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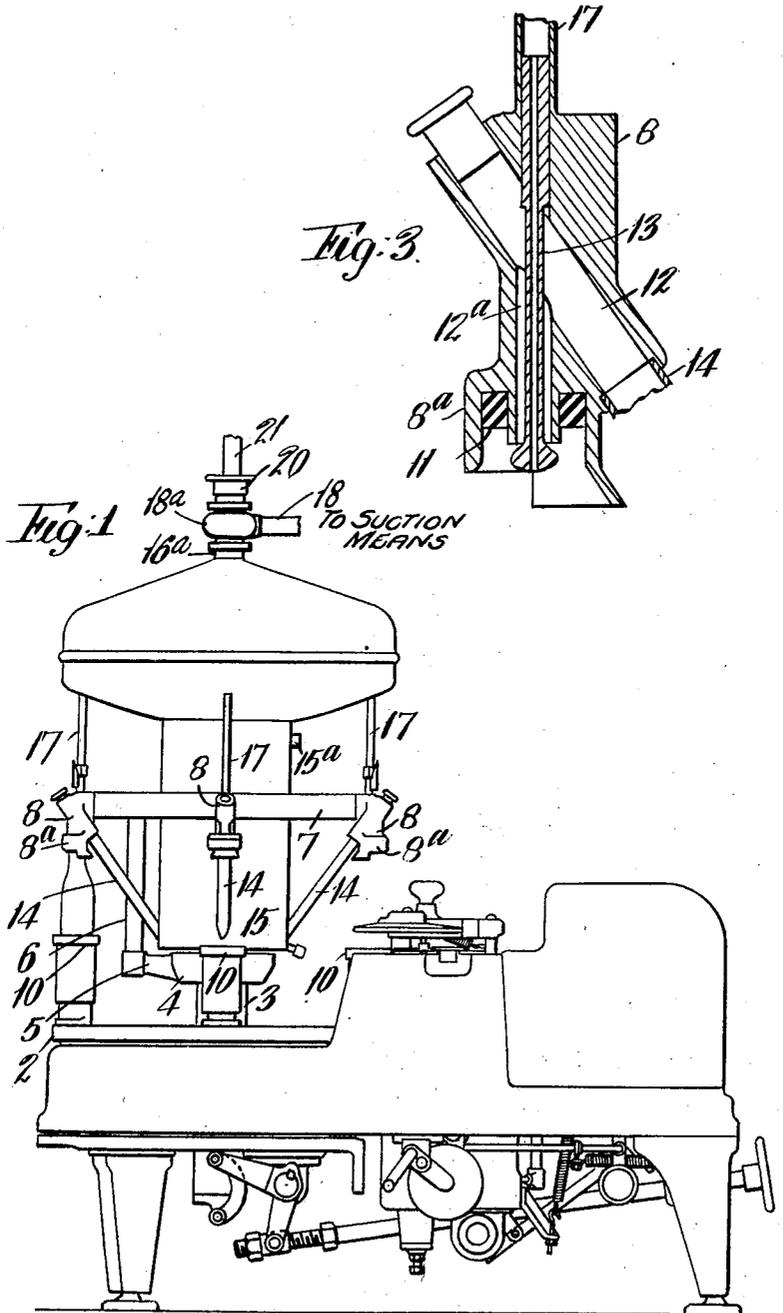
S. F. BROADHURST

