Aug. 8, 1950 E. D. RAPISARDA 2,518,064

CAN FILLING MACHINE

Filed June 22, 1946 4 Sheets-Sheet 1

Fig. 1.

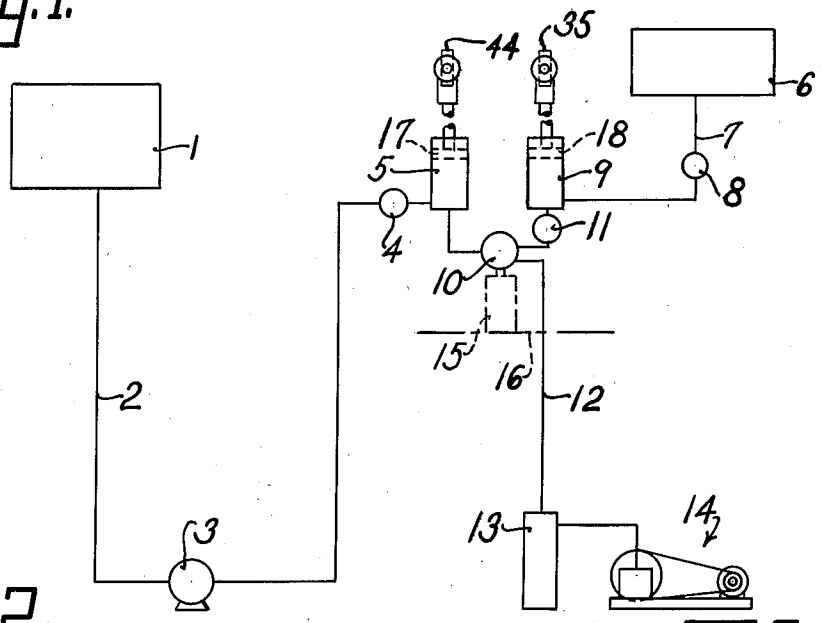


Fig. 2.

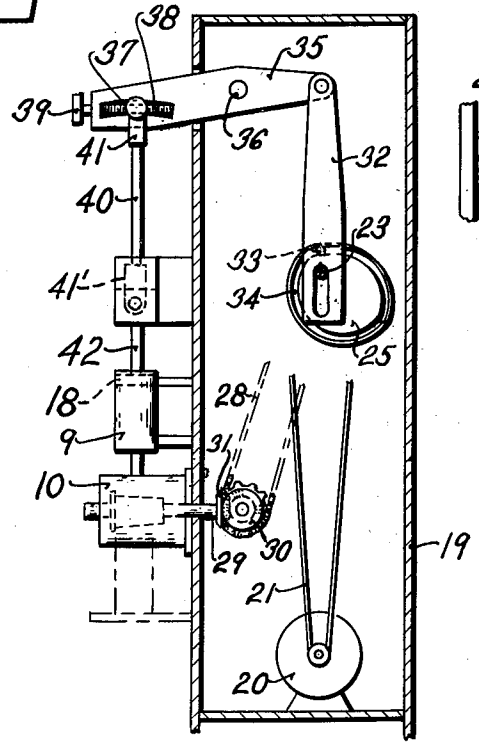
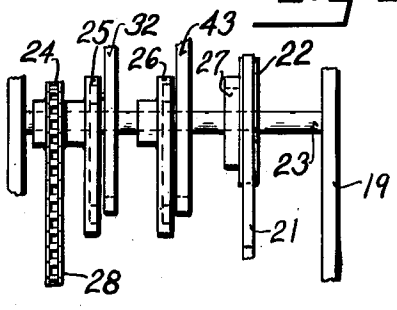


Fig. 3.



