

June 10, 1930.

K. KIEFER

1,763,240

FILLING MACHINE

Filed March 16, 1922

2 Sheets-Sheet 1

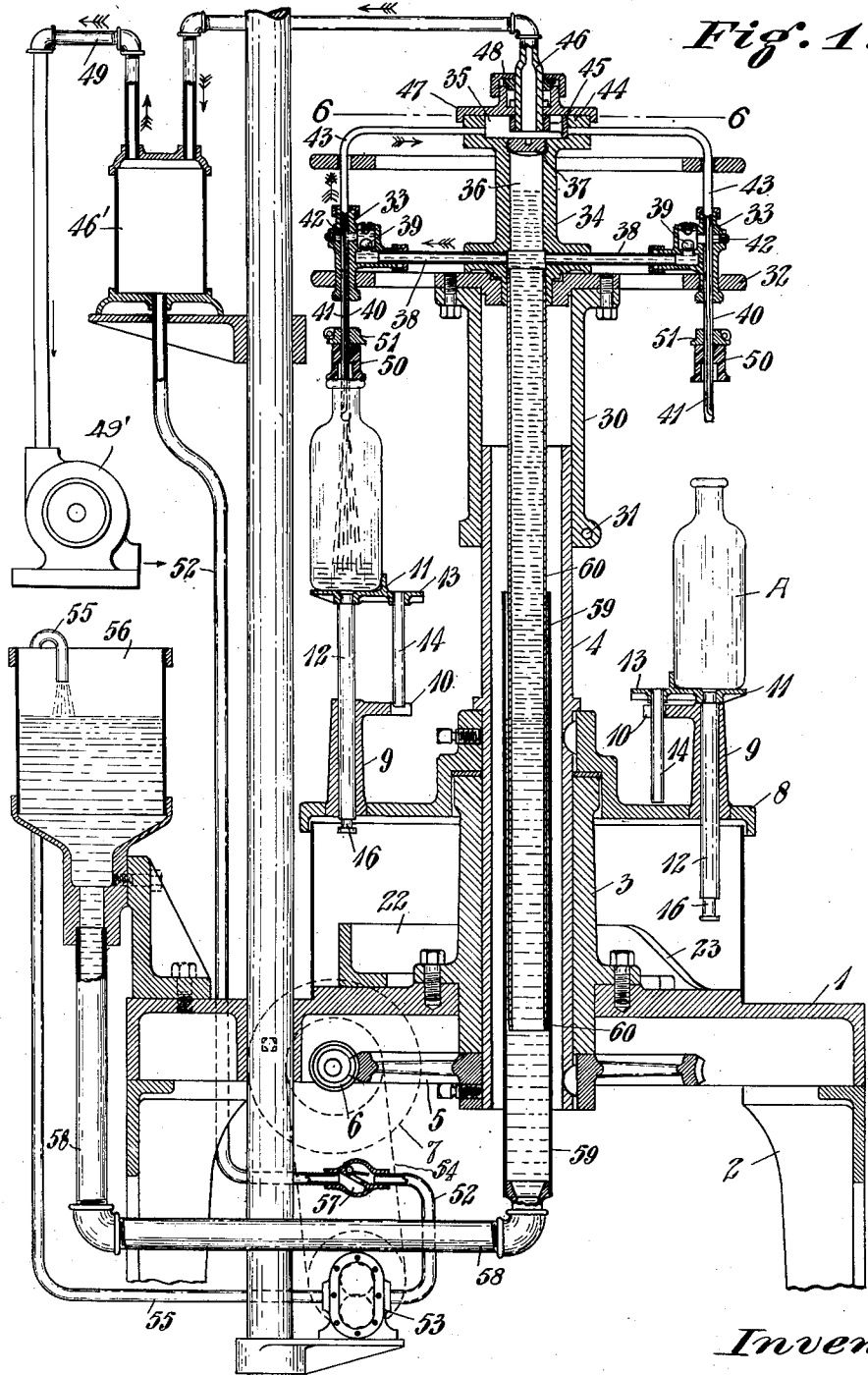


Fig. 1.

