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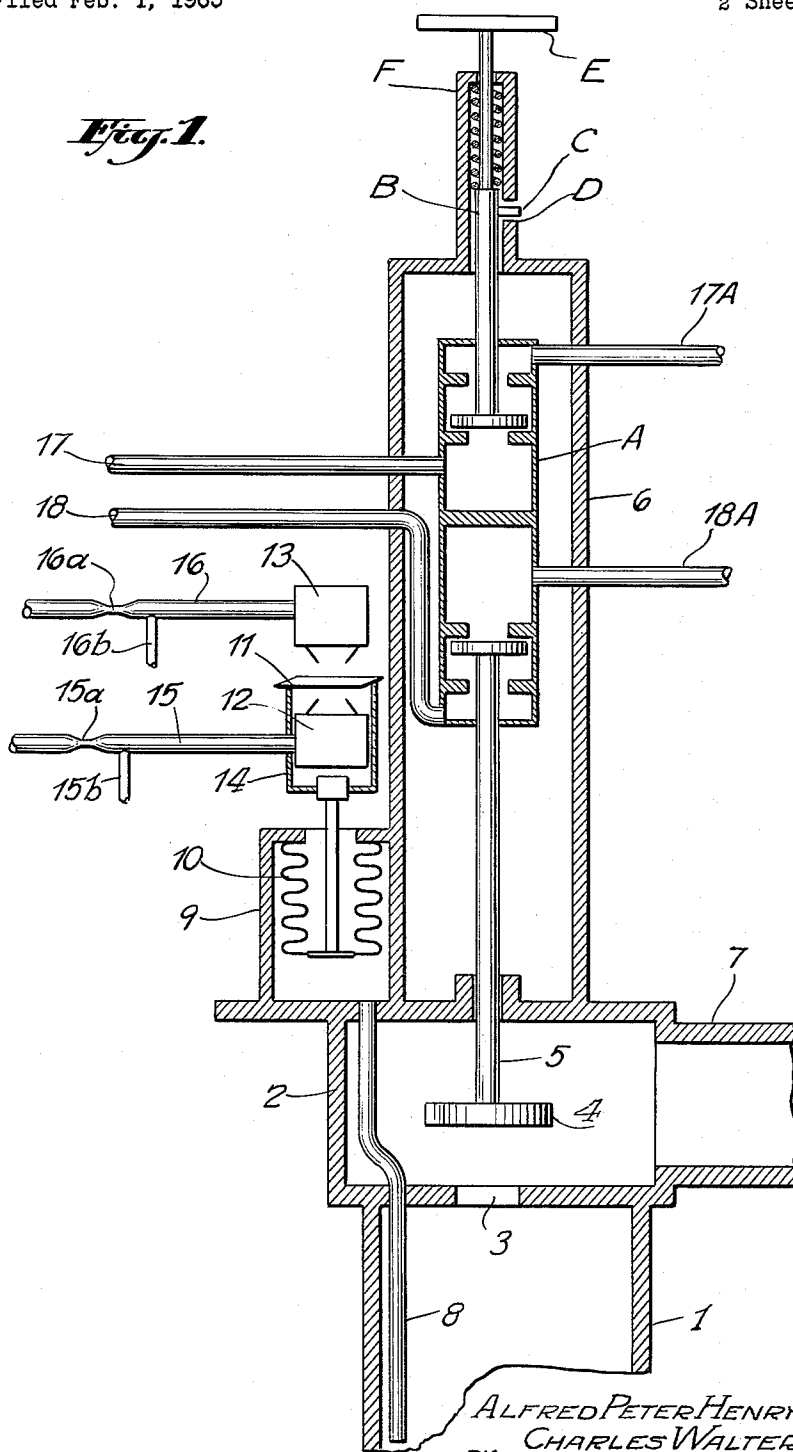
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LIQUID DELIVERY DEVICE

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2 Sheets-Sheet 1

Fig. 1.



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Fig. 2.