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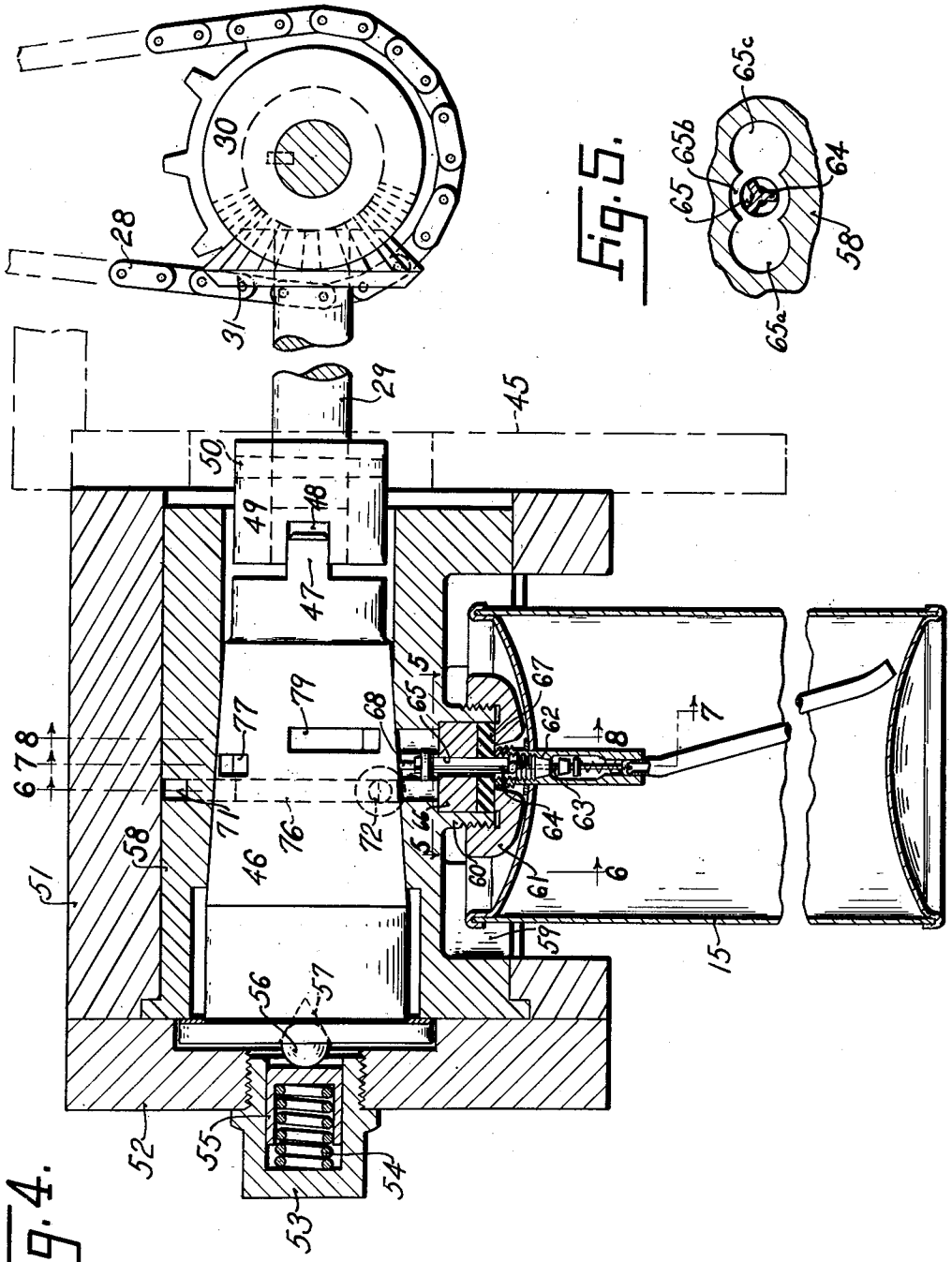


Fig. 4.

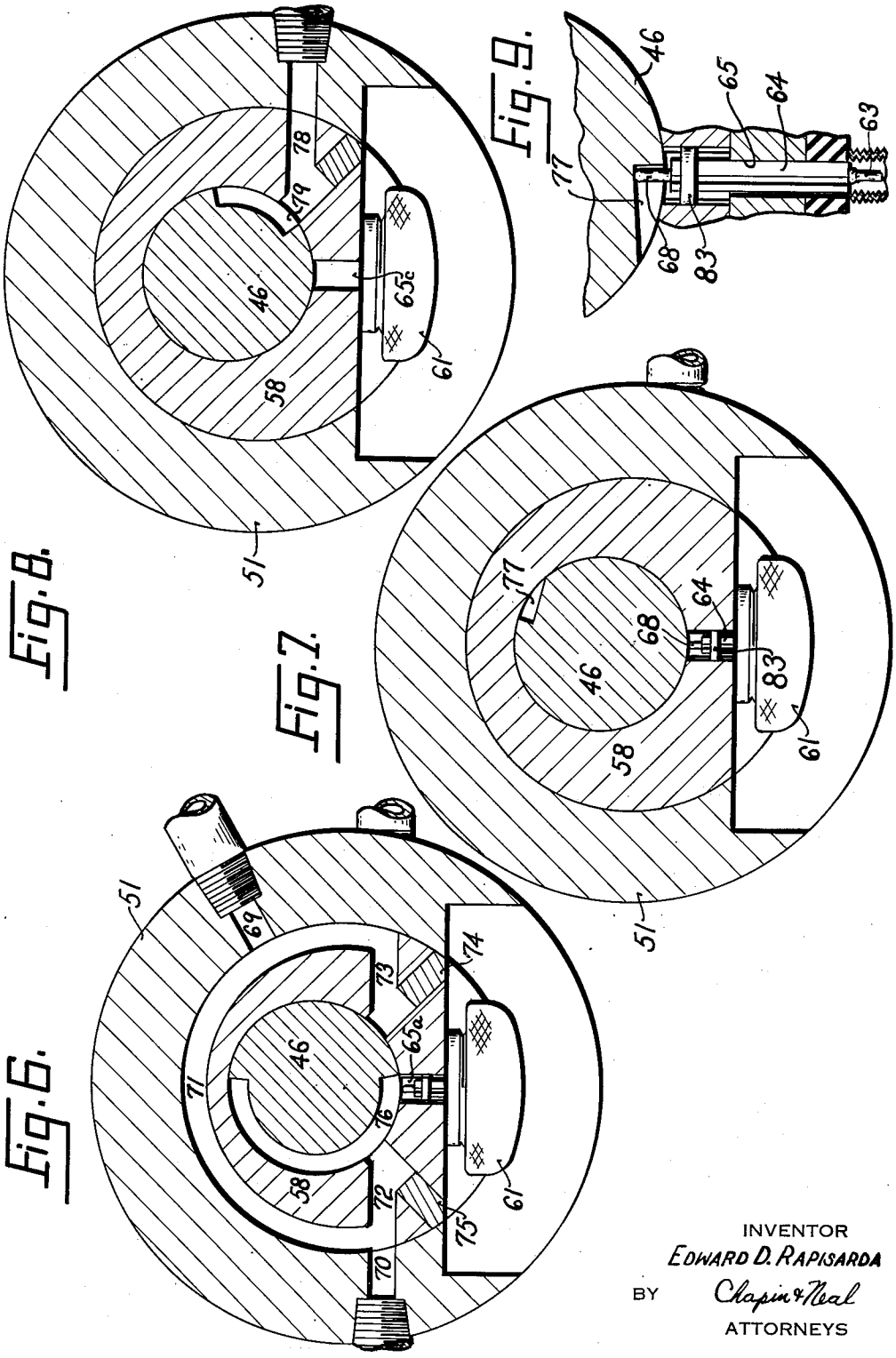
Fig. 5.