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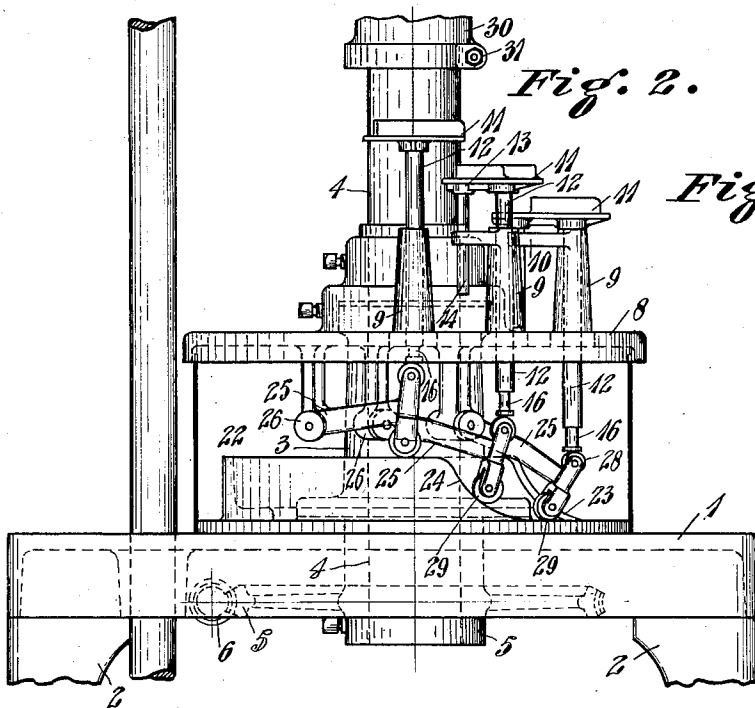


Fig. 2.

Fig. 4.

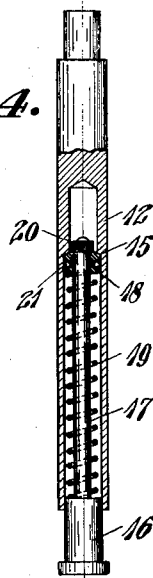


Fig. 3.

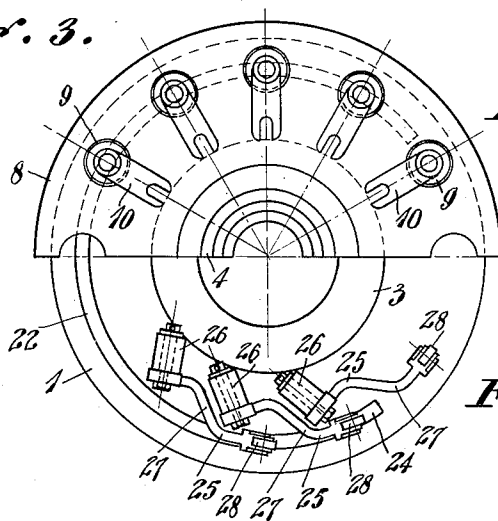


Fig. 5.

Fig. 6.

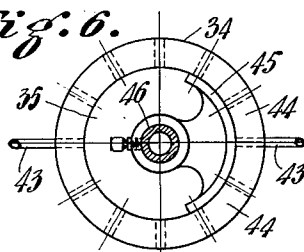
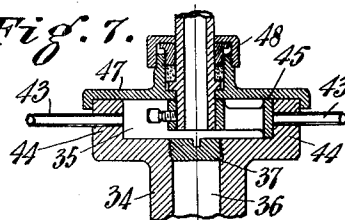


Fig. 7.



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FILLING MACHINE

Application filed March 16, 1922. Serial No. 544,236.

My invention relates to devices for filling containers with liquid by the aid of suction, withdrawing the air from the containers and allowing the liquid to enter under the atmospheric pressure.

The object of my invention is to provide such a device in simple and compact form, for rapid and efficient filling of containers to uniform height with a minimum of hand labor and economy of power. A further object is to make such a device readily adjustable for containers of different heights, especially when a number of filling means are provided for filling a number of containers concurrently. Another object is to provide for variations in containers of a given size, in conjunction with rapid power operation. Other objects will appear in the course of the ensuing description.

