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E. PIQUEREZ
FILLING LIMITERS
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4 Sheets-Sheet 1

Fig. 1

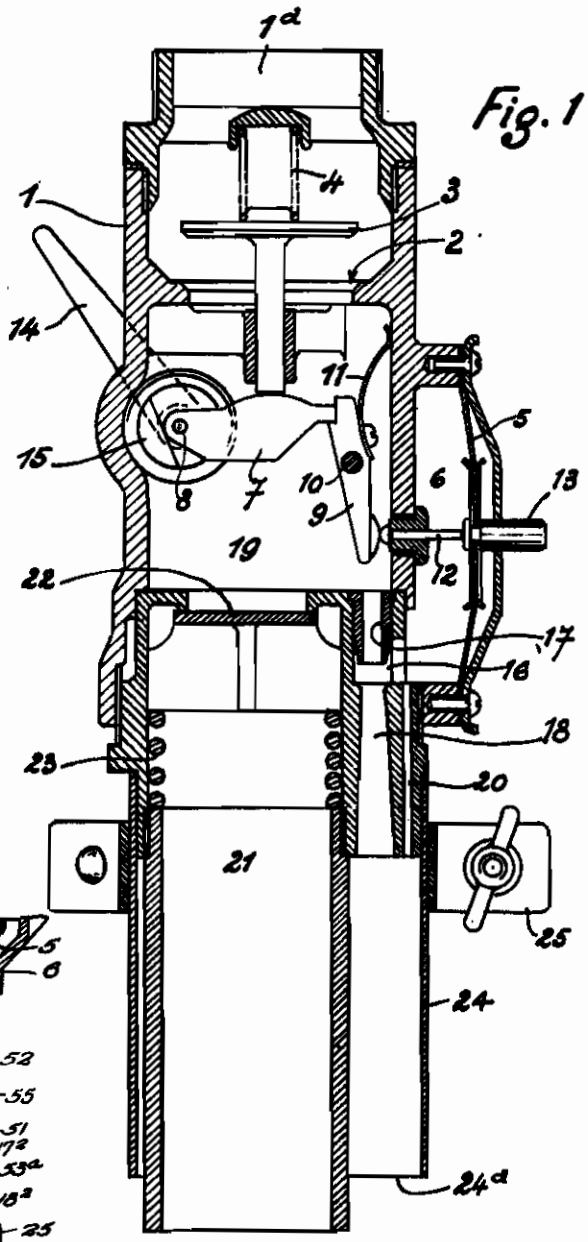
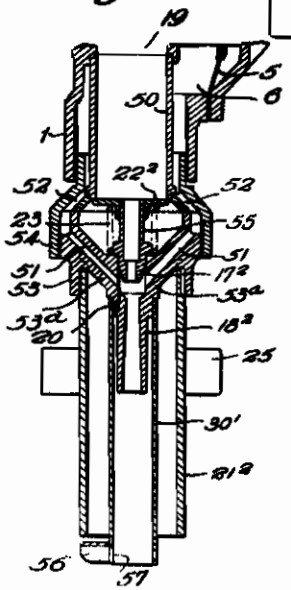