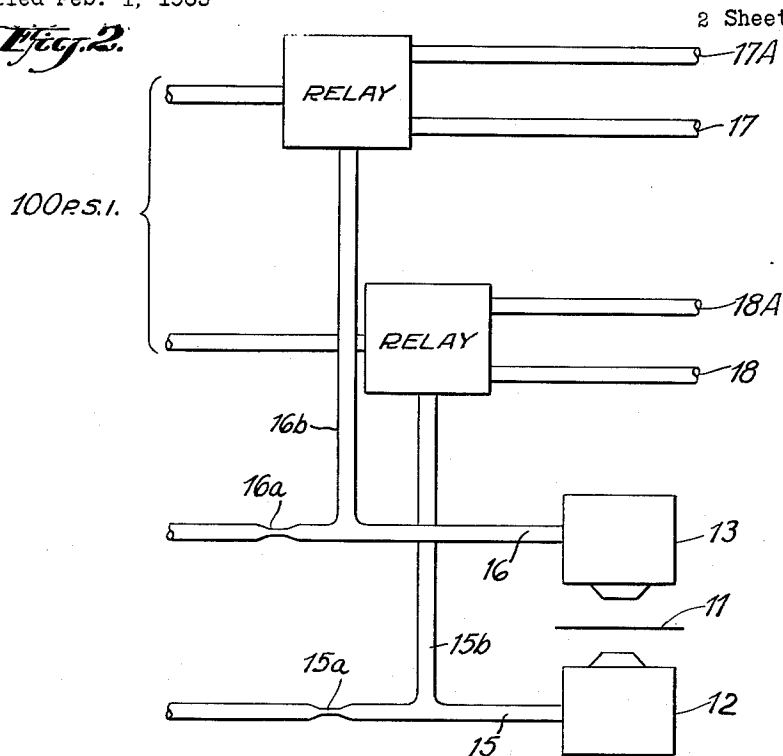
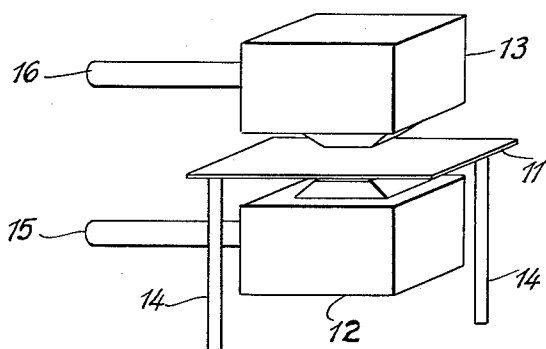


Fig. 3.

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LIQUID DELIVERY DEVICE

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4 Claims. (Cl. 141-128)

The invention relates to automatic filler devices for filling containers with liquids to a predetermined level and is a continuation-in-part of our application Serial No. 218,049 (filed August 20, 1962, now abandoned).

Devices are known for filling containers with predetermined levels of liquid, these devices relying on the principle of levers to effect stoppage of the flow of liquid from the supply when the desired level is reached. Automatic filler devices are also known of the type in which the valve controlling the flow of liquid operates in response to the pressure increase in a dip tube associated with the filler nozzle due to the rise of liquid therein as the container fills. All of these devices however lack sensitivity and do not give reproducible deliveries which may lead to spilling and wastage of liquid.

It is an aim of the present invention to provide an automatic filler device of increased sensitivity than was hitherto obtainable and having a high degree of reproducibility of delivery.

According to the present invention liquid delivery device for filling containers with liquid to a predetermined level comprises a filler tube, a valve for controlling the passage of liquid through said tube, a dip tube having one end thereof extending into said container, pneumatic control cylinder means having an air inlet and an air outlet, means for controlling the air pressure in said pneumatic control cylinder by varying the air flow through the air outlet in response to the pressure in the dip tube due to the level of liquid therein, means for closing said valve in successive stages or increments responsive to the air pressure in said pneumatic control cylinder.

