Aug. 5, 1958 T. J. BAGAROZY 2,845,761

APPARATUS AND METHOD FOR FILLING CONTAINERS WITH HIGH PRESSURE GAS

Filed Aug. 8, 1956 3 Sheets-Sheet 1

Fig. 1.

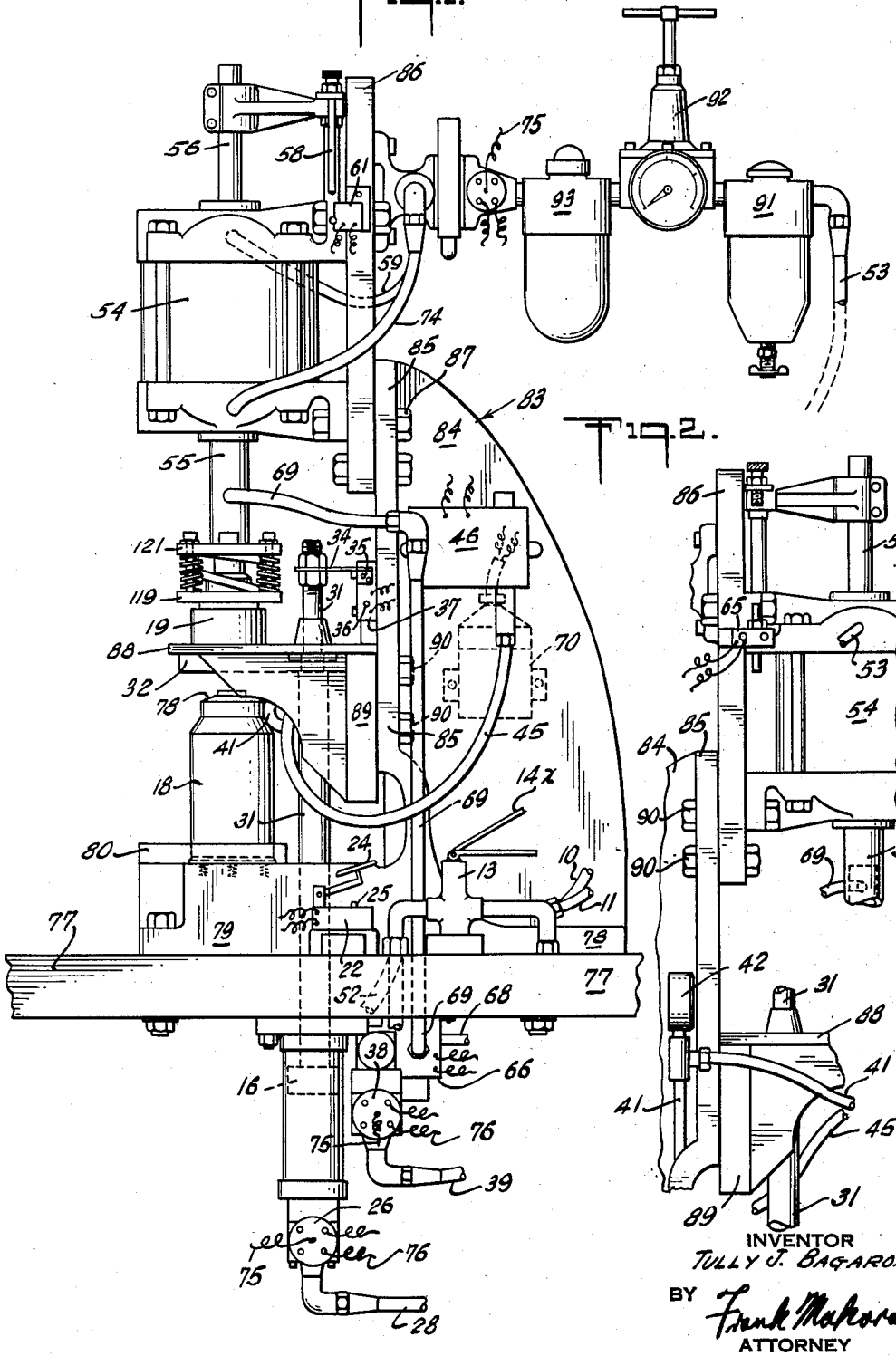


Fig. 2.

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Filed Aug. 8, 1956 3 Sheets-Sheet 2

Fig. 2.