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MACHINE FOR FILLING RECEPTACLES WITH LIQUIDS

Filed April 8, 1939

2 Sheets-Sheet 1



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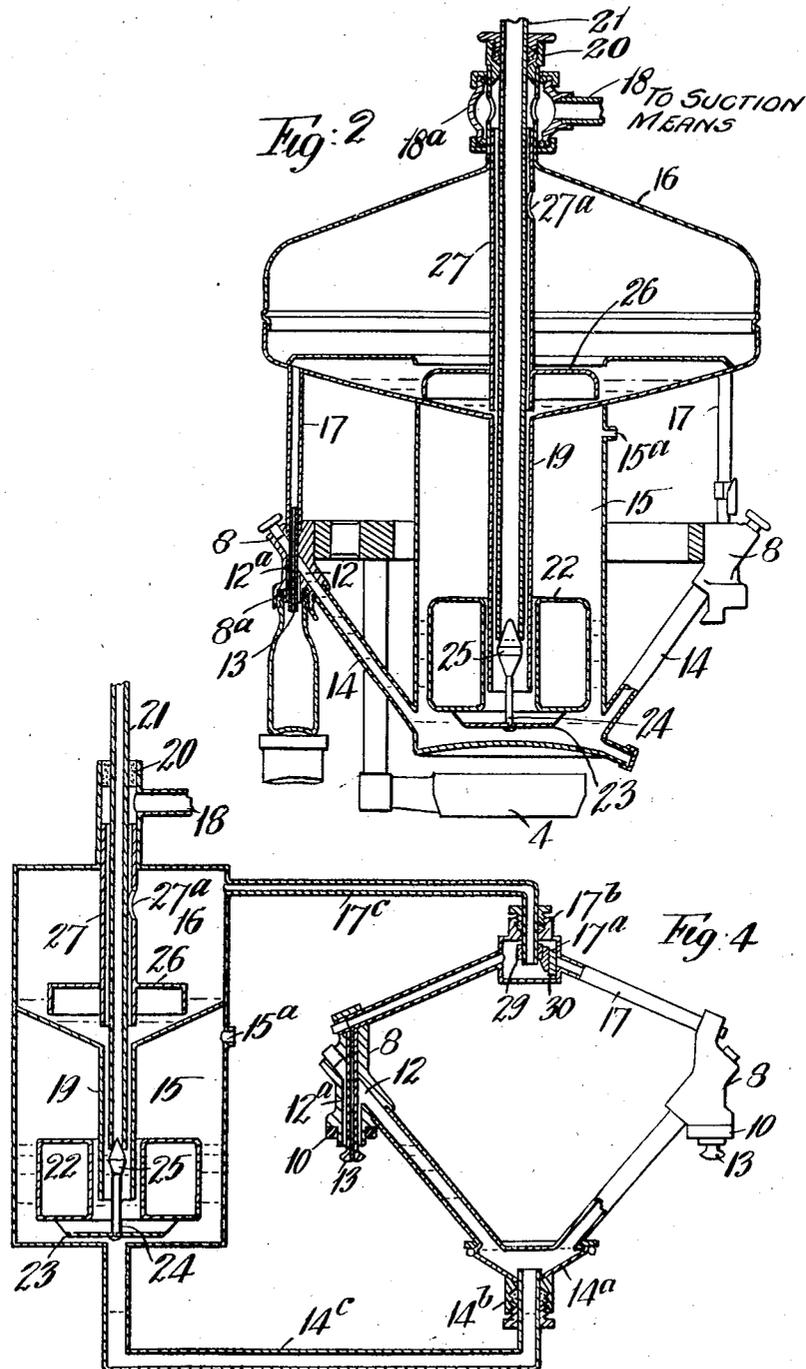
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UNITED STATES PATENT OFFICE

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MACHINE FOR FILLING RECEPTACLES
WITH LIQUIDSStanley Frederick Broadhurst, London, England,
assignor to Albro Fillers and Engineering Com-
pany Limited, Wood Green, London, EnglandApplication April 8, 1939, Serial No. 266,799
In Great Britain February 10, 1938

8 Claims. (Cl. 226—116)

I have filed an application in Great Britain,
February 10, 1938.

The present invention relates to machines for
filling receptacles with liquids by creating a re-
duction of air pressure within the receptacle and
thereby causing the liquid to flow into it, through
a tube, from a reservoir to which a supply is
fed, the air being sucked from the receptacle by
a pump connected to the mouth thereof through
a pipe in which is inserted a chamber for inter-
cepting any liquid sucked into the pipe and pre-
venting it from passing into the pump, such
machines being provided with a plurality of fill-
ing heads and so constructed as to be continu-
ously dispensing liquid, at any time while in use,
to at least one receptacle.

The interceptor just described is situated at
a higher level than the reservoir and is so ar-
ranged that its bottom portion is at a lower level
than the points of connection of the tube in
which it is interposed, so that any liquid passing
into the interceptor is trapped in its lower por-
tion, and passes by gravity, down a drain pipe,
back to the reservoir.

This machine is subject to the disadvantage
that the degree of vacuum cannot be increased
to more rapidly fill the receptacles with liquid,
as, should this be done, the liquid within the
interceptor rises to an undesirable level.

The object of the present invention is to over-
come this objection in order that the speed of
the machine may be increased.

According to the present invention, the supply
of liquid to the reservoir is effected in a manner
such as to produce a continuous injector action,
during the normal operation of the machine,
upon the liquid within the drain pipe to assist
in feeding it back to the reservoir, and thus per-
mit the speed of the machine to be increased
beyond that which would otherwise be per-
missible.

The invention will now be described with refer-
ence to the accompanying drawings, in which:

Fig. 1 is a side elevation of a milk bottle filling
machine according to one form of the present
invention.

Fig. 2 is a sectional view, to an enlarged scale,
of part of the machine shown in Fig. 1.