Movement of the baffle in an air jet in response to the pressure increase in the dip tube may be effected in any suitable manner. For example the increasing pressure in the dip tube may be used to cause the movement of a flexible bellows or diaphragm which is associated by a mechanical linkage with the baffle itself. The device may comprise more than one baffle and air jet to effect operation of the cylinder stages according to the precise design of the apparatus employed. The use of a single baffle disposed between two axially opposed air jets is preferred.

The pneumatic relay employed may be any known form of relay suitable for the purpose.

One embodiment of a filler device in accordance with the invention is illustrated further with reference to the accompanying drawings in which

FIGURE 1 shows schematically a vertical section through the device

FIGURE 2 shows schematically the inter-connecting piping and

FIGURE 3 shows an enlarged perspective view of a part of the device.

A filler nozzle 1 for insertion into the container to be filled is attached to, and in open communication with a header chamber 2 through an opening 3. Opening 3 may be sealed by valve 4 which is operated by a plunger 5 connected with a duplex pneumatic control cylinder shown schematically as a unit 6 which operates in two stages, the first of which partially closes the valve, and the second of which completely closes the valve. Header chamber 2 is connected by pipe 7 to a suitable liquid source (not shown). A dip tube 8 attached to the inside of the filler nozzle 1 extends through the header chamber 2 and

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opens into enclosed chamber 9. A metal bellows 10 closed at one end is sealed into the chamber 9 so that its inside is open to the atmosphere. A baffle 11 in the form of a strip or plate of suitable material e.g. metal, is held between two axially opposed nozzles 12 and 13 by a stirrup 14 connected to the moveable end of the bellows 10. The plane of the baffle is horizontal while the common axis of the nozzles is vertical and movement of the bellows is in the vertical plane. Nozzles 12 and 13 are attached to a compressed air supply through pipes 15 and 16 which have restrictions 15a and 16a respectively. Nozzles 12 and 13 are connected through lines 15b and 16b respectively and a relay valve (not shown). With the flexible compressed air supply lines (17, 17a, 18 and 18a) to the two stage pneumatic control cylinder, the connections 15b and 16b being made in pipes 15 and 16 between the nozzles and the restrictions 15a and 16a. Movement of the baffle between the axially opposed air jets issuing from nozzles 12 and 13 alters the rate of flow of air through the nozzles thus changing the pressure drops across the restrictions 15a and 16a. The resultant changes in pressure in the lines 15 and 16 are communicated to the relay valve through the lines 15b and 16b.

The control unit requires a compressed air supply suitably at 100 p.s.i.

When the start button (not shown) on the filler device is pressed 100 p.s.i. air is applied to the duplex cylinder through lines 17A and 18 while lines 17 and 18A are opened to atmosphere. This causes the plunger 5 to rise within the cylinder body A while the cylinder itself moves upward on the upper piston B, this piston being held relative to the main frame of the filler by the engagement of rod C in the slot D in the position shown. The plunger 5 is thus raised to its fullest extent and gives the maximum flow rate of liquid through the opening 3.

When the level of liquid in the container reaches the open end of the dip tube the rising level compresses the air in the tube and thus causes the bellows 10 to contract. The motion of the bellows moves the plate 11 between the two nozzles 12 and 13 which are supplied with air under pressure. The bellows and nozzle system comprise the pneumatic amplifier.

As the liquid level continues to rise the plate 11 rises and uncovers the nozzle 12. This causes the pressure at the nozzle to fall sharply. The fall in pressure is used, via a relay valve (not shown) to cause the 100 p.s.i. pressure in line 17A to be transferred to line 17 while line 17A is opened to atmosphere. This causes the body of the cylinder to move downwards carrying with it the plunger 5 which moves into a position intermediate of the open and closed positions to reduce the flow rate to a value of about one third of maximum.

Further rise in liquid level causes the plate 11 to approach nozzle 13 eventually closing it. This causes the pressure at the nozzle to rise and this is used, via a second relay valve (not shown) to transfer the compressed air from line 18 to line 18A. The plunger 5 is caused to move on to its seat and shut off the liquid flow. The valve remains shut off until the filler is transferred to an empty container and the start button pressed.