Fig. 6



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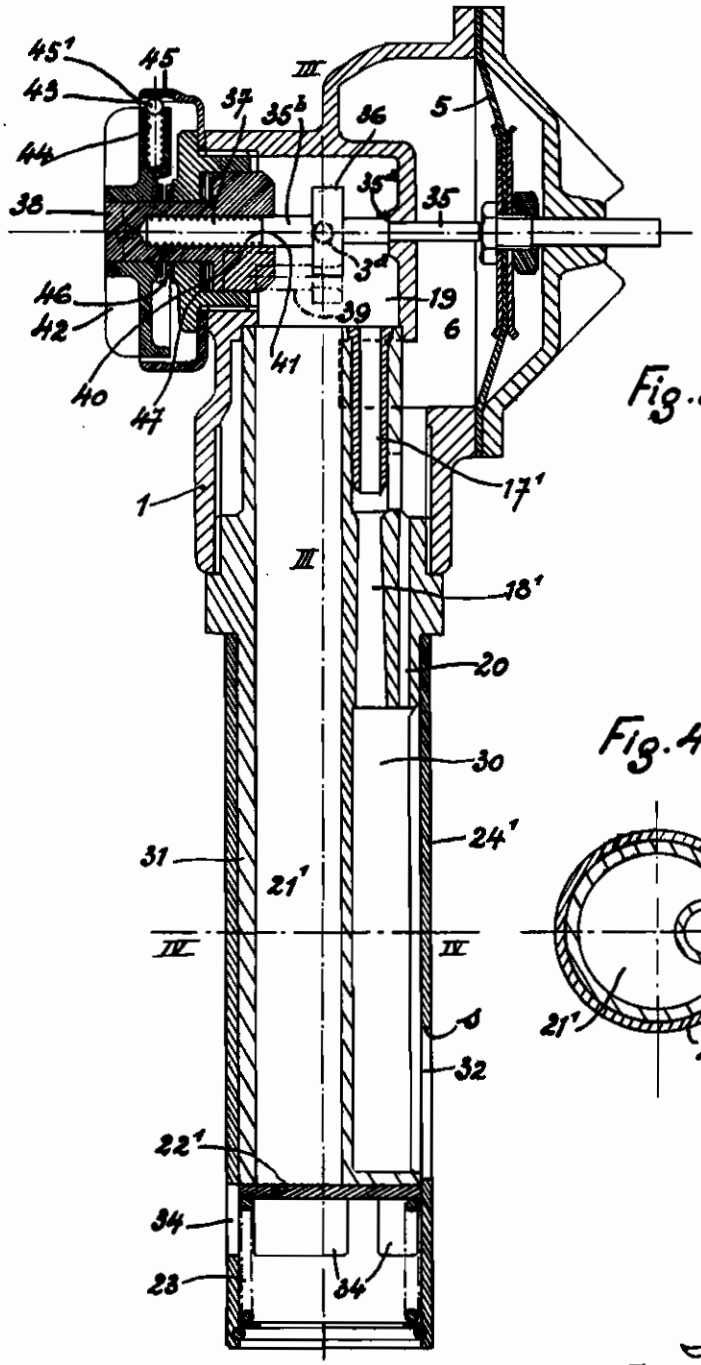

