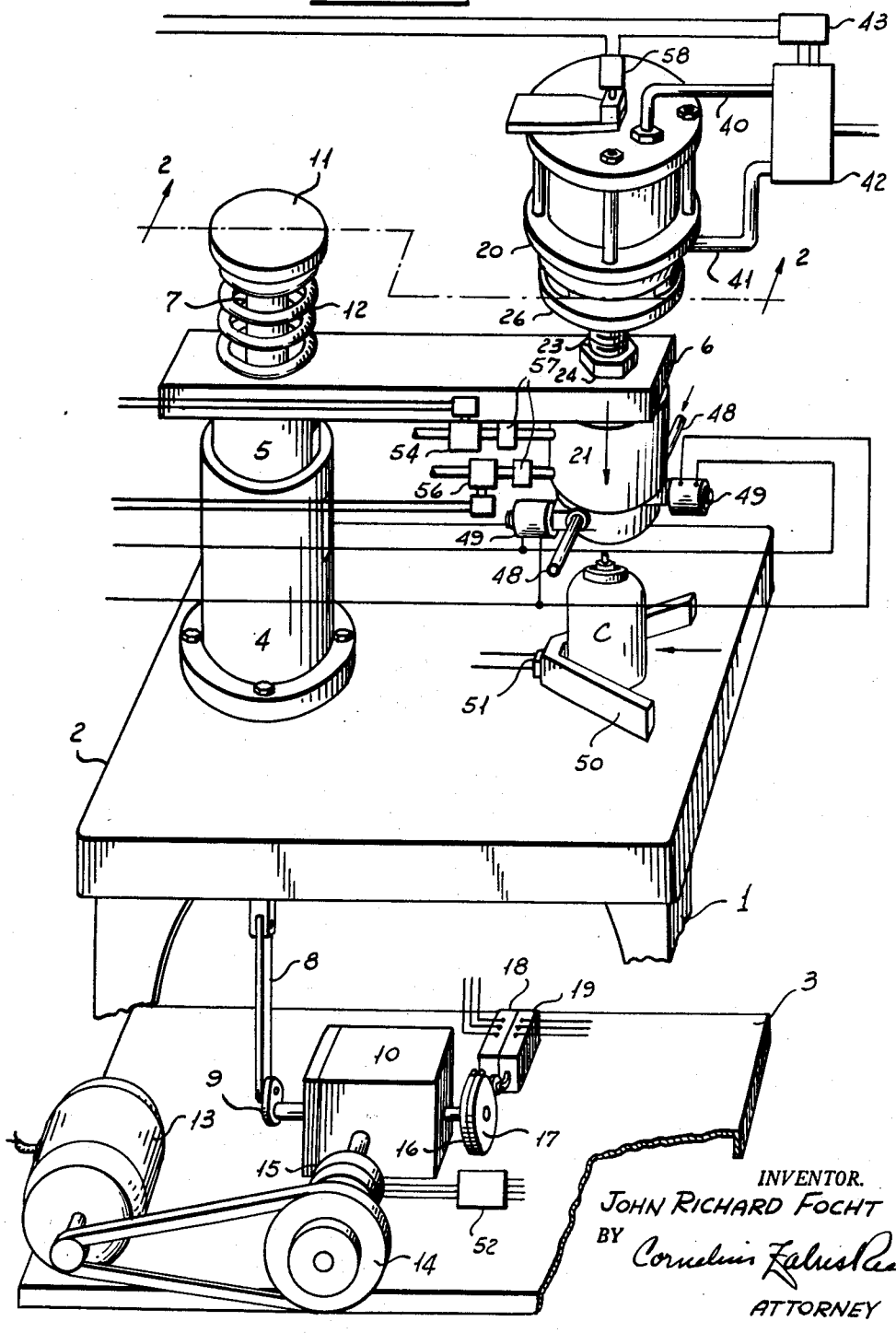
Aug. 2, 1960 J. R. FOCHT 2,947,904

MACHINE FOR SUPPLYING A CHARGE OF PROPELLANT TO AN AEROSOL CONTAINER AND FOR SEALING THE LATTER

Filed May 4, 1955 5 Sheets-Sheet 1

Fig 1



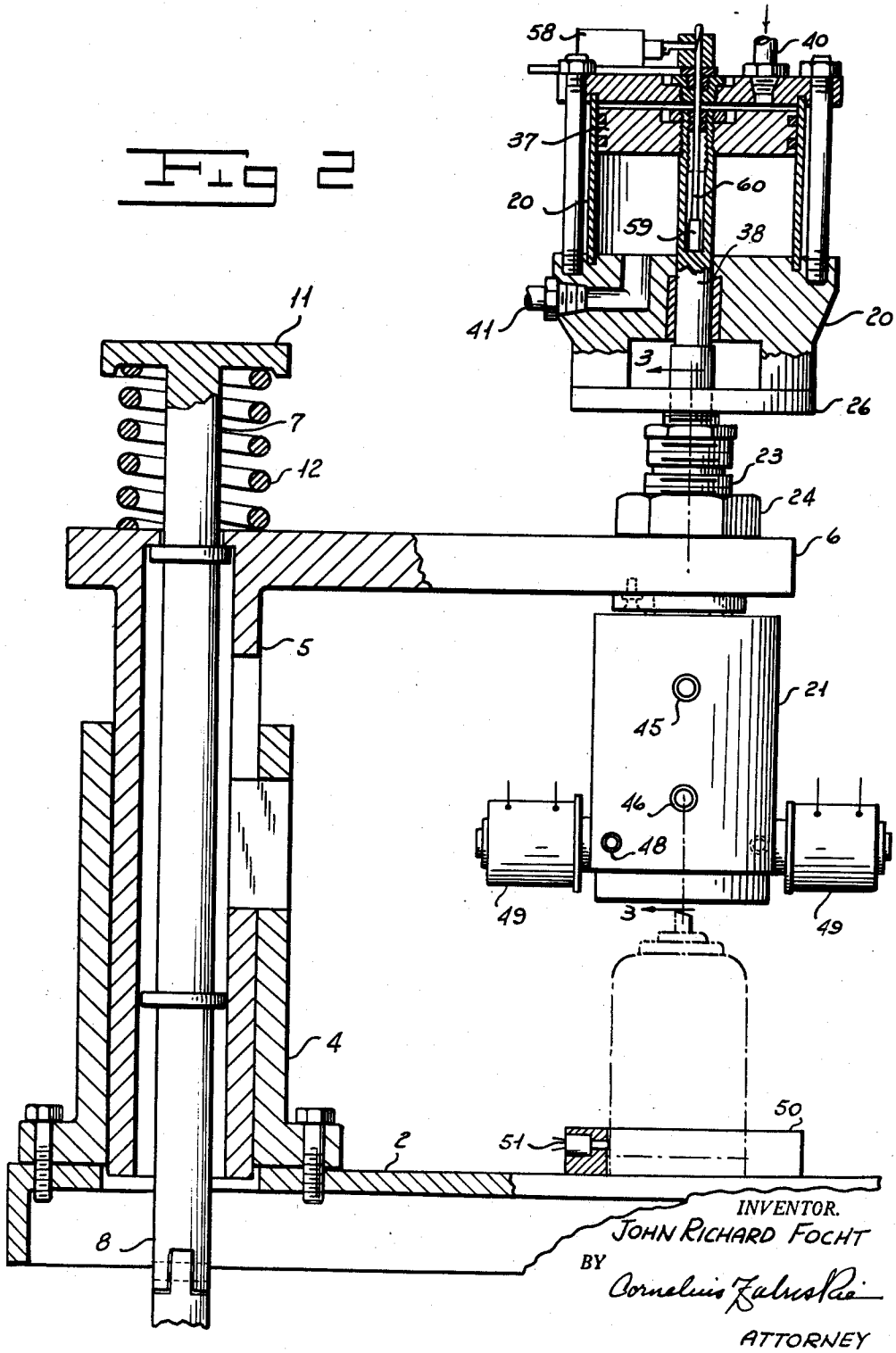
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MACHINE FOR SUPPLYING A CHARGE OF PROPELLANT TO AN AEROSOL CONTAINER AND FOR SEALING THE LATTER