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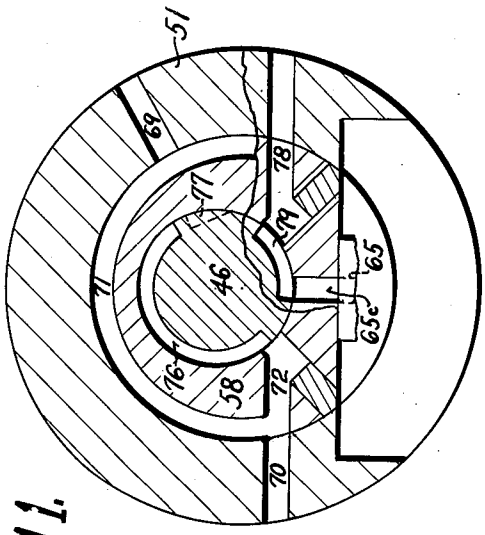


Fig. 11.

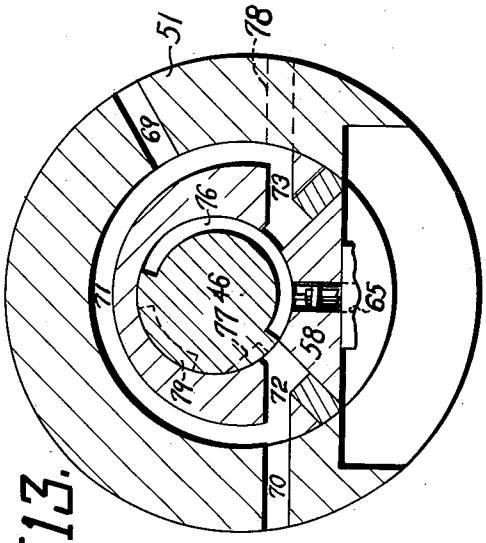


Fig. 13.

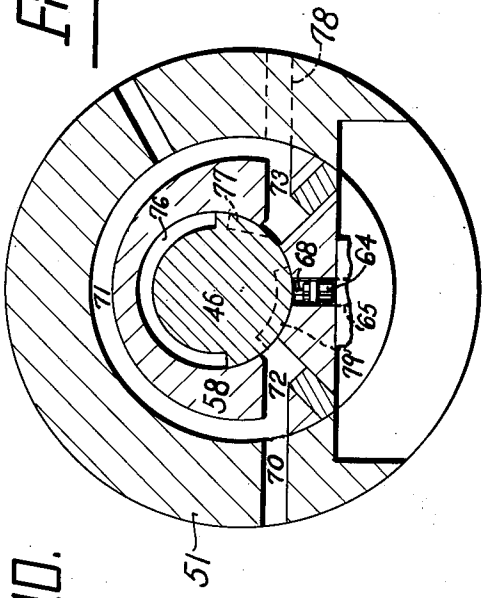


Fig. 10.

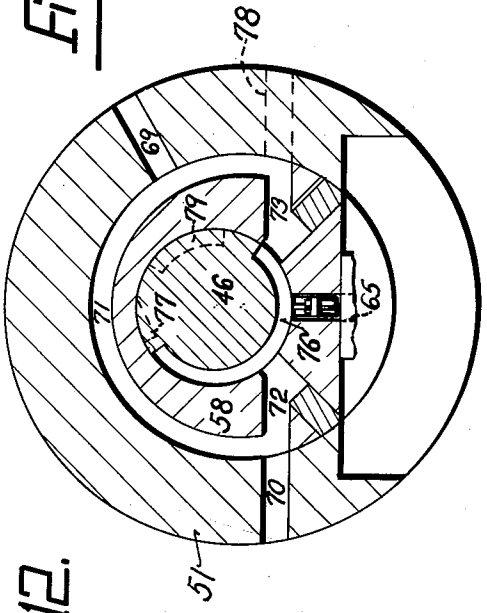


Fig. 12.

