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FILLING NOZZLE FOR LIQUIDS WITH AUTOMATIC LIMITATION OF THE LEVEL OF THE LIQUID AND AUTOMATIC RESETTING

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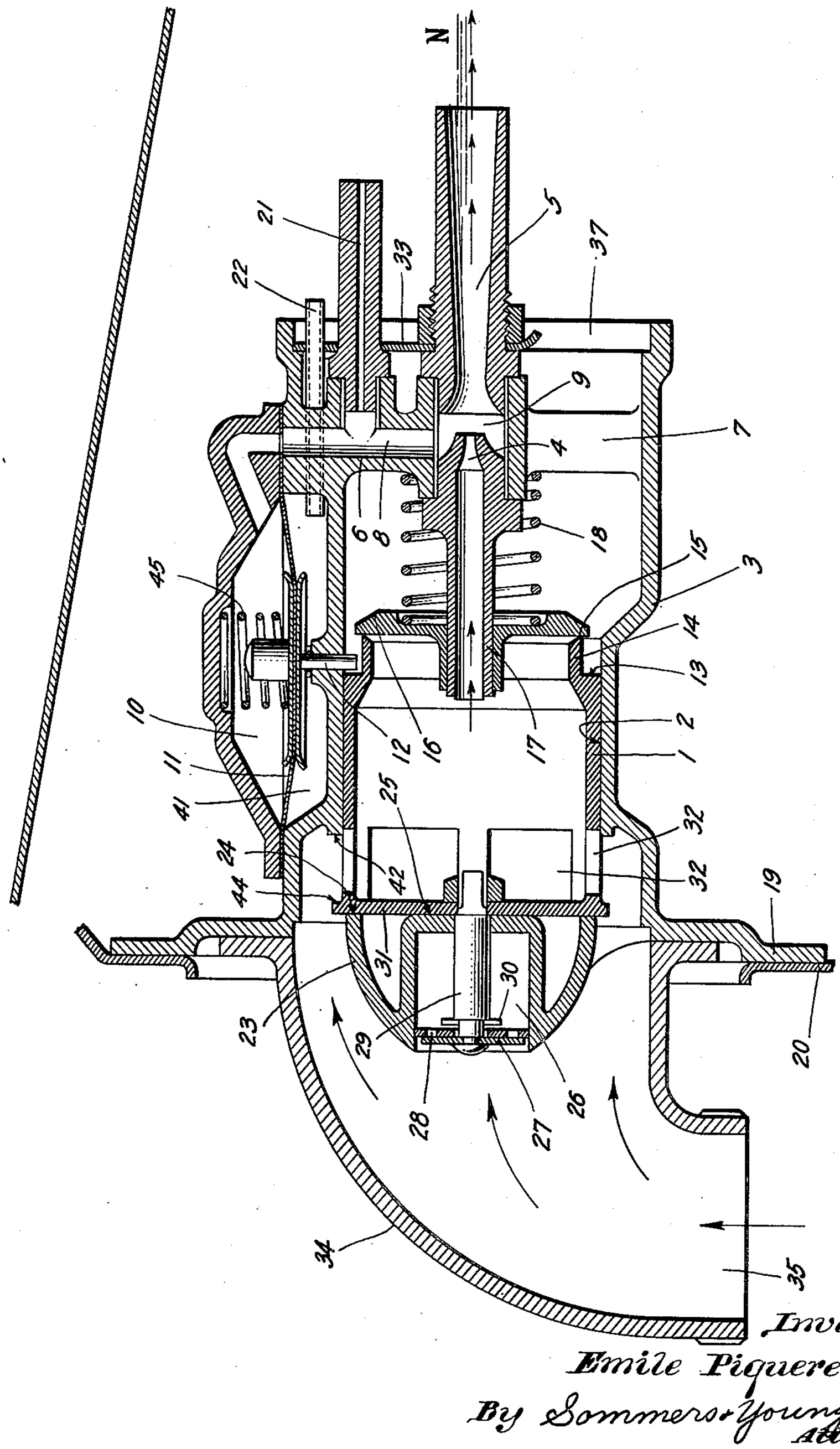

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FILLING NOZZLE FOR LIQUIDS WITH AUTOMATIC LIMITATION OF THE LEVEL OF THE LIQUID AND AUTOMATIC RESETTING

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In engineering, it is often necessary, when filling reservoirs or receptacles with a liquid by means of pipes, to ensure an automatic limitation of the filling height.

This result can be obtained in different ways, for example, by making use of the momentum of the flow of liquid on more or less complicated reversing devices for closing the closure member.