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Fig 2



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MACHINE FOR SUPPLYING A CHARGE OF PROPELLANT TO AN AEROSOL CONTAINER AND FOR SEALING THE LATTER

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Fig 3

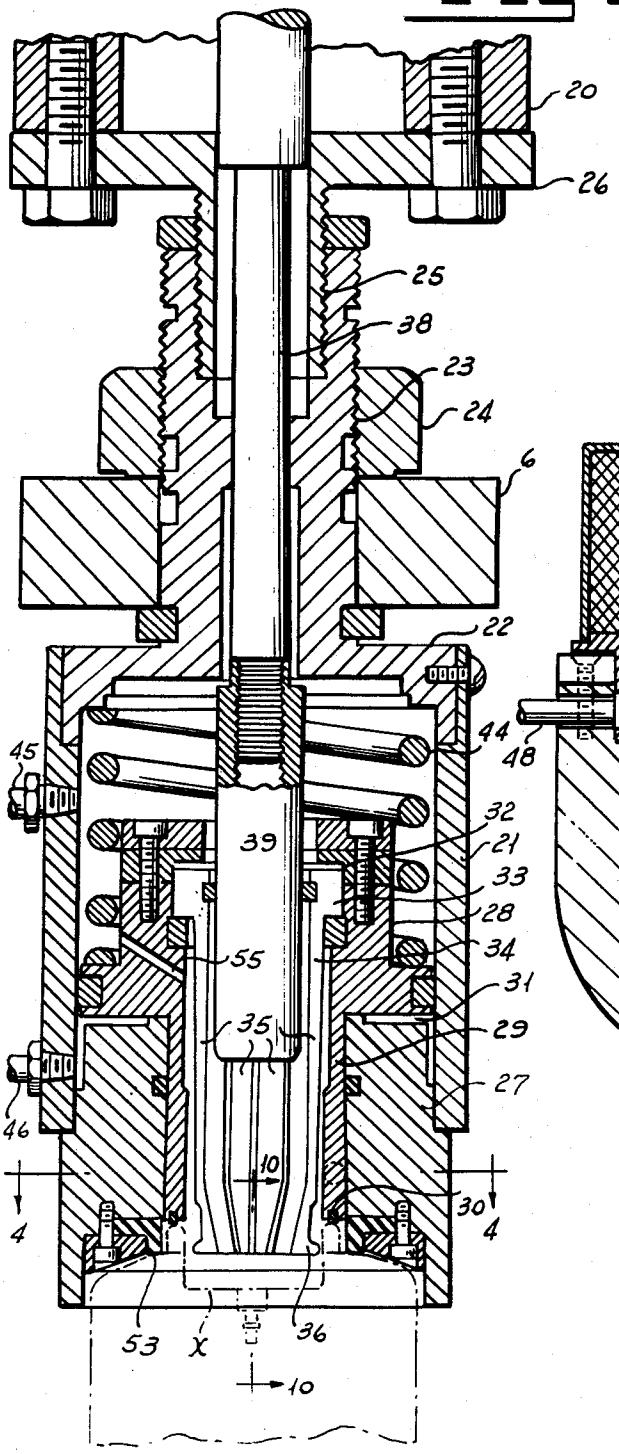
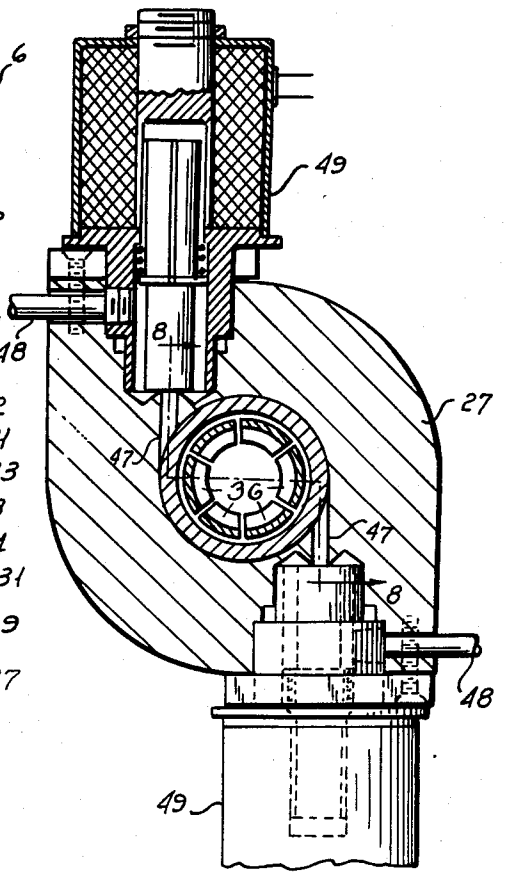