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UNITED STATES PATENT OFFICE

2,518,064

CAN FILLING MACHINE

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Application June 22, 1946, Serial No. 678,571

5 Claims. (Cl. 226—100)

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This invention relates to an improvement in can filling machines. Its main purpose is to provide a machine for filling a can to carry and spray an insecticide. An understanding of the can, its contents, and its use will help an understanding of the purpose of this machine invention. The can is to hold its insecticide under spraying or atomizing pressure. It has a self-closing valve, like a tire valve, to hold its pressure. The user is expected to open the can valve by finger pressure applied so as to press the stem against the spring of the valve which spring normally holds the valve closed.

Of course insecticides are chemical compositions and it is some times desirable to draw a vacuum in the can before the filling of it. When filling cans with an offensive material it is highly desirable to avoid spilling, particularly when it is poison. When filling cans with material needing to be kept under pressure, particularly the offensive materials, it is desirable to provide the pressure by use of a pressure liquefied gas of an inoffensive kind, to put a quantity of the liquefied gas in the can during the filling operation.

These features of the can and its contents should be kept in mind to better understand the nature of the problem involved in the improved can filling machine disclosed in this specification.

Many elements of the machine are so well known that they need no more than mere indication and naming. For this reason the drawings of the disclosure have been cut down to a minimum with the desire to show the detail of the machine only in the can filling valve assembly with enough other detail added to indicate the way of providing for timing relations.

In the drawings,

Fig. 1 is a diagrammatic view of a can-filling apparatus with parts omitted;

Fig. 2 is a schematic view of some of the apparatus to deliver fluids to the filling valve;

Fig. 3 is a schematic view of the drive shaft and mechanism driving the parts shown in Fig. 2;

Fig. 4 is a sectional elevational view of the filling valve and mechanism for the can filling nozzle, showing also a can in position for filling;

Fig. 5 is a fragmentary sectional plan view taken on line 5—5 of Fig. 4 to show the machine nozzle outlet passage arrangement;

Fig. 6 is a cross sectional view taken on line 6—6 of Fig. 4;

Fig. 7 is a cross sectional view taken on line 7—7 of Fig. 4;

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Fig. 8 is a cross sectional view taken on line 8—8 of Fig. 4;

Fig. 9 is a fragmentary sectional view on an enlarged scale showing the nozzle and valve plug detail on completion of the filling operation;

Figs. 10, 11, 12 and 13 are composite views on a reduced scale showing relative positions, during a filling cycle, of the valve passages shown separately in Figs. 6, 7 and 8.

The machine indicated is an example adapted for the following preferred cycle of can filling operations. A can pressed upwardly against the filling nozzle of the machine has its can valve pressed open, a vacuum is drawn in the can, a measured quantity of liquid insecticide is fed in, a measured quantity of an inoffensive liquefied gas is forced in to hold the can contents under pressure, some of this liquefied gas may be fed in simultaneously with the insecticide but enough is fed in toward the end, so as to be back of insecticide after the latter is all in and alone occupy the space of the machine filling nozzle passage connecting with the can nozzle. Then the can valve is permitted to close to retain the pressure. The can is then released from the machine filling nozzle. Any material spilling out of the machine nozzle or can nozzle top as the can is taken away is the inoffensive material alone, i. e. the liquefied gas. It is released to the atmosphere passing off as a gas. The cycle stated is preferred. Of course the machine is adapted to carry out an equivalent cycle with variations in detail and with various insecticides and liquefied gases or volatile liquids for the relatively inoffensive material. If the character of the materials used does not make the drawing of the vacuum in the can useful that vacuum drawing step can be easily omitted by cutting off its operation, per se, in obvious ways.

The machine indicated will carry out the whole cycle automatically. The first step of pressing the can to a pressure fit with a filling nozzle may be done by hand or any well known can or bottle filling step by step feed of the container and its presentation to the machine nozzle. Such step by step container feeding per se is in so many can filling machines that a showing has been omitted. It is merely indicated by a belt feed of containers or cans.