Fig. 2

Fig. 4

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Fig. 3

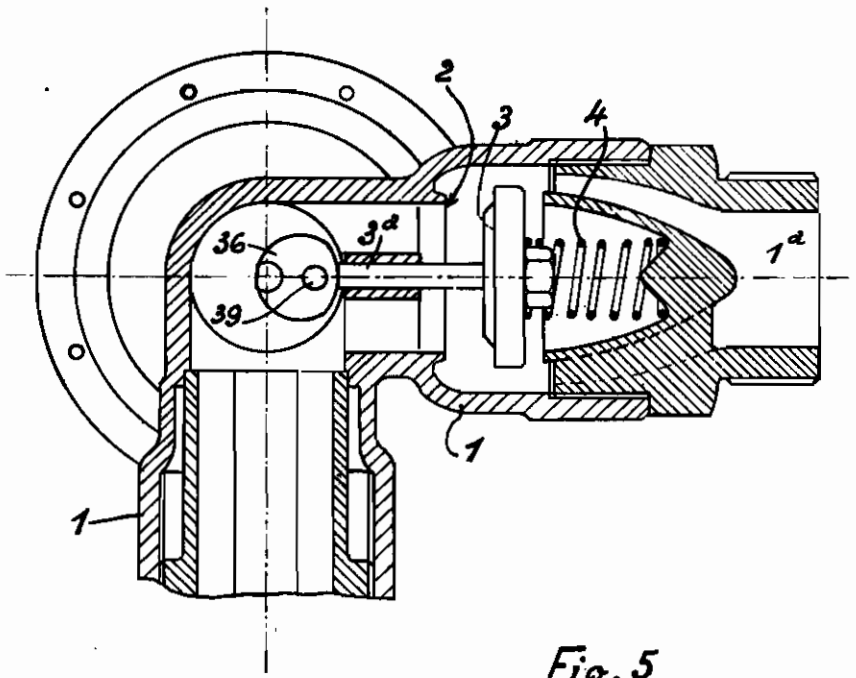

Fig. 5

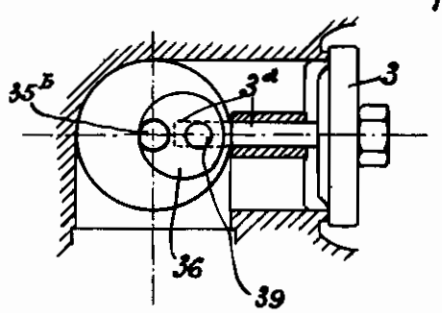

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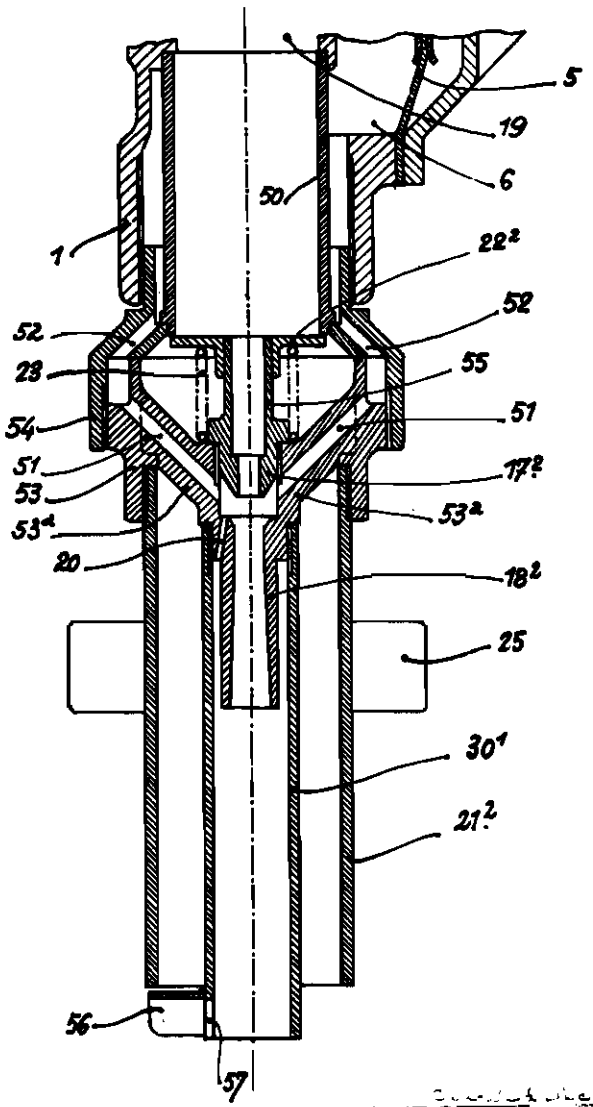
Fig. 6



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ALIEN PROPERTY CUSTODIAN

FILLING LIMITERS

Emile Piquerez, Saint-Cloud, France; vested in the Alien Property Custodian

Application filed January 18, 1940

Apparatus, called filling limiters, are already known which are adapted to stop the supply of a liquid to a tank when the level in the latter reaches a predetermined limit and which operate, at that instant, by means of a depression produced in a movable wall chamber by a trump through which the liquid current flows.

It is known, in this connection, that the depression produced by a trump is dependent on the velocity and, consequently, on the discharge rate of the liquid delivered.

On the other hand, in manipulating certain liquids, the velocity of flow has to be limited in order to avoid, either evaporation, or the formation of an undesirable emulsion. Furthermore, it is obvious that a trump which is designed for a small output is not suitable for a much larger output, without running the risk of creating an objectionable fall of pressure.

Consequently, hitherto, for satisfactory operation, an apparatus of this type provided with a given trump, could only be used for discharge rates between a predetermined minimum "*d*" and maximum D.

This involved the necessity, in order to meet all the requirements of industrial practice, of constructing a set of apparatus with gradually differing minimum and maximum discharge rates.

The present invention obviates this drawback inasmuch as it enables the interval between the minimum discharge rate "d" and the maximum D for a given apparatus to be extended, under such conditions that, theoretically, a single apparatus would be sufficient for usual industrial requirements and practically, only the concern of avoiding the use of too bulky an apparatus, in the case of a very small discharge rate, will lead to the construction of a plurality of apparatus instead of a single one.

For this purpose, in apparatus of the type referred to, that is to say provided with a valve for closing the supply of liquid, the closing of which is caused by a depression created by a pump in a movable wall chamber when the liquid reaches a predetermined level, the invention consists in the combination of said trump with another pipe which is connected to the liquid supply but which is closed, when inoperative, by a calibrated valve, in such a manner as constantly to give the trump a sufficient discharge rate, under a predetermined pressure, to perform its function, and to allow the excess discharge to flow directly into the tank, through said pipe, when said pressure is reached or exceeded.

Under these conditions, in spite of the variations of the discharge rate between very wide limits, the limiting of the level will be ensured in the tank which is being filled. This arrangement therefore enables an apparatus to be constructed which has a very large output and which will nevertheless retain all its sensitivity for very small outputs.

By way of indication and with the sole object of giving an idea of the possibilities provided by the present invention, it may be stated that it is possible to construct on these bases a limiting apparatus that operates for outputs of between 10,000 and 150 litres per hour for example, whereas hitherto a trump controlled apparatus designed for an output of 10,000 litres per hour could not operate when the output fell below 3,000 litres and an apparatus adapted to operate for a minimum output rate of 150 litres per hour could not be used for an output above 500 litres.