Fig 4



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MACHINE FOR SUPPLYING A CHARGE OF PROPELLANT TO AN AEROSOL CONTAINER AND FOR SEALING THE LATTER

Filed May 4, 1955 5 Sheets-Sheet 4

Fig 5

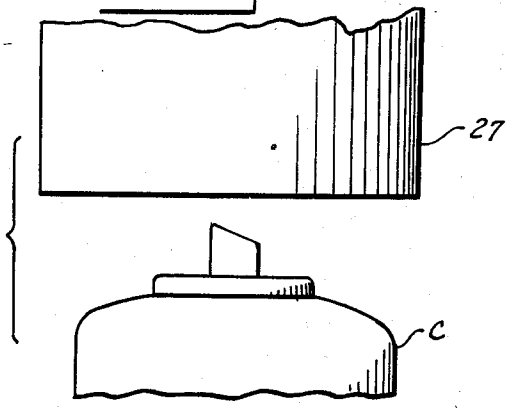
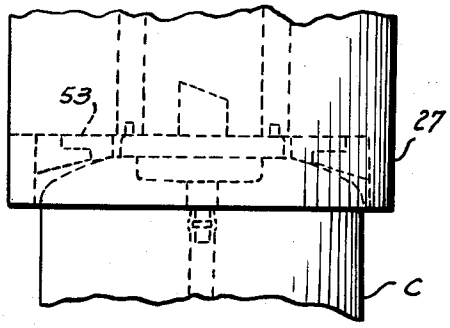


Fig 6



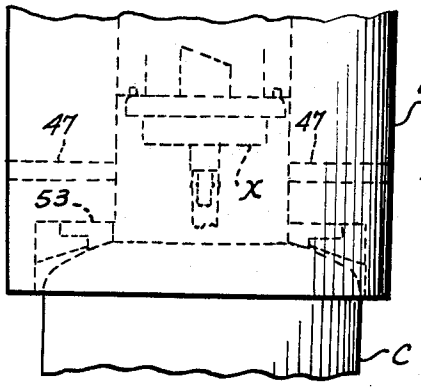


Fig 7

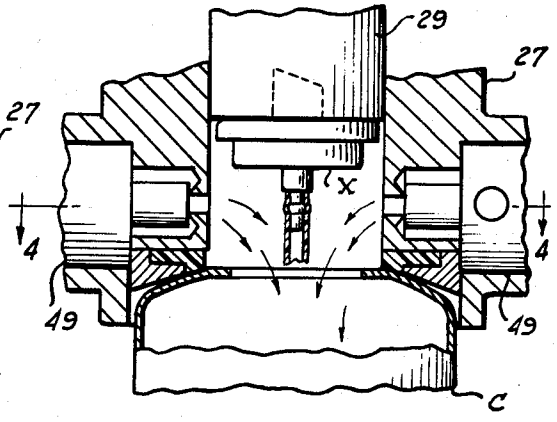


Fig 8

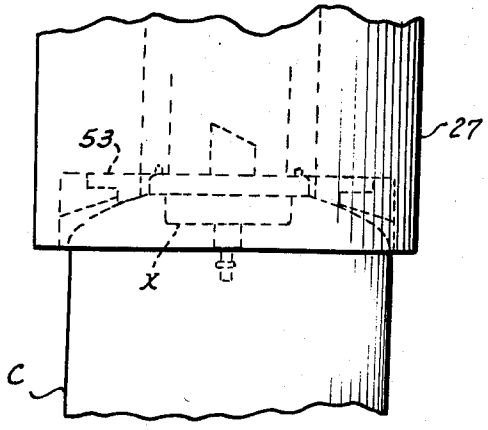
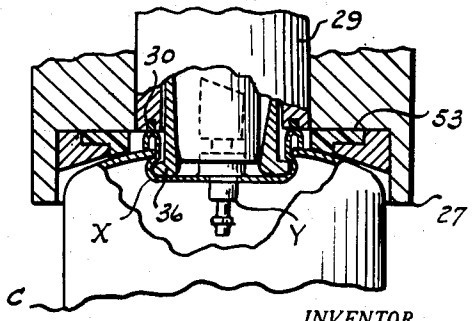