The parts of the machine are diagrammatically shown by Fig. 1. It includes a gas supply tank 1 with outlet 2, booster pump 3, mechanical control valve 4 and a pressure piston cylinder 5 with its measuring chamber for the gas delivery. The gas is under heavy pressure; in the example

under consideration it is in a liquefied state. For convenience it will be called gas. The pump could as well be an intercooling device, the purpose being to prevent gasifying of the liquid in tank 1 and outlet 2. For the delivery of an offending liquid, (for convenience it will be called toxic), a toxic supply tank 6 with outlet 7, a mechanical control valve 8, and toxic pressure piston cylinder with measuring chamber 9 is shown. Chambers 5 and 9 each lead to a filling valve 10, the toxic line having a check valve 11. Also connected with valve 10 is a vacuum line 12 with vacuum tank 13 and vacuum pump 14. A can 15, with its valved inlet, is lifted into the place indicated with platform 16 automatically by mechanism not shown, or the can could be placed in position by hand. It is fitted under the discharge nozzle of valve 10, as will be later described, where the can is filled during the cycle of operation. The can is then lowered and replaced by a succeeding can.

A complete cycle of operation in the machine is as follows. The can 15 is pressed in position to receive the discharge from the outlet nozzle of valve 10. The vacuum pump 14 connected through the valve 10 nozzle assembly, evacuates the can. When the can is emptied of air, the toxic and liquefied gas are forced into can 15 by the operation of pistons 17 and 18 in chambers 5 and 9, respectively. The mechanical control valves 4 and 8 in each supply conduit prevent any liquid discharge into the supply chambers during the pressure strokes. The strokes of both the toxic and the gas feeding pistons commence simultaneously. However, the toxic piston 18 finishes its stroke prior to the gas piston 17. At the finish of the toxic stroke the can is not as yet full. As a distinct step in the filling operation the discharge of gas is continued after the toxic supply stroke has ceased. Gas alone is then supplied in the passage from valve 10 to back of the toxic mixture in the can. This gas movement at the end of the cycle not only rinses the passages of valve 10 of all toxic material but also tends to trap the toxic or offensive material in the can under the final amount of gas separately delivered to the can. Immediately after the final amount of gas is forced into the can, the mechanism of valve 10, as will be described, automatically permits the automatic closure of the self-closing can valve. The can 15 is then lowered. Any spilling of material on the top of the can as the can is freed of its pressure fit connection with the filling nozzle is of a non-offending nature quickly evaporating and leaving no chance for any of the offending or toxic material to be left on the can surfaces.

Considering now some of the pertinent operating mechanism of the machine for a further understanding of this invention, the drawings of Figs. 2 and 3 will be discussed in connection with the driving mechanism for the toxic and gas feeding pistons.

The standard 19, Fig. 2, represents a casing structure supporting operative machinery. A motor 20 drives a belt 21 connected to a driving pulley 22, Fig. 3, on shaft 23. On shaft 23 are also fixed a sprocket wheel 24 and two cam wheels 25 and 26. Between the driving pulley 22 and th driven wheels is a single tooth clutch or connection adapted to drive for one revolution the shaft 23, having the sprocket and the cam wheels on it. One revolution of the shaft 23 corresponds to one cycle of operation for the machine. It will be understood in connection with these parts that any suitable mechanism, not shown, such as a hand, foot or automatic device as in a punch press, is provided for tripping the clutch 27 to commence the cycle. Also any suitable conveyor mechanism common in can filling machines generally and operating intermittently, but not shown herein, raises the platform 16 to place a can in position to be filled, and after the can is filled, lowers it from operative contact with the nozzle of valve 10. The machinery for performing these detail functions takes many forms and is well known to those skilled in this art of can filling machines. This machinery indicated in the drawings also is adapted by the one way clutch 27 for stopping after one cycle of operation or for automatically recommencing another cycle to fill a series of cans brought up on a continuous conveyor belt, or to fill a series of cans fed by hand. These operations are all common detail functions of the many types of elements used in this art. While they relate to operating successive cycles, we are concerned here with only a single cycle to disclose what each one of the successive cycles is rather than the way to perform the mere succession of cycles.

The sprocket wheel 24 and a chain drive belt 28 rotate a valve shaft 29 through bevel gears 30 and 31. The wheel 25, Figs. 2 and 3, operates the piston 18 in toxic chamber 9. A crank arm 32 slotted in its lower section to receive shaft 23 is provided with a pin and roller connection 33 in a cam groove 34 on the face of wheel 25. It is to be noted the cam groove 34 is provided with a dwell at the beginning of the cam revolution to allow time for the can conveyor and vacuum mechanism to operate at the start of the cycle. The upper end of crank arm 32 is pivoted to one end of a rocker arm 35 which is in turn pivoted on a fixed rocker shaft 36. The other end of rocker arm 35 is provided with an arcuate slot 37 with a threaded bar 38 mounted in the slot and adjustable by a handle 39. On bar 38 one end of a variable stroke arm 40 is pivoted by a threaded collar connection as at 41, the other end being threaded in a similar collar connection 41', the latter being pivotally secured as by a cross head connection to a piston rod 42 for piston 18.

The grooved cam wheel 26 for the gas delivery control has similar connections between a crank arm 43, Fig. 3, for wheel 26 and a rocker arm 44 and gas piston 17, Fig. 1. Wheel 26 to control gas delivery also has a dwell provided in its groove to pause while the can conveyor operates when its operation is automatic. However, the groove is shaped to provide a longer down stroke for piston 17 than shown for piston 18 of the toxic delivery apparatus. It will be readily understood that while both the gas and toxic piston strokes are commenced at the same time, the toxic stroke and hence delivery will be completed prior to the gas stroke and delivery. How these timed strokes are related to the separate valve conduits and the nozzle outlet of the valve will be later described.