In particular, it is known to secure the closing of an admission valve or of a similar member by means of a reduction of pressure formed by a suction member, for example, a liquid jet device composed of an injector and a nozzle, operating by reason of the passage of the liquid. Devices of this kind are described in French Patents No. 804,710 of July 25, 1935, in the name of Emile Piquerez for: "Automatic limiting device for the filling of all reservoirs, cisterns, etc." and 837,673 of October 29, 1937, in the name of Emile Piquerez for: "Filling apparatus for all reservoirs with automatic limitation of the liquid level."

During the operation of these devices, the passage of the liquid in the suction member must not produce any substantial reduction of pressure but, at the moment when the level of the liquid in the reservoir reaches this suction member, a reduction of pressure is suddenly produced and is made use of for producing closing of the closure member.

Apparatus of the type in question are also known in which the suction member is combined with another conduit connected to the liquid supply and closed in the position of rest by suitably loaded exhaust valve which opens automatically as soon as the pressure in the liquid conduit has reached a certain value; in this manner the suction member always has a sufficient flow to enable it to work properly, the flow surplus flowing directly, through the said conduit, when the pressure rises above the force by which the exhaust valve is loaded.

In this latter type of apparatus, described in French Patent No. 855,052 of January 12, 1939, in the name of the present applicant, for: "Self limiting filling apparatus," the operation is ensured in spite of the important variations in the flow, whereby an apparatus having a large output, can be designed which retains its sensitiveness for very small outputs.

Every limiting apparatus of the above type is constructed so as to be mounted at the end of the liquid supply pipe to the reservoir to be filled and it comprises a resetting mechanism which it is necessary to actuate by hand, prior to a new filling operation. Such a construction limits the field of use of the limiting apparatus which must always remain accessible, or the resetting of which must be remotely controlled.

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The object of the invention is to provide a limiting apparatus in which the resetting is effected in an automatic manner as soon as the pressure is removed in the replenishing pipe and which can therefore be permanently mounted on the reservoir to be filled, even at an inaccessible point.

In order to ensure closing of the closure member, the filling device with automatic limitation of the liquid level, according to the invention, makes use of a suction member through which passes at least a portion of the liquid and producing, when the predetermined level is reached, a reduction of pressure which acts on a movable wall controlling the locking device of the closing member. It is notable that this closing member is subjected to the action of the liquid pressure acting in the direction of closing and to a resilient oppositely acting force acting in the direction of opening, while the locking device mentioned above retains the said closure member in its open position while the reduction of pressure produced by the suction device has not entered into play.

In a preferred and exemplary embodiment of the new limiting device:

The closure member is subjected, in the opposite direction to the fluid pressure, to the action of a spring controlling the exhaust valve. A damping device is provided for limiting the speed of closure of the closing member and avoid hydraulic recoils. An air exchange duct is arranged between the movable wall chamber and the reservoir to be filled. A deflector is provided in order to maintain the suction device and its air exchange duct outside the passage of the liquid.

Other advantages and characteristics will appear from the description about to be given in reference to the accompanying drawing, given by way of example, in which the sole figure shows, in axial section, a limiting device according to the invention arranged along a horizontal plane inside the reservoir to be filled.

In this apparatus, which is of the type by means of which it is possible to obtain a precises limitation of level with widely different outputs, the closure member **1** is mounted in such a manner that it can slide axially in a boring **2** of the body **3** of the limiting device; whilst the suction member, composed in known manner, of the injector **4** and the nozzle **5**, is itself fixed, co-axially, in a rear wall **6** of the body **3** exhibiting openings **7** for the passage of the replenishing liquid.

The body **3** is provided, at its front portion,

with a seat 42 on which the closure member 1 bears when in the closing position.

A duct 8, provided in the rear wall 6 of the body 3 is arranged for establishing communication between the space 9 situated between the injector 4 and the nozzle 5 on the one hand, and the chamber 10 provided with the movable wall 11. The movable wall 11 carries, on the side opposite the chamber 10, a finger 12 for locking the closure member 1. The said member 1 is provided, for this purpose, with a shoulder 13 bearing on the side surface of the finger 12 and a reduced diameter portion 14 the end 15 of which constitutes the seat of the exhaust valve 16. This valve 16 is slidably mounted on the tail 17 of the injector 4 and is subjected to the action of a resilient force, in the present case to the force of a coil spring 18 bearing on the rear wall 6 of the body 3 of the limiting device

The body 3 of the limiting device is provided with a flange 19 to enable it to be secured to one of the walls 20 of the reservoir R to be filled.