Fig 9

Fig 10



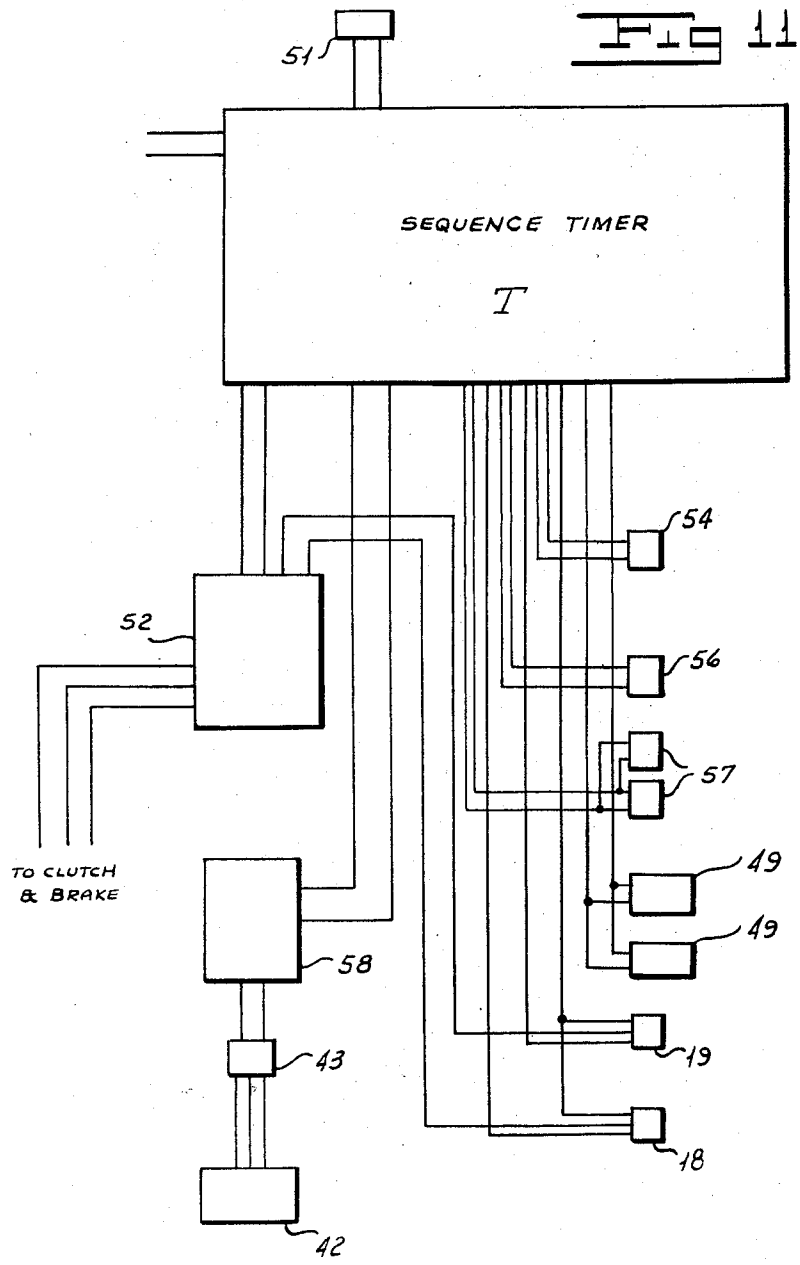
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MACHINE FOR SUPPLYING A CHARGE OF PROPELLANT TO AN AEROSOL CONTAINER AND FOR SEALING THE LATTER

Filed May 4, 1955 5 Sheets-Sheet 5

FIG 11



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United States Patent Office 2,947,904
Patented Aug. 2, 1960

2,947,904

MACHINE FOR SUPPLYING A CHARGE OF PROPELLANT TO AN AEROSOL CONTAINER AND FOR SEALING THE LATTER

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Filed May 4, 1955, Ser. No. 505,880

16 Claims. (Cl. 53—37)

This invention is a machine for supplying a charge of propellant to an aerosol container and for thereafter sealing the latter.

In the packaging of aerosols within metal containers, it has heretofore been the practice to introduce the material to be dispensed, i.e., the concentrate, into the container, then attach the dispensing valve to the container, then evacuate air from the container, and then introduce the propellant, such, for example, as Freon in liquid form into the container through the valve while the latter is held open, and then finally apply to the stem of the valve a suitable spray button. These operations have generally been performed by placing the concentrate in the container and permanently attaching the valve to the latter before introducing the assembly into a machine embodying a succession of stations with operating heads, where the remaining operations are consecutively performed.