It is to be noted further that the two piston strokes may be adjusted for a variable volumetric or measuring delivery by the adjusting means illustrated by handle 39 and bar 38. An adjustment of the connection 41 toward the pivot 36 of the rocker arm 35 will cause a shorter piston stroke of arm 42 than would be the case of an adjustment away from such pivot.

Fig. 4 illustrates details of the machine filling

valve. As mentioned above the valve parts are driven through the sprocket wheel arrangement with bevel gears 30 and 31. The shaft 29 is journaled in a mounting bracket 45 and is provided with a flexible coupling connection with valve plug 46 by a tongue 47 of the plug and a groove 48 in bearing block 49 fixed to shaft 29 by a key 50.

The plug 46 is enclosed by the casing of filling valve 10 which also comprises a cylindrical body 51 with an end block 52, a threaded bearing plug 53 with a compression spring 54 and cap 55 yieldably bearing against a ball 56 engaged by a cone shaped recess 57 in the head of plug 46.

The plug 46 is seated in a cylindrical valve plug casing 58 which is inserted in the body 51 as by a press fit. The body 51 and casing 58 are cut at the bottom to form a recess 59 for the reception of the top portion of a can 15. Centrally of the recess is a hub 60 depending from casing 58. A knurled filling head 61 is threaded to the hub 60 for positioning the valve of a can nozzle 62 in a depression of head 61. The valve of the can nozzle 62 is similar to a common type of tire valve, permitting, whenever its stem 63 is depressed, the inlet of a substance forced through it under pressure to the can or the outlet of a substance from the can through the nozzle if forced by can pressure to the atmosphere. This kind of a valve is so well known in the form of a tire valve that no details in structure will be described. The valve has many forms, the action is the same and it is intended as the kind of valve in the cans filled with the use of this machine.

Centrally of the hub 60 and in the machine is a vertical stem 64 of spider like cross section loosely and slidably fitted for vertical movement in a nozzle outlet 65 through a block 66 and a washer 67 fitted in the hub 60. The washer is held in the position shown by the knurled head 61. Washer 67 is of rubber-like material and compressible to make an anti-leak pressure fit of the can nozzle 62 with the nozzle of valve 10. At the top of stem 64 is a pin 68 bearing on the surface of plug 46 as will be described.

The passages connecting the liquid gas, toxic and vacuum conduit pipes with the nozzle outlet 65 to the can will be considered in connection with Figs. 5, 6, 7 and 8. In Fig. 6 the gas and toxic conduits from each piston are tapped through the body 51 at inlet ports 69 and 70 respectively. These ports lead to a circumferential groove 71 cut in the cylindrical casing 58 and connecting two cored inlet passages 72 and 73 leading to the periphery of plug 46. Radial passages, plugged at 74 and 75, provide the proper angle to the valve plug 46 for the passages 72 and 73. To cooperate with these inlet passages the surface of plug 46 is provided with a circumferential filling groove 76 cut to register with passages 72 and 73 and the connection to nozzle outlet 65 all according to the timed relation to be described in connection with the remaining mechanism.

In Fig. 7 the plug 46 is shown with a notch 77 cut in the plug circumference to cooperate with the pin 68 and into which notch pin 68 of stem 64 may project under pressure exerted by the "tire valve" of the can nozzle which normally urges its stem 63 upwardly toward closed position. It will be readily seen that when the form of plug 46 depresses the pin 68 and extends it down beyond the end of nozzle 65, see Fig. 4, said pin engages the stem of said tire valve and the latter is opened for the passage of fluid into the can.

The vacuum connection is shown by Fig. 8. An inlet port 78 is connected with nozzle outlet 65 by a vacuum groove 79, cut in the plug 46 circumference to cooperate with this inlet. The rotation of plug 46 brings vacuum groove 79 in registration with both inlet 78 and the passage from nozzle outlet 65. This occurs early in the cycle as will be explained.

The passage arrangement to the nozzle outlet 65 from the vacuum and filling grooves is shown in cross section by Fig. 5. The nozzle outlet 65 is connected by three intersecting circular cored openings 65*a*, 65*b*, and 65*c* in the plug casing 58. This forms a common outlet port for the grooves. It is also the inlet port of the machine valve nozzle outlet 65. The central opening 65*b* provides a bearing for a guide washer 83, Fig. 7, on the stem 64, the two side openings 65*a* and 65*c* leading from the liquid gas and toxic filling groove 76 and the vacuum groove 79.