Fig. 3 is an enlarged sectional view showing
more clearly certain details.

Fig. 4 is a diagrammatic view illustrating an
alternative construction.

Referring to Figs. 1, 2 and 3 of the accompany-
ing drawings in which only such parts are shown
in detail as are necessary to the proper under-

standing of the invention, 1 indicates the ma-
chine frame upon which is mounted a turntable
2 with which is also arranged to rotate an up-
right member 3 carrying at its upper end a
transverse member 4 having arms such as 5
carrying pillars such as 6 mounted upon the
upper ends of which is a ring 7.

Screwed or otherwise attached to the periphery
of the ring 7 and arranged at equal distances
therearound are shown four filling heads such
as 8, the lower ends 8a of which are designed to
receive the upper ends of milk bottles 9, which
are raised and lowered upon pneumatically oper-
ated platforms 10, carried upon the turntable 2
and disposed below each filling head.

The filling heads are provided with rubber
sealing rings such as 11 against which the upper
edges of the mouths of the bottles are pressed
into sealing contact by the platforms 10 during
each filling operation, the arrangement being
such that after each bottle is filled its platform
lowers it clear of the filling head.

12 indicates the liquid passage of each filling
head, and 12a the passage through which the
liquid passes therefrom into the bottle, and 13
constitutes the pipe through which air is sucked
from the bottle to cause this to take place.

The passage 12 of each of the filling heads is
connected by a pipe 14 to the lower end of a
reservoir 15 carried upon the underside of the
interceptor, indicated by 16, which latter is sup-
ported on tubes 17, which are connected to the
upper ends of the pipes 13, the upper ends of
these tubes 17 connecting with the lower portion
of the interceptor.

Normally communicating, through a gland 18a,
with the tubular upper end 16a of the interceptor
16 is a pipe 18, which is connected to the suction
pump, not shown, so that a partial vacuum is
maintained therein, this vacuum causing the
bottles to be partially evacuated and the liquid
to be sucked up the pipes 13, through the pas-
sages 12 and 12a, into the bottles, as soon as
these are sealed against the heads, as previously
described. The arrangement just described is
such that the tubular upper end 16a of the tank
16 can rotate within the gland 18a.

Any liquid, in the form of froth or otherwise,
which may be sucked up the pipes 13 passes
down into the bottom of the interceptor which
is connected by a pipe 19 to the lower portion
of the reservoir 15, and thence back into the
reservoir.

The pipe 19 is of such length that its lower end
is always immersed in the liquid in the reservoir.

Passing through a gland 20, into the upper tubular end 16a of the interceptor and nearly to the lower end of the pipe 19 is the main liquid supply pipe 21, the exterior diameter of which is somewhat less than the interior diameter of the pipe 19, so as not to appreciably obstruct the passage of the intercepted liquid down the last mentioned pipe.

The liquid in the supply pipe 21 is maintained under a sufficient head, or under sufficient pressure by a pump, for it to be fed into the reservoir.

The liquid supply pipe 21 is connected to an external or main liquid supply which is so arranged that the liquid within this supply pipe is, in effect, under considerably greater head than the maximum possible head of liquid within the drain pipe 19.

Slidingly arranged upon the pipe 19 is an annular float 22, having upon its underside a bracket 23 bearing an upwardly projecting rod 24 having at its upper end a cone valve 25.

The valve 25 is so arranged that when the requisite quantity of liquid has passed from the supply pipe 21 into the reservoir 16, this float actuated valve shuts the lower end of the said pipe.

When, however, the valve 25 opens, the liquid passing through the annular opening formed between it and the lower end of the supply pipe 21 causes an injector action in the lower end of the pipe 19 which draws liquid down the latter from the interceptor and injects it into the reservoir.

By reason of the action just described it is possible to partially evacuate the interceptor to a higher degree than hitherto, without the risk of causing the interceptor to be overfilled, and consequently the machine can be operated at a considerably greater speed.

The reservoir 15 is maintained open to atmosphere, and for this purpose is provided at one side, above the liquid level, with a short ventilator tube 15a.

Disposed within the lower part of the interceptor 16 is a bell float 26, carrying a sleeve 27, which is arranged concentrically with the main supply pipe 21 but is of a somewhat larger internal diameter than the external diameter of the latter, the upper end of this sleeve forming a sliding fit within the tubular upper end portion 16a of the interceptor.

The arrangement just described is such that should the degree of vacuum within the interceptor rise beyond a predetermined level, and the level of the liquid therein consequently rises, the bell float 26 will rise and with it the sleeve 27 so that the upper end portion of this sleeve shuts off the pipe 19 from the interceptor and thus prevents the degree of vacuum rising beyond this predetermined level and consequently prevents the interceptor from becoming overfilled with the liquid.