According to the present invention, in contradistinction, the concentrate is placed in a container having a top opening in which is loosely positioned a closure on which a discharge valve, with attached spray button, is permanently mounted. The container is then placed at a single station in the machine where it remains stationary until all other operations are completed through the operations of a single operating head. While at this station, the container is gripped and firmly held in position, the closure is lifted to permit the propellant to be introduced through an unrestricted opening in the container, the propellant is then introduced, and the closure is thereupon placed in said opening and immediately crimped or otherwise locked in place on the container to form therewith a permanent seal. The container is then removed from the machine and the operations described are carried on on the next container.

The present invention permits the complete assembly of the valve and its spray button on the closure by production machinery before the assembly is loosely placed in the container opening. It provides for the charging of the container with the propellant through an unobstructed opening therein in very much less time than it could possibly be accomplished when introduced through a valve held open for the purpose. It permits all of the operations of the machine to be carried out by a single operating head at a single station in the machine and thus greatly simplifies the construction of the machine. It eliminates the necessity of evacuating air from the container while in the machine. And it very materially increases production over prior machines for charging and sealing aerosol containers. Moreover, the machine is so controlled that the operations described automatically follow one another in predetermined sequence, so that all the operator has to do is to position the containers in the machine and remove them therefrom and, in practice, even this operation may be carried out mechanically.

Features of the invention, other than those adverted to, will be apparent from the hereinafter detailed description and appended claims, when read in conjunction with the accompanying drawings.

The accompanying drawings illustrate one practical embodiment of this invention, but the construction therein shown is to be understood as illustrative, only, and not as defining the limits of the invention.

Fig. 1 is a perspective view largely diagrammatic in nature showing the mechanical parts and the primary electrical controls.

Fig. 2 is a section on the line 2—2 of Fig. 1.

Fig. 3 is a section on the line 3—3 of Fig. 2.

Fig. 4 is a section on the line 4—4 of Figs. 3 and 8.

Figs. 5–10 are views illustrating successive steps in the operation of the machine from the time the container is placed in the machine to the time when the cap is crimped in place on the container to complete the filling and sealing operation. In these views, Fig. 8 is a section on the line 8—8 of Fig. 4 and Fig. 10 shows certain parts broken away on the line 10—10 of Fig. 3.

Fig. 11 is an electric wiring diagram for the machine shown in the foregoing figures of the drawings.

In the drawings, 1 designates the frame of the machine which comprises a table 2 beneath which is a shelf 3. On the table 2 is supported an upright tubular guide 4 in which a plunger 5 is guided for vertical movement and keyed against rotation. The upper end of this plunger 5 carries a horizontal arm 6 and an upright rod 7 passes downwardly through the arm 6 and plunger 5 to a point beneath the table and has a link connection 8 with a crank 9 mounted on a reducing gear 10 of any appropriate and conventional form, supported on the shelf 3. The rod 7 passes loosely through the arm 6 and plunger 5 and has a head 11 with a spring 12 interposed between the head and the arm 6, so that, when the arm 6 is drawn downwardly by the crank 9, the arm will be yieldably depressed. The purpose of this yieldable connection is to compensate for containers of slightly different heights.

Mounted on the shelf 3 is a constant speed electric motor 13 having a belt drive to a pulley 14 connected to the reducing gear 10 through an interposed clutch and brake assembly 15 of any appropriate and conventional form. The function of this clutch and brake assembly is to operatively connect the pulley 14 with the reducing gear so that the latter may be driven at proper times and to brake the reducing gear at other times. The reducing gear drives two cams 16 and 17 operable upon micro switches 18 and 19 to control electric circuits as hereinafter described.

Mounted rigidly on and above and below the outboard end of the arm 6 is an operating head embodying a pair cylinders, namely, an upper cylinder 20 and a lower cylinder 21. The lower cylinder 21 has an upper cylinder head 22 provided with an upright tubular shank 23 which extends upwardly through an opening in the arm 6 and is externally threaded above the arm to receive a clamping nut 24 which locks the shank rigidly to the arm and at the same time rigidly supports the lower cylinder on the arm. The upper end of the shank 23 is counterbored and internally threaded to receive a depending shank 25 formed on the lower cylinder head 26 of the upper cylinder 20 whereby the upper cylinder 20 is also rigidly supported on the arm 6. The lower end of the lower cylinder 21 is closed by a lower cylinder head 27 of tubular form and mounted in the cylinder between the heads 22 and 27 is a piston 28 which has a depending cylindrical sleeve 29, the lower edge of which is channeled to receive a sealing gasket 30 of rubber or other suitable soft and resilient material. The upper surface of the lower cylinder head 27 is cut away as shown at 31, so that, when the piston 28 is seated on said lower head, the space 31 is between them, as clearly shown in Fig. 3.

The piston 28 is shown as built up, but essentially it provides a counterbored chamber 32 in which is received with a fairly loose fit an enlarged head 33 of a tubular crimping member 34. This crimping member is longitudinally slotted at arcuately spaced apart distances, so as to arcuately divide the lower portion of this crimping member into a plurality of annularly arranged spring arms or clamping jaws 35, the lower ends of which are provided with external beads 36.

Positioned within the upper cylinder 20 is a piston 37 having a downwardly extending piston rod 38 on the lower end of which is mounted a jaw operating plunger 39. This plunger extends downwardly into the interior of the crimping member 34, as shown best in Fig. 3, and is chamfered at its lower end. When in raised position, the plunger 39 permits the jaws to radially contract but, when the plunger is forced downwardly against the interior converging faces of the jaws, these jaws are forced apart in a radial direction for the purpose of crimping a cap onto a container, as hereinafter described.