The accompanying drawings show, by way of example, three embodiments of the filling limiting apparatus according to the present invention.

Fig. 1 of said drawing is a longitudinal section of a first embodiment.

Fig. 2 is a longitudinal section of a second embodiment.

Fig. 3 is a partial section along A—A of Fig. 2.

Fig. 4 is a partial horizontal section along B—B of Fig. 2.

Fig. 5 illustrates a phase of the operation.

Fig. 6 shows a partial vertical section of a third embodiment.

In Fig. 1, 1 designates the main frame or body of the apparatus. In said frame is formed the seat 2 of the valve 3 for stopping the liquid current arriving through the nipple 1a. Said valve, which is loaded by a spring 4, is normally kept open, against the action of said spring, by a locking device adapted to be released by the movement of a diaphragm 5 when a suitable depression is produced in a chamber 6 of which said diaphragm forms one of the walls.

This locking device is formed, for example, by a lever 7, pivoted at 8, against which the stem of the open valve abuts and which is held in this position by a lock proper 9 pivoted at 10. A spring blade 11 holds this lock engaged and, on the other hand, presses it at the same time against the end of a rod 12 which is adapted to receive the action of the diaphragm 5. A push button 13 enables, if desired, the diaphragm to be operated by hand in order to swing the lock 9 and thereby cause the valve 3 to close.

On the other hand, an external lever 14 secured to a rotary cam 15 enables the lever 7 to be

lifted so as to return the valve to the open position after each automatic operation of the limiting device.

The chamber 6 communicates with the suction orifice 16 of a trump which comprises an injection nozzle 17 and a delivery nozzle 18 and is designed only to operate when the orifice of said delivery nozzle is immersed. The injection nozzle 17 constantly communicates with the liquid chamber 19 formed after the seat 2 of the valve 3. A small duct 20, which separately places the chamber 6 in communication with the atmosphere of the tank being filled, enables air to return into the chamber 6 in the event of the trump's producing an unexpected suction in said chamber, for example when an air pocket bursts at the outlet of the injection nozzle 17.

This system is, by construction, adapted to produce the closing of the valve 3 when the trump, through which a current is flowing at a predetermined speed v is immersed.

According to the invention, the trump is combined with a pipe 21 which preferably has a much larger passage cross-section, and which extends between the liquid chamber 19 and the tank to be filled, said pipe being closed, when inoperative, by a valve 22 which is loaded by a spring 23 in such a manner as only to open under a pressure equal to or greater than the pressure p corresponding to the velocity v for which the trump is adapted to fulfil its function.

Under these conditions, the trump has a priority of discharge with respect to the pipe 21 which opens to allow the excess discharge to flow towards the tank only when the pressure in the chamber 19 is greater than p. Consequently, the operation of the limiting device is ensured for all values of the discharge rate greater than that which corresponds to p, the upper limit of utilization of the apparatus depending only on the cross-section given to the pipe 21.

It is advantageous, as shown in the drawing, in order to avoid having to use a trump of great length, to surround same and the pipe 21 with a cylindrical casing 24 which enables the filling level to be brought substantially to the level of the lower orifice 24^a of said casing. As soon as said orifice is closed by the rising liquid, the air in the casing is driven through said liquid by the jet issuing from the trump. The liquid then rises almost instantly up to the lower orifice of the delivery nozzle 15 and the trump sucks in the chamber 6 and causes the valve 3 to close. The rapidity of the operation is such that at this instant, the level in the tank has only risen a negligible amount above the plane of the orifice 24^a.

Said casing also enables the position of the apparatus to be ensured by guiding in the filling nipple of the tank to be filled. The insertion may be limited by an adjustable stop 25 which enables the filling level to be fixed by fixing the position of the orifice 24^a relatively to the tank.

As stated, it is possible, by means of the invention, to construct an apparatus which is adapted to operate for discharge rates varying for example from 150 to 10,000 litres per hour and which consequently meets most of the usual requirements. The upper limit of such an apparatus could, moreover, be raised above 10,000 litres per hour; but it will be understood that in that case the bulk of the apparatus would be such as to make its use illogical in the case of discharge rates in the region of the lower limit.

In the embodiment of Figs. 2 to 4, the same reference numerals designate the same members. The tube formed by the trump 17^1—18^1 and its extension 30 is in this case included in a cylindrical pipe 31, the remainder of the cross-section of which forms a pipe 21^1 which performs the function of the pipe 21 of Fig. 1. The trump discharges into the tank through the orifice 32 provided in the casing 24^1 and communicating with the extension 30. The filling level is substantially on a level with the upper edge s of said orifice 32. The valve 22^1 for closing the pipe 21^1 is in this case arranged in the lower part of said pipe which can discharge into the tank to be filled, when the valve is open, through the lateral orifices 34 of the casing 24^1. An adjustable stop, not shown, is mounted on the casing 24^1 as in the case of Fig. 1.