An adjustment of the liquid levels at which the two stages operate can be made by setting the reference pressures of the two relay valves.

Further it will be appreciated that other modifications may be made in the above described device without departing from the general principle of the invention. Thus, for example, the nozzles 12 and 13 may be positioned in the device independent of each other and may be associated with either a common or individual baffle provided such baffle or baffles operate in response to the pressure increase in the dip tube. Moreover the bellows may be

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replaced by a diaphragm of suitable flexible material which serve to cause the desired movement of the baffle.

We claim:

1. A liquid delivery device for filling containers with liquid to a predetermined level comprising a filler tube, a valve for controlling the passage of liquid through said tube, a dip tube having one end thereof extending into said container, a two stage pneumatic control cylinder having two air inlets and two air outlets, means for controlling the air pressure in said pneumatic control cylinder by varying the air flow through the air outlets in response to the pressure in the dip tube due to the level of liquid therein, means for closing said valve in two successive stages responsive to the air pressure in said pneumatic control cylinder.

2. A liquid delivery device for filling containers with liquid to a predetermined level comprising a filler tube, valve means for controlling the passage of liquid through said tube, a dip tube having one end thereof extending into said container, whereby the increase of pressure in the dip tube is responsive to the rise of liquid therein when the container is being filled, a baffle, means for moving said baffle in response to pressure changes in said dip tube, a plurality of pneumatic pipe lines, an air nozzle connected to the end of each of said pneumatic pipes lines, said baffle being disposed adjacent the discharge of said nozzles, for deflecting the flow of air therefrom and thereby controlling the back pressure in said pneumatic pipe lines respectively, a multi-stage pneumatic control cylinder for operating said valve responsive to the changes of back pressure in said pneumatic pipe lines respectively.

3. A liquid delivery device for filling containers with liquid to a predetermined level comprising a filler tube, a valve for controlling the passage of liquid through said tube, a dip tube having one end thereof extending into said container, an enclosed chamber in open communication with the other end of said dip tube, whereby the pressure in the chamber is responsive to the increase in pressure in the dip tube created due to the rise of liquid therein when the container is being filled, a bellows operatively responsive to pressure changes in said chamber, a baffle, means for moving said baffle in response to movement of said bellows, air jet means disposed adjacent said baffle, pneumatic piping means interconnected in fluid flow communication with said air jet means, whereby the back pressure in said pneumatic piping means is responsive to movement of said baffle relative to said air jet means, a two-stage pneumatic control cylinder operatively respon-

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sive to the back pressure in said pneumatic piping means and adapted to move said valve whereby said valve is partially closed by operation of the first stage of the cylinder when the container is partially full and completely closed by operation of the second stage of the cylinder when the container is filled to the predetermined level.

4. A liquid delivery device for filling containers with liquid to a predetermined level comprising a filler tube, a valve for controlling the passage of liquid through said tube, a dip tube having one end thereof extending into said container, an enclosed chamber in open communication with the other end of said dip tube, whereby the pressure in the chamber is responsive to the increase in pressure in the dip tube due to the rise of liquid therein when the container is being filled, a bellows operatively responsive to pressure changes in said chamber, a baffle, means for moving said baffle in response to movement of said bellows, a pair of pneumatic pipe lines, a pair of axially opposed air nozzles disposed on either side of said baffle, said air nozzles being connected with said pneumatic pipe lines in fluid flow communication respectively, said baffle being adapted to deflect the flow of air from said nozzles in response to movement of said baffle in the area between said nozzles whereby the back pressure in each of said pipe lines is responsive to movement of said baffle, a two-stage pneumatic control cylinder operatively connected to said valve, means interconnecting said control cylinder and said pneumatic pipe lines, whereby said valve is partially closed by operation of the first stage of the cylinder in response to the change in back pressure in said pneumatic pipe lines when the container is partially full and completely closed by operation of the second stage of the cylinder in response to a further change in back pressure in said pneumatic pipe when the container is filled to the predetermined level.

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