The jaw operating plunger 39 is actuated by the piston 37 within the upper cylinder 20 and the piston is, in turn, pneumatically operated by compressed air admitted through inlets 40 and 41. Air is selectively introduced at the opposite sides of the piston through a four way solenoid valve 42, shown in Fig. 1, controlled by a switch 43.

The lower piston 28 is normally depressed by a spring 44, but is operated by suction and compression, there being a suction inlet 45 into the cylinder above the piston and a compressed air inlet 46 below the piston.

The lower head 27 of the lower cylinder is provided below the wall of the cylinder 21 with inlet passages 47 which are arranged tangentially of the inner cylindrical surface of the head, as shown in Fig. 4. These passages provide for the introduction of the propellant, e.g., Freon, into the container. The propellant is fed under pressure through inlets 48 to solenoid valves 49 of any appropriate conventional kind, their function being to normally seal the passages but they are adapted, when the coils of the solenoids are energized, to unseal the passages 47, so that the propellant may enter the container. The relation between these valves and inlets is shown best in Figs. 4 and 8. From these figures, it will be noted that, when the propellant is fed into the interior of the lower cylinder head, it enters the chamber therein and then the container tangentially and is thus received therein without undue agitation which I have found is apt to cause undesirable frothing, whereas it is preferred to deposit this propellant in a liquid state. Experience has shown that the tangential feed is the best possible way of feeding which I have been able to produce. It overcomes many disadvantages inherent in prior practice of introducing a propellant into an aerosol container.

Containers to be charged and sealed are adapted to be positioned manually or otherwise upon the table 2 in a predetermined position determined by the angular stop 50 and as a container, such as indicated at C, is brought into this predetermined position, it is adapted to actuate a micro switch 51 at the apex of the angle, as shown in Fig. 1, for the purpose of closing a circuit and initiating the operations of the machine.

It is essential in the operation of this machine that the various parts thereof function in predetermined sequence to carry out their respective functions and in this machine I prefer to control electrically several trains of mechanisms involved. I may conveniently utilize for this purpose any well known and conventional form of sequence timer connected by electric circuits with the several micro switches to which I have referred and which operates in a conventional manner to render the several micro switches effective to initiate the operations in proper succession.

Rather than complicate Fig. 1 of the drawings by showing all of the wiring connections, I have incorporated these wiring connections within a separate figure of the drawing, namely, Fig. 11, wherein I have indicated the several switches shown in the other figure. I have not attempted to show the details of a sequence timer because there are so many well known forms of sequence timer on the market that they may be considered conventional. In Fig. 11, the sequence timer bears the reference character T.

The operation of the machine will now be described in connection with the charging and sealing of one container C. This container before introduction into the position shown in Fig. 1 first receives the desired quantity of the material to be dispensed, to which may be added a small quantity of the propellant to purge the container of air. Various forms of container may be employed, but the machine of this invention is primarily intended to operate on either plastic or metal containers which have a relatively large opening at their top adapted to be sealed by a closure in the form of a cup x equipped with a dispensing valve having a spray button and an associated dip tube, such as illustrated in the Robert H. Abplanalp Patent No. 2,631,814, dated March 17, 1953. The preferred type of cup x is best shown in the accompanying drawings in Figs. 6–10 inclusive. The type of container shown is adapted to be sealed by inserting the cup into the top opening of the container and then expanding the base portion of the cup to a greater diameter than the opening. To produce a leak-proof seal a gasket may be introduced between the cup and the wall of the opening.

It will be assumed in the following description that I am charging and sealing a container of this kind.

Having introduced the concentrate into the container and loosely placed the cup in the top opening thereof, the container is brought into the position shown in Fig. 1 and, as it seats in the apex of the angular stop or guide 50, it actuates the micro switch 51 to momentarily close the same (Figs. 1 and 11). This initiates the operation of the timer T which immediately thereafter closes the circuit to the power unit 52 which controls the brake and clutch assembly 15. As a result, the constantly driven motor 13 will be coupled to the reducing gear 10 for the purpose of moving the crank 9 from the upper dead center shown in Fig. 1 to its lower dead center. By the time this operation is completed, the cam 16 associated with the reducing gear 10 acts upon the micro switch 18 to disengage the clutch and engage the brake of the clutch and brake assembly 15 to leave the crank at rest at lower dead center.

The movement of the crank 9 from upper dead center to lower dead center has effected the lowering of the arm 6 and the lower cylinder 21 so that its lower cylinder head 27 bears upon and firmly clamps the container C to the table, while a resilient gasket 53 associated with said cylinder head bears against the top of the container and forms a leak-proof seal therewith, as shown in Figs. 3 and 6. As the lower cylinder is lowered as stated, its piston 28 moves downwardly with it and the spring 44 in said cylinder forces the lower edge of the cylindrical sleeve 29 against the upstanding peripheral portion of the cup x, so that the gasket 30 in the lower edge of said sleeve simultaneously forms a leak-proof seal with the cup x.

When these initial steps of bringing the lower cylinder and parts thereof into cooperation with the container and cup have been completed, the timer T acts upon the solenoid valve 54 (Figs. 1 and 11) to communicate a vacuum through the connection 45 of Fig. 3 and exhaust the portion of the cylinder above the lower piston 28 with the result that the vacuum thus produced is communicated through a passage 55 to the interior of the tubular sleeve 29 and acts to anchor the cup x to the lower end of said tubular sleeve 29. The vacuum thus produced is of such magnitude that it will not

overcome the tension of the spring 44 and thus the piston 28 remains in its lowered position of Fig. 3.