One revolution of the plug 46 is shown in successive stages during the cycle of operation by Figs. 10, 11, 12 and 13. In Fig. 10 the pin 68 and thus stem 64 is being held downwardly by the surface of plug 46. The can lifting mechanism or an operator's hand brings a can, see Fig. 4, upwardly to place the can nozzle against the washer 67 with an anti-leak pressure. The can inlet is underneath the nozzle outlet 65 of the machine valve the lower end of stem 64 depressing the can valve stem 63. The can nozzle is thus opened when the can 15 is positioned for filling. As shown in Fig. 10, the leading edge of the vacuum groove 79 has unsealed the opening to nozzle outlet 65 and is approaching the vacuum port 78 for vacuum connection. The view shown in Fig. 11 illustrates the relative position of the grooves 79 and 76 at the next stage of the cycle, when the vacuum is drawn into the can. Portions of the body 51, plug casing 58, and plug 46 are cut away for purposes of clarity. It will be noted also that the filling groove 76 has unsealed the inlet passage 72 directly connected to the toxic inlet port 70.

In the period between the position of the plug 46 as in Fig. 11 and that shown by Fig. 12 the filling groove 76 successively unseals the inlet passage 72, the opening to nozzle outlet 65, and then the inlet passage 73. At the moment the opening to the nozzle 65 is connected to inlet 72 the toxic and gas pistons have commenced their strokes. It is initially, therefore, a mixture of gas and toxic liquid flowing under pressure into the can, the gas inlet 69 being connected by plug casing groove 71 to the inlet passage 72. A certain volume of mixed liquids is thus introduced into the can while the plug is rotating to unseal the inlet passage 73. As this latter passage is connected by groove 76 to nozzle 65, the gas from port 69 then finds additional connection through groove 76 and passage 73, mixing in the common outlet port of the valve with the toxic mixture introduced through passage 72.

During the rotation of plug 46 to the position shown by Fig. 13 the toxic piston has completed its stroke. Fig. 13 shows the groove 76 having just sealed the inlet passage 72. Pressure from the toxic piston having ceased, all toxic material is trapped in the inlet port 70, the liquefied gas exerting pressure through casing groove 71 to prevent any discharge of toxic. The check valve 11, mentioned in reference to Fig. 1, prevents gas pressure affecting the toxic supply con-

duit. Gas alone is then being introduced into the can when the parts are positioned as in Fig. 13. It will be appreciated that in this position of the parts the liquefied gas is rinsing out the groove 76, the common valve outlet port and the nozzle outlet 65. No offensive residue of toxic is left in these conduits to dribble on the can surfaces, on separation of the can nozzle from machine nozzle 65.

As the gas piston completes its stroke the groove 76 seals off the opening to nozzle 65. The notch 77 of the plug is then positioned to receive the pin 68 of stem 64, see Fig. 9. The stem 63 of the can valve being spring pressed pushes the machine stem 64 upwardly thereby automatically closing off the can nozzle and trapping the two liquids in the can. It will be seen by Fig. 9 showing the notch 77 with pin 68 projected into it that liquid residue in the nozzle 65 and common inlet to it from plug 46 may dribble on the can surface as the anti-leak pressure fit is released by the lowering of the can by hand or of the platform of the can conveyor with the can on it when an automatic conveyor can feeding device is used. As the can is lowered the stem 64 will also be lowered by gravity or be cammed downwardly by the slope of notch 77 in the event stem 64 should stick. Any liquid residue, however, which drips on the can will be liquefied gas and of a non-offending nature.

From the description of the example of my invention, a machine adapted to introduce a toxic material and a non-toxic gas under liquefying pressure, into a can has been disclosed with the preferred cycle of operations for each can. However, such machine is also useful for filling cans under pressure with any two or more materials one of which is offensive either because of smell, color, consistency or toxic nature and another one relatively inoffensive.

Having disclosed my invention, I claim:

1. A can filling machine comprising in combination a machine nozzle for anti-leak pressure connection with a can nozzle, movable means at the machine nozzle to press open and to release for closing a spring closed valve in the can nozzle, a rotary valve adapted to operate said means, said valve being supplied with a plurality of separate inlet ports, a common outlet port and passages through it to connect such inlet ports to the common outlet port in timed relation according to the rotary movement of such valve, said outlet port being the inlet end of the machine nozzle, automatic means connected to one of such inlet ports to draw a vacuum in a can, automatic means connected to another of such ports adapted to feed into the can a measured volume of a toxic material, automatic means connected to another of such ports adapted to feed a volume of non-toxic material alone, under substantial pressure, and after the toxic material, to complete the amount of material desired in the can, said rotary valve being formed to act with said opening means to make it function for opening the can valve and for releasing the can valve to permit its closure by its spring prior to breaking said pressure connection as the rotary valve is finishing one cycle, so that any spilling of material upon breaking said anti-leak connection between the machine nozzle and can nozzle will be of non-toxic material, means to rotate said valve and operate said automatic means in timed relation for carrying out the sequence of the can filling operation described.