Provided in the sleeve 27 is a perforation 27a for causing an equalization of pressure between the inside and the outside of this tube.

In the embodiment of the invention shown in Fig. 4, in which as far as possible reference numerals the same as those employed in Figs. 1, 2 and 3 are used, the reservoir 15 and interceptor 16 are arranged to be stationary and not to rotate with the filling heads 8.

The pipes 14, instead of being connected directly to the reservoir 15, are connected to a manifold 14a.

The manifold 14a is provided with a gland 14b into which passes one of the vertical end portions

of a pipe 14c bent substantially U-shape, the other vertical limb of which pipe is connected to the bottom of the reservoir 15.

The pipes 17, at their upper ends, are connected to the sides of a vertical cylindrical manifold 17a, provided at its upper end with a gland 17b arranged in vertical axial alignment with the gland 14b.

Passing through the gland 17b and into the manifold 17a is the downturned portion at one end of a pipe 17c, the opposite end of which pipe is connected to the upper end of the interceptor 16.

The filling heads are rotated around the vertical axis which is common to the glands 14b and 17b.

Disposed within the manifold 17a and mounted upon the end of the pipe 17c is a bracket 29 which carries a plate 30, the arrangement being such that this plate 30 acts as a valve to close the pipes 17 while the filling heads 8 are passing through the part of their circular path of travel in which no bottles are in engagement therewith so that no unnecessary inbleeding of air takes place through the pipes 13.

From the foregoing description it will be readily seen that at all times during the operation of the machine at least one filling head is in operation upon a bottle. The valve 25 is so adjusted that at all times after the machine has reached its normal operating condition this valve is open.

In view of this fact the aforesaid injector action is a continuous one.

I claim:

1. In a multiple head machine for filling receptacles with liquid, having a liquid reservoir, suction producing means for sucking the liquid from said reservoir into the receptacles by partially evacuating them, and a liquid interceptor connected between the suction producing means and the filling heads, to intercept liquid and prevent its passage to said suction producing means, and a drain-tube through which drain-tube the intercepted liquid returns to the reservoir, in combination, a pipe through which liquid is supplied, under pressure, to the reservoir, so that the liquid issues from said pipe as a jet, said pipe being so arranged with respect to said drain-tube that said jet exerts a continuous injector action on the drain-tube, which assists the return flow of the intercepted liquid to the reservoir.

2. In a multiple head machine for filling receptacles with liquid, having a liquid reservoir, suction producing means for sucking the liquid from said reservoir into the receptacles by partially evacuating them, and a liquid interceptor connected between the suction producing means and the filling heads, to intercept liquid and prevent its passage to said suction producing means, which interceptor is situated at a higher level than the filling heads, and a drain-tube having its lower end continually immersed in the liquid within the reservoir, through which drain-tube the intercepted liquid returns to the reservoir, in combination, a liquid supply pipe, through which liquid under pressure is supplied to said reservoir, so as to issue from the pipe as a jet, said pipe being sealed from said interceptor, and extending coaxially down said drain-tube and nearly to the lower end of same and being of smaller external diameter than the internal diameter of the drain-tube, in order that the jet of liquid passing out of the lower end of said supply pipe to said reservoir shall produce an injector action within the drain-tube and thereby

assist the return of the intercepted liquid to the reservoir.

3. In a multiple head machine for filling receptacles with liquid, having a liquid reservoir, suction producing means for sucking the liquid from said reservoir into the receptacles by partially evacuating them, and a liquid interceptor connected between the suction producing means and the filling heads, to intercept liquid and prevent its passage to said suction producing means, and a drain-tube, through which drain-tube the intercepted liquid returns to the reservoir, in combination, a pipe through which liquid is supplied, under pressure, to the reservoir, so that the liquid issues from said pipe as a jet, said pipe being so arranged with respect to said drain-tube that said jet exerts a continuous injector action on the drain-tube, which assists the return flow of the intercepted liquid to the reservoir, together with a float controlled valve within said interceptor for cutting off the latter from said suction producing means, when the liquid intercepted therein exceeds a predetermined level.