As in the previous case, the suction orifice of the trump communicates with the chamber 6 provided with a diaphragm 5.

The device for locking and releasing the valve 3 is in this case advantageously formed by a cam which is adapted to be operated rotatably from the outside and against which the stem of the valve abuts in the open position, said cam being connected to the diaphragm in such a manner as to move parallel with itself and allow said stem to escape, thereby to enable the valve to close when the depression causes the diaphragm to move.

The rod 35, which can be moved by the diaphragm 5, carries the cam 36, the position of which behind the stem 3^a of the valve 3 is determined by the abutment of a shoulder 35^a against an inner wall of the frame. The extension 35^b of the rod 35 is engaged in a bore 37 of an operating key 38 which is adapted to drive the cam by means of a projection 39 secured to said cam and engaged in another bore or recess 40 of the key. In Fig. 2, said projection, which is assumed to have been brought into the plane of the figure, has been drawn in chain dotted lines. A spring 41 tends to hold the cam constantly in its above defined position, behind the stem of the valve.

On the key 38, outside the apparatus, is pinned a knob 42 provided with a ball 43 and with a spring 44 for resiliently engaging with a fixed cage 45 so as to form a mark for the user.

A spring 46 with flat convolutions, ensures fluid-tightness by pressing the key 38 against a gasket 47.

The device being in the position of Figs. 2 and 3, the valve 3 is open and its stem abuts against the cam 36. The ball 43 is engaged in the groove 45^1 of the cage 45.

It will be readily understood that when the diaphragm moves towards the left of Fig. 2, responsive to the depression, it will also move the cam 36 towards the left by compressing the spring 41 and consequently said cam will allow the stem 3^a of the valve to escape, enabling the latter to close by the action of the spring 4 (Fig. 5). At this instant, the cam will be held in its new position by the actual stem of the valve against which the projection of the cam abuts under the pressure of the spring 41.

For resetting the apparatus, that is to say for opening the valve 3 again, it suffices to operate the cam 36 rotatably by means of the knob 42. Starting from the position of Fig. 5, it will be understood that after a half-revolution, the projection of the cam will have escaped from the stem of the valve 3, and consequently the spring 41 will be able to move said cam in the axial direction and return it to the plane of the stem 3^a. Consequently, by continuing the rotation for a further half-revolution, the valve

3 will be lifted by the projection of the cam, and the engaging ball of the knob 42 will fall into the groove 45^1 and inform the operator that said valve is open.

In the embodiment of Fig. 6, the conduit formed by the trump and the conduit controlled by the loaded valve are concentric.

The trump 17^2—18^2 is arranged in the axis of a tube 50 through which the liquid coming from the inlet chamber 19 flows down. Its suction orifice communicates with the depression chamber 6, for example through two series of small ducts 51 and 52, the first bored in radial arm 53^a of a tubular part 53 secured to the delivery nozzle 18^2, and the second in a sleeve 54 connecting the part 53 to the frame 1 of the apparatus.

In the part 53 are screwed a tube 30^1 which extends the trump like the pipe 30 of Fig. 2, and a tube 21^2, concentric with the former, which performs the function of the pipe 21 of Fig. 1, or 21^1 of Fig. 2, and which at the same time acts as a guide for placing the apparatus in position on the tank to be filled. The seat of the valve 22^2 that controls the flow of the liquid through the pipe 21^2, is in this case formed at the lower end of the tube 50. The valve 22^2 is of annular shape and is adapted to slide without play on a tubular extension 55 of the injection nozzle 17^2. In its closed position it is flush with the liquid inlet orifice of said injection nozzle.

It will be understood that, without any other arrangement, the jet of liquid flowing from the large pipe 21^2 would be liable to isolate the central pipe 30^1 from the atmosphere of the tank and consequently, the trump might operate prematurely.

In order to avoid this possibility, it suffices to set up a communication, through the annular jet of liquid falling from the pipe 21^2, between the pipe 30^1 and the atmosphere of the tank, for example by means of inverted gutters 56 fixed at the bottom of the tube 30^1 which is provided with registering recesses 57. The filling level will in this case be established substantially in the plane of the top of said recesses.

It is obvious that the invention is not limited to the embodiments described and illustrated and that it includes all the modifications of same based on the same principles.

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