While this vacuum is held, to anchor the cup to the piston sleeve, the timer energizes a solenoid valve 56 (Figs. 1 and 11) to admit compressed air through the inlet 46 (Fig. 3) into the space 31 below the piston 28 and, as a result, the piston is elevated to lift the cup out of the top opening of the container into the position shown in Fig. 7. While the piston is thus elevated, the timer energizes the twin solenoid valves 49 with the result that the propellant is fed into the container through the channels 47 of Figs. 4 and 8. This feed may be timed or the propellant may be passed through a suitable measuring valve, so as to feed a predetermined quantity of propellant but in any event as soon as the requisite amount has been fed, the timer T de-energizes the twin solenoid valves 49. Immediately thereafter the timer energizes two solenoid operated valves 57 (Figs. 1 and 11) to vent both the upper and lower portions of the lower cylinder and the spring 44 immediately lowers the piston 27 of said cylinder to reseat the cup x in the container opening, as shown in Fig. 9.

When the cup has been seated as stated, the timer closes a micro switch 58 which, in turn, closes the relay 43 to energize a four way solenoid valve 42 (Fig. 1) and feed compressed air into the upper cylinder 20 above the piston 37 (Fig. 2). This piston is thus depressed carrying with it the jaw operating plunger 39 which forces apart the jaws 35 with the result that that portion of the cup below the lip of the opening in the container is expanded radially to a tight seal with the margin of the container opening.

As this operation is completed, the downward movement of the piston acts upon the enlarged head 59 of a switch controlling pin 60 so that the pin is depressed and breaks the circuit at the micro switch 58 with the result that the four way valve 42 vents the upper chamber of the cylinder 20 and admits compressed air at 41 to the lower portion of the cylinder. The piston 37 is thus elevated and returns the plunger 39 to the position shown in Fig. 2.

While all of these operations, subsequent to the initial lowering of the arm are being carried out, the arm remains lowered as stated, but now that these operations are completed, the timer energizes the power unit 52 to disengage the brake and engage the clutch of the assembly 15 and the motor 13 thereupon drives the reducing gear 10 to return the crank 9 from lower dead center to the initial upper dead center position of Fig. 1, for the purpose of lifting the arm and associated parts of the head free from the charged and sealed container. As soon as the crank 9 reaches upper dead center, the cam 17 (Fig. 1) trips the micro switch 19 with the result that the brake is set and the clutch released, so that all the parts, except the motor, come to rest in the initial position. The operator may then remove the container and place another container in position to be operated upon through a recurrence of the operations hereinbefore described.

The foregoing detailed description sets forth the invention in its preferred practical form, but the invention is to be understood as fully commensurate with the appended claims.

For example, in the machine shown in the accompanying drawings, the container is positioned on a seat which forms part of the table 2. The seat, as well as the rest of the table, is stationary and the operating head is raised and lowered to engage with the container through operation of the plunger 5 as described.

Inasmuch as the primary purpose of this arrangement is to bring about engagement and disengagement due to relative movement between the container and the head, it is entirely practical to mount the arm 6 rigidly upon the part 4, so that the head will be rigid with the table and move the seat up and down to bring the container into and out of engagement with the head. This may be done by having the portion of the table which embodies the seat and carries the guide 50 in the form of a movable platform mounted for vertical adjustment and operated from the reducing gear mechanism 10 by a pitman 8 in the same manner as hereinbefore described, so as to move the seat up and down in proper timed relation with the other parts of the machine.

Having thus fully described the invention, what I claim as new and desire to secure by Letters Patent is:

1. A machine of the character described comprising: a seat adapted to receive and support in upright position a container having a top opening with a valved closure loosely resting therein, an operating head positioned above the seat, means for producing relative movement between the seat and the head to bring about engagement between the head and the container, means on the head for producing a seal around the top opening of the container when the head is engaged with the latter, means on the head for lifting the closure free from the top opening of the container, walled passages leading into a chamber in the head tangentially of said chamber for introducing a predetermined quantity of propellant through the head into the container while the closure is lifted, means for thereafter lowering the closure, and means on the head for thereafter crimping the closure to the container to form a hermetic seal therewith while the top opening of the container remains sealed with respect to the head.

2. Machine according to claim 1, wherein the flow of propellant through said passages is valve controlled.

3. A machine of the character described comprising: a seat adapted to receive and support in upright position a container having a top opening with a valved closure loosely resting therein, an operating head positioned above the seat, means for producing relative movement between the seat and the head to bring about engagement between the head and the container, said means embodying a prime mover, change speed gearing operable by said prime mover, a crank and pitman including a spring for yieldably engaging the head with the container, means on the head for producing a seal around the top opening of the container when the head is engaged with the latter, means on the head for lifting the closure free from the top opening of the container, means for introducing a predetermined quantity of propellant through the head into the container while the closure is lifted, means for thereafter lowering the closure, and means on the head for thereafter crimping the closure to the container to form a hermetic seal therewith while the top opening of the container remains sealed with respect to the head.