4. In a multiple head machine for filling receptacles with liquid, having a liquid reservoir, suction producing means for sucking the liquid from said reservoir into the receptacles by partially evacuating them, and a liquid interceptor connected between the suction producing means and the filling heads, to intercept liquid and prevent its passage to said suction producing means, which interceptor is situated at a higher level than the filling heads, and a drain-tube having its lower end continually immersed in the liquid within the reservoir, through which drain-tube the intercepted liquid returns to the reservoir, in combination, a liquid supply pipe, through which liquid under pressure is supplied to said reservoir, so as to issue from the pipe as a jet, said pipe being sealed from said interceptor, and extending coaxially down said drain-tube and nearly to the lower end of same and being of smaller external diameter than the internal diameter of the drain-tube, in order that the jet of liquid passing out of the lower end of said supply pipe to said reservoir shall produce an injector action within the drain-tube and thereby assist the return of the intercepted liquid to the reservoir, together with a float controlled valve within said interceptor for cutting off the latter from said suction producing means, when the liquid intercepted therein exceeds a predetermined level.

5. In a multiple head machine for filling receptacles with liquid, having a liquid reservoir, suction producing means for sucking the liquid from said reservoir into the receptacles by partially evacuating them, and a liquid interceptor connected between the suction producing means and the filling heads, to intercept liquid and prevent its passage to said suction producing means, and a drain-tube, through which drain-tube the intercepted liquid returns to the reservoir, in combination, a pipe through which liquid is supplied, under pressure, to the reservoir, so that the liquid issues from said pipe as a jet, said pipe being so arranged with respect to said drain-tube that said jet exerts a continuous injector action on the drain-tube, which assists the return flow of the intercepted liquid to the reservoir, and a float controlled valve for automatically regulating the rate of exit of the liquid from the liquid supply pipe to maintain constant the level of the liquid within the reservoir.

6. In a multiple head machine for filling receptacles with liquid, having a liquid reservoir, suction producing means for sucking the liquid from said reservoir into the receptacles by partially evacuating them, and a liquid interceptor connected between the suction producing means and the filling heads, to intercept liquid and prevent its passage to said suction producing means, which interceptor is situated at a higher level than the filling heads, and a drain-tube having its lower end continually immersed in the liquid within the reservoir, through which drain-tube the intercepted liquid returns to the reservoir, in combination, a liquid supply pipe, through which liquid under pressure is supplied to said reservoir, so as to issue from the pipe as a jet, said pipe being sealed from said interceptor, and extending coaxially down said drain-tube and nearly to the lower end of same and being of smaller external diameter than the internal diameter of the drain-tube, in order that the jet of liquid passing out of the lower end of said supply pipe to said reservoir shall produce an injector action within the drain-tube and thereby assist the return of the intercepted liquid to the reservoir, and a float controlled valve for automatically regulating the rate of exit of the liquid from the liquid supply pipe to maintain constant the level of the liquid within the reservoir.

7. In a multiple head machine for filling receptacles with liquid, having a liquid reservoir, suction producing means for sucking the liquid from said reservoir into the receptacles by partially evacuating them, and a liquid interceptor connected between the suction producing means and the filling heads, to intercept liquid and prevent its passage to said suction producing means, and a drain-tube, through which drain-tube the intercepted liquid returns to the reservoir, in combination, a pipe through which liquid is supplied, under pressure, to the reservoir, so that the liquid issues from said pipe as a jet, said pipe being so arranged with respect to said drain-tube that said jet exerts a continuous injector action on the drain-tube, which assists the return flow of the intercepted liquid to the reservoir, together with a float controlled valve within said interceptor for cutting off the latter from said suction producing means, when the liquid intercepted therein exceeds a predetermined level, and a float controlled valve for automatically regulating the rate of exit of the liquid from the liquid supply pipe to maintain constant the level of the liquid within the reservoir.

8. In a multiple head machine for filling receptacles with liquid, having a liquid reservoir, suction producing means for sucking the liquid from said reservoir into the receptacles by partially evacuating them, and a liquid interceptor connected between the suction producing means and the filling heads, to intercept liquid and prevent its passage to said suction producing means, which interceptor is situated at a higher level than the filling heads, and a drain-tube having its lower end continually immersed in the liquid within the reservoir, through which drain-tube the intercepted liquid returns to the reservoir, in combination, a liquid supply pipe, through which liquid under pressure is supplied to said reservoir, so as to issue from the pipe as a jet, said pipe being sealed from said interceptor, and extending coaxially down said drain-tube and nearly to the lower end of same and being of smaller external diameter than the internal di-

ameter of the drain-tube, in order that the jet of liquid passing out of the lower end of said supply pipe to said reservoir shall produce an injector action within the drain-tube and thereby assist the return of the intercepted liquid to the reservoir, together with a float controlled valve within said interceptor for cutting off the latter from said suction producing means, when the liquid intercepted therein exceeds a predetermined level, and a float controlled valve for automatically regulating the rate of exit of the liquid from the liquid supply pipe to maintain constant the level of the liquid within the reservoir.

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