I attain these objects by the device illustrated, for example, in the accompanying drawings, in which—

Figure 1 is a vertical cross-section of a machine embodying my invention, omitting the container-lifting arms and part of the container lifters or carriers;

Fig. 2 is a corresponding partial side elevation, showing part of the container lifters and their operating arms;

Fig. 3 is a partial plan view of the base, column and rotary table, showing part of the container-lifting arms and their track and part of the container-lifter guides;

Fig. 4 is a detail side elevation, enlarged, of one of the container-lifter stems, partly in vertical section with interior parts revealed in elevation;

Fig. 5 is a detail plan view of the expanding ring used inside the stem of Fig. 4, enlarged;

Fig. 6 is an enlarged detail plan view of the lower part of the valve head and the valve member therein on the suction pipe, the latter being in cross-section on the plane of the line 6—6 of Fig. 1; and

Fig. 7 is a vertical cross-section of the valve head and associated parts, on the scale of Fig. 6, corresponding to the section of Fig. 1.

Base 1 has legs 2, parts only of which are

shown, to support it a desired height above the floor; and in center it has upright hub 3 extending above and below, with upright hollow column 4 journaled in the hub. Below hub 3 worm gear 5 is fixed on column 4, meshing with worm 6 driven by pulley 7 (dotted lines) from any suitable power source. Above hub 3 table 8 is fixed on column 4 and has a circular series of upright guide-hubs 9 concentric with column 4, each having a fork projected radially inward. Container carriers or lifters 11 are tray shaped, with hollow stems 12 extending down through guide-hubs 9; and each carrier 11 has radially inward projection 13 with guide-rod 14 extending downwardly through respective fork 10, holding carrier with open or unflanged side radially outward to receive bottle A or other container, set thereon by the operator.

Each hollow stem 12 has inside in its upper part an annular shoulder 15. A plunger comprises the lower head 16 fitting snugly up in lower end of stem 12, and the shank 17 extending up inside stem. Collar 18 surrounds shank 17, with spring 19 coiled around shank between head 16 and collar 18, and nut 20 screwed on upper end of shank to act as a stop against upper side of collar 18. In periphery of collar 18 is an annular groove receiving expanding ring 21, so that when this assembly is inserted up in stem 12 with collar 18 up against shoulder 15, ring 21 frictionally coacts with inside stem walls to hold these parts in position, but for ready removal or insertion.

Base 1 has circular track 22 coincident with the circular series of container lifters just described (Fig. 3) having a major part of its extent higher than a minor segment thereof, with the two parts joined by inclines 23 and 24 (Fig. 2). For each container lifter, a lifter arm 25 is fulcrumed on a depending bracket 26 on the under side of the table 8, and the arm 25 has a compound bend 27, so that the fulcrum is radially inward behind the next arm 25 in the series, but the outer or free end of the arm is under its respective lifter, with a roller 28 up against the lower enlarged end of the head

16 of the lifter. Also, this outer end of each arm 25 has a depending fork journaling a roller 29 that rolls on the track 22.

Column 4 is in two sections, the lower one having the driving worm gear and the table fixed to it as above described, and the upper section 30 being clamped around the upper end of the lower section as at 31, so that it can be slid up or down on the lower section and clamped accordingly, thus making the column extensible. On top of upper section 30 is fixed a concentric spider 32 (Fig. 1) carrying a concentric circular series of filler-heads 33 over respective container carriers or lifters 11. Fixed in center of this spider 32 and standing up therefrom is the valve head 34 with upper valve chamber 35 separated from lower hollow pedestal 36 by plug 37. Liquid conductor tubes 38 lead from interior of pedestal 36 out into respective filler-heads 33, which have, above the entrances of these tubes 38, ball check valves 39 seating downward, and which have, beyond these valves 39, up and down passages through which extend filling tubes 40 extending down to enter containers A raised on respective lifters 11.