4. A machine of the character described comprising: a seat adapted to receive and support in upright position a container having a top opening with a closure loosely resting therein, an operating head mounted for movement toward and away from said seat in a direction normal to the latter and provided with a gasket to bear against and form a seal with the container peripherally of said opening to hold the container in fixed position on the seat, a hollow piston located in the head and having an extension carrying a gasket to bear against and form a seal with the closure, a spring acting upon the piston to normally hold the same in lowered position, means for imparting a vacuum to the interior of the piston and its extension to anchor the closure to the piston, means for introducing compressed air below the piston to elevate the same and lift the closure from the top opening of the container, valve controlled passages in the head through which a predetermined quantity of a propellant is introduced into the container through the top opening of the latter while the closure is lifted, means for thereafter venting the space above and below the piston to return the closure to a position within the top opening of the container, and means for thereafter expanding

the closure within said opening of the container to form a pressure tight seal between them.

5. Machine according to claim 3, wherein the connection between the prime mover and the change speed gearing includes a clutch and brake assembly, and means for timing the operations of the clutch and brake assembly to synchronize their operations with the operation of the parts carried by the head.

6. A machine of the character described comprising: a stationary seat adapted to receive a container having a top opening with a closure loosely resting in said opening, a cylinder positioned coaxially of the container on said seat and movable in a direction normal to the seat, said cylinder being provided with a lower tubular cylinder head provided on its under side with a gasket to engage with and form a leak-proof seal with the container remote from the top opening in the latter, an upper cylinder head for said cylinder, a hollow piston positioned between the upper and lower cylinder heads and having a depending tubular extension provided at its lower edge with a gasket to engage and form a seal with the closure, a spring interposed between the piston and the upper cylinder head to normally maintain the piston in lowered position, means for introducing a partial vacuum into the interior of the tubular extension to anchor the closure to said extension, means for thereupon introducing compressed air into the cylinder below the piston to elevate the piston and lift the closure free from the container, valved passages leading into the interior of the lower cylinder head for introducing propellant into the container while the closure is lifted, a crimping member projecting downwardly through the piston and its tubular extension and having crimping jaws adapted to engage with the closure when the piston is in lowered position, a plunger extending downwardly into the crimping member, means for depressing the plunger to move the crimping jaws apart for the purpose of expanding the closure to a tight seal within the container opening, and means for bodily lowering the cylinder to engage the gasket of its lower head and the gasket of the tubular extension of the piston with the container and closure and for elevating the piston to disengage the sealed container for removal from the machine.

7. Machine according to claim 6, wherein the valved passages for the propellant are arranged trangentially of the interior of the hollow lower cylinder head.

8. Machine according to claim 6 comprising means for synchronizing and timing the operation of the parts to occur in predetermined sequence.

9. Machine according to claim 6 wherein the means for raising and lowering the cylinder comprises a supporting arm mounted on a supporting plunger guided for vertical movement, a motor and change speed gearing interposed between and having driving connections with both the motor and the supporting plunger, there being a clutch and brake assembly interposed between said motor and change speed gearing, and means for synchronizing the operations of the clutch and brake assembly with the operations of the other part of the machine to effect operation of all parts of the machine in predetermined sequence.

10. An aerosol charging and sealing machine comprising: means for supporting a container having a top opening with a valved cap loosely engaged therewith, a charging and sealing head provided therein with a chamber, means for imparting relative movement between such a container and the head to engage the container with the head with the container opening registering with the head chamber, means to engage and lift the valved cap free from the container and thereafter to return it into engagement therewith, means for injecting a predetermined measured charge of propellant into the head chamber and through said chamber and container top opening into the container while the valved cap is lifted free from the container to permit unrestricted passage of propellant into the container, and means for sealing the valved cap to the container after it has been returned to engagement therewith, said propellant being injected into the head chamber through a plurality of passages which are spaced apart about said chamber and are substantially tangent thereto.

11. An apparatus for charging an aerosol container having a top opening, comprising: a charging head provided therein with a chamber having an open bottom with a gasket for forming with a container a seal about the top opening of the latter, and a propellant inlet passage leading to said chamber tangentially thereof.

12. An apparatus according to claim 11, wherein there are a plurality of such inlet passages spaced apart about said chamber.

13. An apparatus according to claim 11, comprising a differential pressure valve for controlling the feed of propellant through said passage.

14. An apparatus according to claim 11, comprising a source of propellant under pressure, a conduit leading from said source to said passage, a valve having a spring pressed sealing member for normally sealing the passage from said conduit, and a piston connected with and of greater area than the valve and exposed to the pressure of the propellant to unseat said sealing member when such pressure exceeds that at the source.

15. The herein described method of filling an aerosol container having a top opening and a separate closure provided with a dispensing valve mechanism, which comprises: introducing into the container a predetermined quantity of active ingredient, then placing the closure loosely in cooperative relation with the top opening with the closure in unsealed condition and with the dispensing valve mechanism closed, bodily lifting the closure from the container, then introducing a predetermined quantity of a propellant into the container through the top opening thereof beneath the closure and tangentially of the top opening while the dispensing valve mechanism of the latter remains closed, and thereafter lowering the closure and permanently securing it to the container.

16. The method of charging and sealing an aerosol container having a top opening and a valved cap, which comprises: positioning the valved cap loosely on the container in cooperative relation with the top opening of said container, thereafter bodily lifting the valved cap free of said container to completely free the top opening from obstruction thereby, thereafter injecting a predetermined measured quantity of a propellant into the container substantially tangentially of and through the thus unobstructed top opening thereof, and thereafter returning the valved cap into cooperative engagement with the container and sealing said valved cap thereto.

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