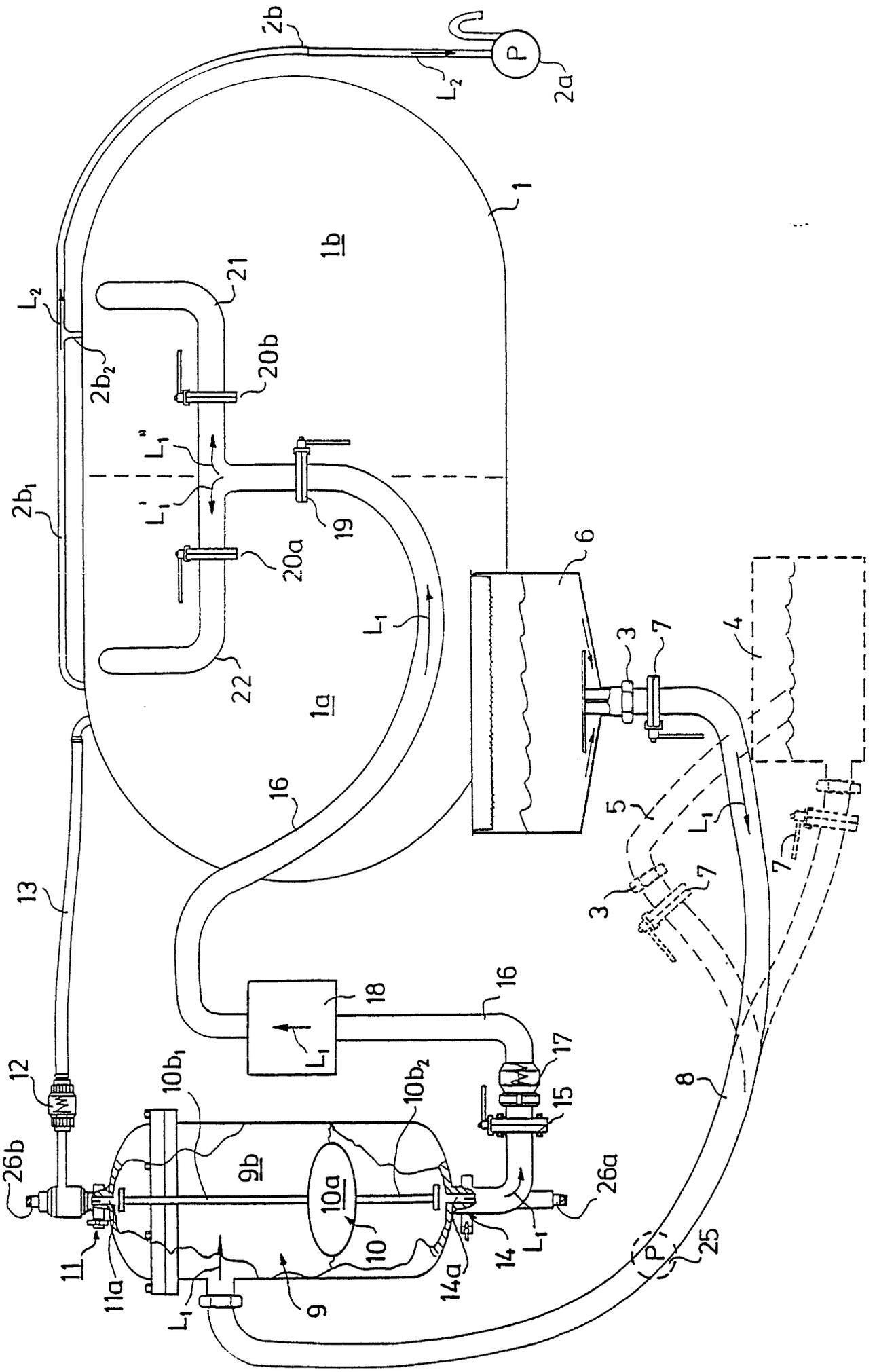
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Fig. 1

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 87 11 2411

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X Y	EP-A-0 146 695 (SCHOENHUBER) * Page 12, lines 23-35; figure 1; claim 1 *	1,2,4, 10,13, 17 5,7,8, 11,14, 15	B 67 D 5/54 B 67 D 5/58
X	DE-A-1 582 962 (DIESSEL) * Page 10, line 18 - page 11, line 10; figure 1 *	1,3,4, 12	
Y	DE-A-1 473 052 (COMPAGNIE DES COMPTEURS) * Page 5, lines 12-16; figure 1 *	5,7,8, 11,14, 15	
A	DE-B-1 228 075 (STRUEVER) * Claim 1 *	7,8,14, 15	
A	DE-C- 469 293 (SIEMENS & HALSKE) * Whole document *	7,8,14, 15	
A	GB-A- 967 197 (ESTEVE)		TECHNICAL FIELDS SEARCHED (Int. Cl.4) B 67 D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	17-11-1987	SCHELLE,J.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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