2. A can filling machine having in combination a rotary supply valve and automatic means to turn it, a depending valve nozzle connected to the outlet port of said valve and formed to make tight connection with the nozzle of a can presented to the machine for filling, a depending loosely fitting stem mounted in the machine nozzle for limited vertical movement, said stem adapted to be engaged by the valve stem of a spring pressed self-closing valve in the can so as to lift the nozzle stem against the rotary part of the supply valve when the can is positioned for filling whereby the can valve will be pressed open, separate inlet ports for said supply valve which are connected to its outlet port according to the turning of the rotary part of such valve, localized means on said rotary part of the supply valve to release the stem of the can valve to permit self-closing of the can valve after said machine valve has turned to connect its inlet ports and its outlet port for the can filling operation and before the said tight connection is loosened, automatic means operable in timed relation to the turning of said rotary valve to feed materials in timed relation to a can presented to the machine with a tight connection with said filling nozzle at the beginning of a filling operation.

3. A machine for pressure filling cans with more than one fluid, comprising in combination a machine nozzle for anti-leak pressure connection with a can nozzle, means in the machine nozzle to open a spring closed valve in the can nozzle when and as long as said pressure connection is made, a rotary valve bordering on and perpendicular to the machine nozzle, a valve casing containing both the rotary valve and the machine nozzle, passages through the valve casing, said passages having ports adjacent the periphery of the rotary valve, spaced grooves in the periphery of the rotary valve to connect one or more of said ports to the bore of the machine nozzle according to the rotary movement of the valve, automatic evacuating means connected to one of such passages to draw a vacuum in the can, automatic pressure means connected to another of such passages adapted to feed into the can a measured volume of a toxic material less than the total capacity of the can, automatic pressure means connected to another of such passages adapted to feed a volume of non-toxic liquefied gas under substantial pressure into said can to completely fill it and flush all toxic material in the machine nozzle into the can while the anti-leak connection is maintained, means to rotate said valve and operate said automatic means in timed relation to each other for carrying out the sequence of the can filling operation described.

4. In a machine for pressure filling cans, the combination of a valve casing, a cylindrical valve sub-casing horizontally disposed within said valve casing, a round tapered valve in the sub-casing, said casing and sub-casing cut away at the bottom to form a recess of a size to receive the top portion of a can to be filled, a hub centrally located in the recess and depending from the sub-casing, a vertical stem of spider-like cross section centrally of the hub and supporting means to allow vertical movement of the stem in the hub, said supporting means including a terminal resilient washer compressible to provide an anti-leak pressure fit with a can nozzle of the spring pressed valve closed type, said vertical stem having its upper end bearing against the curved surface of the round tapered valve.

said valve having a cam recess on its surface in the path of said vertical stem when the valve is rotated to receive said upper end, passages through the valve casing, a peripheral recess in the sub-casing connecting with two of said passages, passages from said recess through the sub-casing, spaced grooves on the periphery of the round tapered valve, one of said grooves in line of rotation with the ports of said two passages through the sub-casing, a separate passage through the sub-casing connecting with a passage in the valve casing and with the second of said spaced grooves on the round tapered valve, said hub on said sub-casing having the top of its bore wide enough to register with either of said two spaced grooves on the periphery of the round tapered valve when said valve is rotated to respectively so position a groove, said vertical stem having means thereon and said hub having means therein to seat together in valve relation and stop the flow of material out the hub exit orifice, conduits connected to the passages in the valve casing, a vacuum tank and pump connected with the one of said conduits leading to said separate passage through the sub-casing, two supply tanks and two compressing means connected with said two passages leading to said peripheral recess in the sub-casing, check valves between each of said supply tanks and said compressing means, and an additional check valve between one of said compressing means and the valve casing, and means to operate all compressing means and to rotate said round tapered valve in timed relation for carrying out the sequence of the can filling operation described.

5. In a machine for pressure filling cans, the sub-combination of a valve casing, a cylindrical valve sub-casing horizontally disposed within said valve casing, a round tapered valve in the sub-casing, said casing and sub-casing cut away at the bottom to form a recess of a size to receive the top portion of a can to be filled, a hub centrally of the recess depending from the sub-casing, a vertical stem of spider-like cross section centrally of the hub and supporting means to allow vertical movement of the stem in the hub, said supporting means including a terminal resilient washer compressible to provide an anti-leak pressure fit with a can nozzle of the spring pressed valve closed type, said vertical stem having its upper end bearing against the curved surface of the round tapered valve, said valve having a cam recess on its surface in the path of said vertical stem when the valve is rotated to receive said upper end, passages through the valve casing, a peripheral recess in the sub-casing connecting with two of said passages, passages from said recess through the sub-casing, spaced grooves on the periphery of the round tapered valve, one of said grooves in line of rotation with the ports of said two passages through the sub-casing, a separate passage through the sub-casing connecting with a passage in the valve casing and with the second of said spaced grooves on the round tapered valve, said hub on said sub-casing having the top of its bore wide enough to register with either of said two spaced grooves on the periphery of the round tapered valve when said valve is rotated to respectively so position a groove, said vertical stem having means thereon and said hub having means therein to seat together in valve relation and stop the flow of material out the hub exit orifice, all for the purpose described.

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