On the rear wall 6 of the body 3 of the limiting device is mounted a duct 21 enabling air to be exchanged between the duct 8, putting into communication the space 9 and the reduced pressure chamber 10 having the movable wall, and the atmosphere of the reservoir R, with a view to maintaining the pressure prevailing in the depression chamber 10 and the reservoir R at the same value, even in the case where the suction member produces an undue reduction of pressure in the said chamber, for example in the event of an air pocket bursting at the outlet of the injector 4.

It should be pointed out that the duct 21 is not shown, in the accompanying drawing, in the position which it should actually occupy. In the example shown, the limiting device is arranged along a horizontal plane and the duct 21 is situated, in reality, on the same horizontal plane as the suction member 4—5 so that it is submerged at the same time as the latter, when the predetermined filling level N has been reached in the reservoir R.

A duct 22 is also secured to the fixed rear wall 6 to enable the air to be exchanged between the reservoir R and the equalization chamber 41 of the movable wall 11.

On the side opposite to the rear wall 6, the body 3 of the limiting device carries a member 23 of special shape, in the form of a bell, the lower edge of which 24 is on the same plane as the bottom 25 of a cylindrical, axial chamber 26 inside which can move a piston composed of an outer washer 27 having a substantially smaller diameter than that of the bore of the axial chamber 26 and of an inner washer 43 having a diameter such that it can move axially with slight play inside the chamber 26. The inner washer 43 is provided with a number of apertures 28. The outer washer 27 is held by a shoulder at the end of a tail 29 fixed with respect to the closing member 1, whilst the inner washer 43 is mounted, with axial play, between the outer washer 27 and a washer 30 held by a shoulder on the tail 29.

The members 27, 28, and 26 are combined so as to operate after the fashion of a dashpot for hydraulically braking the movement of the stop member 1 when it is unlatched.

The edge 24 and the bottom 25, situated on the same vertical plane, serve as bearing surface for the outer surface of the wall 31 of the closing member 1. This latter, in the form of a cylindrical slide valve, has in its side wall, openings 32 for the ingress of the liquid.

The bottom 25 is provided with an extending flange portion which, on the inner side, forms a bearing surface 44 which bears, in the closed position of the closure member 1, against the seat 42 of the body 3 of the limiting device.

A deflector 33 is disposed at the outlet of the limiting device in order to maintain the suction member outside the passage of the liquid.

Finally, a connection pipe 34 is provided for receiving the feed pipe for the liquid to be transferred. According to the drawing, this is a right angled connection pipe mounted on the flange 19 of the body 3 of the limiting device.

When proceeding to the filling of the reservoir R, the limiting device with all its parts in the position as shown in the drawing, the operation is as follows:

The free end of the feed pipe is filled to the inlet 35 of the connection pipe 34 and the liquid under pressure is allowed to flow in the direction of the reservoir R.

As soon as the liquid reaches the limiting device, it enters, through the openings 32, inside the closure member 1. The actual pressure of the liquid then acting on the difference between the areas existing between the outlet valve 16 and the stop member 1, which is now released, carries the latter along and it tends to strike abruptly against the seat 42. It is at this instant that the shock absorber comes into play, said shock absorber being constituted of the hydraulic device 26, 27, 43 the purpose of which is to retard the closure and prevent the water-hammer blows which would be produced if the closure were sudden.

Due to the play prevailing between the bore of the chamber 26 and the outer washer 27, the liquid *a*, during the flow, will slightly move the inner washer 43 (which bears against the washer 30) and, as it passes through the apertures 28, fill the axial chamber 26.

As the unlatched stop member moves abruptly towards the right, as viewed in the drawing, its movement is braked hydraulically by the liquid present inside the chamber 26 and which can only escape slowly through the various leakage paths present between the members of the hydraulic braking device.

Two cases can then arise:

Either the flow is a weak one, the pressure of which is not sufficiently high to dislodge from its seat 15 the exhaust valve 16 subjected to the force of the spring 18 and in this first case, the liquid flows into the reservoir through the suction member 4—5.

Or the liquid pressure (large outputs) exceeds the force of the spring 18 in which case the exhaust valve 16 moves away from its seat 15 and the excess liquid passes directly into the reservoir R through the passage 37 of the body 3 of the limiting device, which passage is located by the deflector 33, at a lower level than the suction member 4—5, so as to avoid these members 4—5 and 21 being submerged in the gush caused by the ingress of the liquid. In both cases, the pressure of the liquid acts on the closure member 1, prevented from moving by the lock 12 until the predetermined level N of filling is reached.