Each filling tube 40 has an inner suction tube 41 opening out through its side near its open lower end and extending up inside tube 40 above space 42 in filler-head 33 which communicates with inside annular space of tube 40 around tube 41 above check-valve 39. Upper end of suction tube 41 connects by curved suction pipe 43 with inside of hollow valve head or chamber 35 through circular wall 44 thereof; these pipes 43 from the various filling tubes entering this chamber 35 at regular intervals therearound. Suction-controlling valve 45 is segmental, fitting as closely as required against inner surface of wall 44 and covering from three to four entrances of pipes 43, as here shown, as the valve head 34 rotates with column 4 and valve member 45 is held stationary on central suction conducting means or pipe 46 entering valve head 34 through cover 47 thereof, with a stuffing-box 48 around pipe 46. Lower end of pipe 46 is open and can communicate with suction pipes 43 uncovered by member 45; and this pipe 46 leads, through a liquid-trap 46' and pipe 49, to suitable suction-creating means, such as the vacuum pump 49'. The removable plug or partition 37 may be removed when the valve chamber cover and valve element 45 are removed, permitting access not only to the valve chamber 35 but to the liquid passage therebelow, for convenient cleaning of these spaces.

Elastic air-tight container connection 50 surrounds each tube 40, held thereon by clamp 51 for clamping at any height along the tube above the openings of the outer liquid conducting annular space and the suction tube 41.

Return pipe 52 leads from bottom of liquid

trap 46' to rotary pump 53 driven by belt 54 (dotted lines) from the same shaft that carries worm 6; and pipe 55 leads from discharge side of pump 53 into liquid-supply reservoir 56. A check-valve 57 in return pipe 52 opens toward pump 53.

Liquid-supply pipe 58 leads down from reservoir 56 and inward to center of machine, where it connects with upright stationary liquid conductor 59 extending up a proper distance inside hollow column 4. Liquid conductor 60 has its upper end connected with interior of hollow pedestal 36, and its lower part extends loosely down into stationary conductor 59.

Rotation of column 4 draws arms 25 along track 22 raising lifters 11 as arms 25 ride up on incline 23, holding them up during travel on the upper section of track, then lowering lifters as arms pass down incline 24, leaving them down during travel along the lower track section. Bottles A or other containers placed on lifters 11, when raised thereby receive tubes 40 and connections 50 seal the container interiors against the atmosphere. Segmental suction valve member 45 is so positioned that suction tubes 41 are opened to suction pipes 46 and 49, through respective pipes 43 at about the time the sealing commences. The suction-creating means 49', continuously operating through the pipes 46 and 49, thus reduces the pressure in the container, and also the pressure in liquid conductors 59 and 60 through connections 38 and 33, in which conductors the liquid rises to the level in reservoir 56 and seals the space between loosely fitting conductors 59 and 60. The reduction of pressure in these conductors and spaces results in further rise of the liquid, under the atmospheric pressure on the liquid in reservoir 56, and the check-valve 39 opens under this pressure and the liquid discharges into the container down through filling tube 40 around suction tube 41 until level of liquid in container reaches side inlet of suction tube 41, after which, if valve 45 still leaves pipe 43 open, liquid is drawn off through the suction means into trap 46' and returned by pump 53 to supply reservoir 56. Thus the container cannot be filled above suction tube side opening in filling tube 40. The parts are so proportioned that valve member 45 closes pipe 43 about when this level is reached, so that actual overflow through suction means is minimized. Pump 53, by positive action, keeps trap 46' and the suction system more thoroughly drained than mere gravity would when compelled to open check-valve 57 against atmospheric pressure.

The proportioning of the parts also is such that valve member 45, closing pipe 43 at about the time of complete filling of the container, prevents atmospheric inflow at suction tube 41 as container is lowered when arm 25 goes down incline 24, breaking the seal

at connection 50; thus avoiding excessive duty of the suction-creating means. When this seal is broken, atmosphere forces liquid up in filling tube 40 slightly, but closes check-valve 39 quickly; thus retaining liquid in filling tube 40 under the atmospheric pressure, ready for quick starting of filling operation on insertion of that tube into the next container applied thereto, as well as avoiding falling of the liquid in the conductors 59 and 60, likewise contributing to the fastness with which the machine may be operated.

The container lifters having their stems yielding to the arms 25, slight variations in the heights of the containers, due to inaccuracy in their manufacture, are compensated for automatically, without undue strains on the containers or the machine parts. Fulcruming the arms 25 behind adjacent arms permits these arms to be longer, and thus swing farther with a permissible angular range, than where a like number of arms are arranged around a like sized machine without this overlapping relation. Thus an ample up and down movement of the lifter, for convenience of the operator in putting on and taking off the containers, is afforded by comparatively simple and inexpensive mechanism.