When the reservoir R is filled to a predetermined level, the limiting device occupies the closure position with the support surface 44 bearing against the seat 42, so long as pressure is maintained in the inlet pipe (not shown). As soon as the pressure dies down, the movable unit com-

posed of the stop member 1 and the outlet valve 16 is brought back, solely by the expansion of spring 18, to the position shown in the drawing and the lug 12, which is integral with the movable wall 11, under the action of spring 45 as it expands, resumes the position in which it latches the stop member 1. The resetting of the limiting device is thus insured without requiring any manual operation and the apparatus thus constituted is an apparatus suited for universal application, for small and large outputs, which operates automatically.

What I claim as my invention and desire to secure by Letters Patent is:

1. In a liquid level control device for liquid-containing vessels, a casing having an inlet and an outlet, said outlet being located inside the vessel, a closure member located in said casing under the impelling influence of liquid flowing through the chamber into the vessel, a latch for holding said closure in open position when the liquid is below a predetermined level, a diaphragm connected with said latch, a suction device having an inlet located in the flow of liquid in the chamber and an outlet in the vessel, a duct connecting the suction device to one side of the diaphragm, and a deflector for deflecting the liquid flowing into the vessel from said chamber away from the outlet of the suction device.

2. Control mechanism for controlling the level of liquid in a vessel comprising, a casing having an inlet and an outlet through which liquid flows to the vessel, the outlet being located in the vessel at the liquid level to be maintained, said casing having a bore formed therein and a closure seat at its forward end, a slidable cylindrical closure member in said bore and having a closed forward end provided with a flange for engaging the closure seat when moved rearwardly into closed position, said closure member having a valve seat located at its after end and encompassing a smaller area than the closure seat, a valve located adjacent said valve seat, spring means tending to press said valve forwardly into contact with the valve seat and thus slide the closure member to open position, a suction device having an inlet open to flow of liquid in the closure member, having an outlet into the vessel, and having an intermediate reduced pressure chamber, a diaphragm adjacent the casing, a latch connected with said diaphragm, spring means tending to press the diaphragm toward the closure member to hold the latch in position to latch the closure member in open position, a duct connecting the reduced pressure chamber of the suction device with the side of the diaphragm opposite the latch, a second duct connecting said first duct with the vessel at the liquid level to be maintained, a third duct connecting the latch side of the diaphragm with the vessel at a higher level than the second duct, and a shield extending partially across the outlet of the casing for maintaining the suction device outside the liquid passing out of the chamber, whereby when the liquid in the vessel reaches the level of said second duct and obstructs gaseous flow therethrough, the suction device abruptly creates a reduced pressure on one side of the diaphragm and withdraws the latch from the closure member, thereby permitting the closure member to close under the influence of the flowing liquid, and then to automatically open under the influence of the valve spring when the flow has stopped.

3. In an automatically operating liquid level-limiting filling apparatus for filling a container to a predetermined level, a tubular casing for extending downwardly into the container and serving as a conduit for supplying liquid to said container, said casing having an inlet for liquid and a plurality of openings leading into the container, at least one of said openings leading into the container having a shape which generates a reduced pressure forwardly thereof by the flow of liquid therethrough, a pressure responsive movable wall subjected on one side to the said reduced pressure, one of said openings leading to the container having a tube extending into the container and being connected to the said one side of said movable wall to relieve said reduced pressure when the liquid level is below the predetermined level but being closed by the liquid when it reaches the predetermined level, valve means in said tubular casing influenced to closed position by the flow of liquid through the casing, said movable wall having a latch engaging said valve means to latch the valve means in open position before the level of liquid has attained said predetermined level, spring means for pressing said movable wall and latch means into position to hold said valve means open, whereby when the liquid level in said container reaches the predetermined level the opening into the container which is connected to the said one side of said movable wall is closed by the liquid and the relief of the reduced pressure is no longer effected, whereupon the reduced pressure becomes effective to move the movable wall and its latch into a position to allow the valve means, under the influence of the flow of liquid, to move into closed position to close off the flow of liquid into the container.

4. An automatically operating liquid level-limiting filling apparatus according to claim 3 and in which another of said openings leading into the container is provided with a tube extending into the container and terminating in the container at a level higher than that at which the tube of said one opening extends, said other opening is connected to the other side of said movable wall so as to supply pressure thereto for assisting in moving said wall and its latch into releasing position.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,271,557	Killman et al.	Feb. 3, 1942
2,326,251	Piquerez	Aug. 10, 1943
2,388,852	Killman	Nov. 13, 1945