The one liquid conductor, depending loosely in the other conductor, the junction thus made being sealed by the liquid, permits a very simple means for allowing rotation of the one, or adjustment thereof up and down with the upper section of the column 4.

Having the discharge end of the liquid conductor in the filling tube 40 below the inlet end of the suction or vacuum tube 41 permits a more quiescent state of the liquid at the moment of complete filling; as the liquid runs from the lower end of the tube 40 up through the upper part of the discharged body of liquid in the container, to the overflow through suction tube 41, and does not splash down into the main body of discharged liquid as it would if the liquid discharge were above the suction outlet. This contributes somewhat to the accuracy of filling. The proportioning and positioning of the valve member 45 should be such that the suction continues for a short time after the seal of the connection 50 is broken, so that the liquid will be drawn well up into both tubes 40 and 41 and thus not drip as the container is lowered from the tube, to be removed from the machine by the operator.

While certain constructional details are deemed preferable, as shown herein, I do not wish to be understood as being limited thereto, but what I claim as new and desire to secure by Letters Patent is:

1. In a filling machine, a rotary series of filling tubes, a reservoir below said tubes, a single liquid-supply conduit leading up from said reservoir and having conduits communi-

cating with said tubes, suction means, and means comprising a single valve intermittently placing said tubes in communication with said suction means.

2. In a filling machine, a rotary series of filling tubes, a reservoir below said tubes, a single liquid-supply conduit leading up from said reservoir and having conduits communicating with said tubes, suction means, a suction chamber concentric with said supply conduit but distinct therefrom, communicating with said suction means and filling tubes, and a single valve in said chamber intermittently placing said suction means in communication with said tubes.

3. A filling machine comprising a traveling series of filling tubes, means traveling with said tubes having a single liquid-supply conduit with branches to the respective tubes, having a suction chamber distinct from said liquid-supply conduit, and having suction conduits leading up from the respective liquid-supply branches into said suction chamber, and a single valve controlling communication of all of said suction conduits with said suction chamber incident to the travel of said tubes.

4. A filling machine comprising a suction chamber, a traveling series of filling tubes, means traveling with said tubes having a single liquid-supply conduit with branches to the respective tubes and having suction conduits leading up from the respective liquid-supply branches to said suction chamber, and a segmental valve element in said suction chamber, occupying a part only of said chamber, controlling said suction conduits incident to the travel of said tubes.

5. A filling machine comprising a traveling series of filling tubes, means traveling with said tubes having a single liquid-supply conduit with branches to the respective tubes and having suction conduits leading up from the respective liquid-supply branches, said means also having a circular valve chamber over said single liquid-supply conduit, into which chamber said suction conduits lead, said chamber having a removable cap and a removable partition in its bottom between said chamber and said liquid-supply conduit, and a valve element removably mounted in said chamber, controlling the suction conduits leading thereto.

6. A filling machine comprising a traveling series of filling tubes, means traveling with said tubes having a single liquid-supply conduit with branches to the respective tubes and having suction conduits leading up from the respective liquid-supply branches, unitary heads connecting said liquid-supply and suction conduits with the respective tubes, each having a downwardly-seating check valve interposed in the respective liquid-supply conduit, said traveling means also having a circular valve chamber into which the

suction conduits lead, and a segmental valve element in said chamber, occupying a part only of said chamber, controlling said suction conduits incident to the travel of said tubes.

6 7. In a filling machine, a rotary circular series of filling tubes, liquid-supply means and overflow means each comprising a stationary part, and a part rotating with said
10 tubes and disposed along the axis of rotation and communicating radially with said tubes, a circular series of container lifters rotating in coacting relation to said tubes, each having yielding engaging means, a circular
15 series of arms rotating with said lifters, each arm fulcrumed radially inward behind a next arm and extending out into lifting relation with the yielding engaging means of a respective one of said lifters, and means for actuating said arms.

20 8. In a filling machine a hollow central shaft, a rotary series of filling tubes carried by said hollow central shaft, a reservoir open to the atmosphere and below said filling tubes, a liquid supply connection from said reservoir to said filling tubes partly within said
25 hollow shaft and suction means for elevating the liquid from said reservoir to the filling tubes.

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