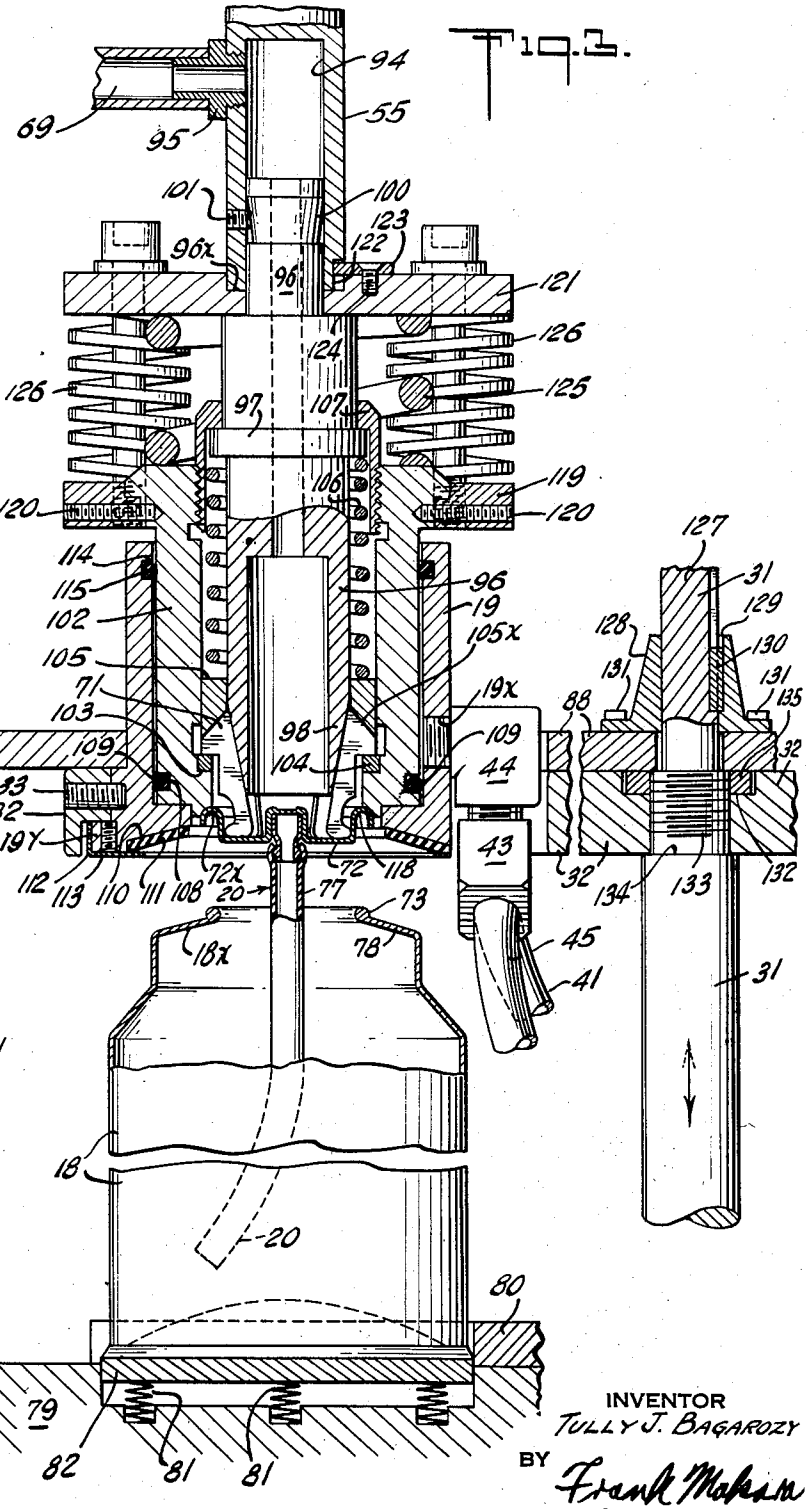


Fig. 5.

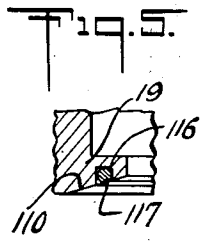
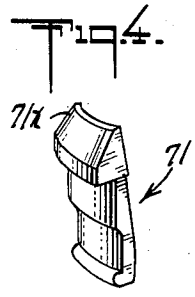


Fig. 4.



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Aug. 5, 1958 T. J. BAGAROZY 2,845,761

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Filed Aug. 8, 1956 3 Sheets-Sheet 3

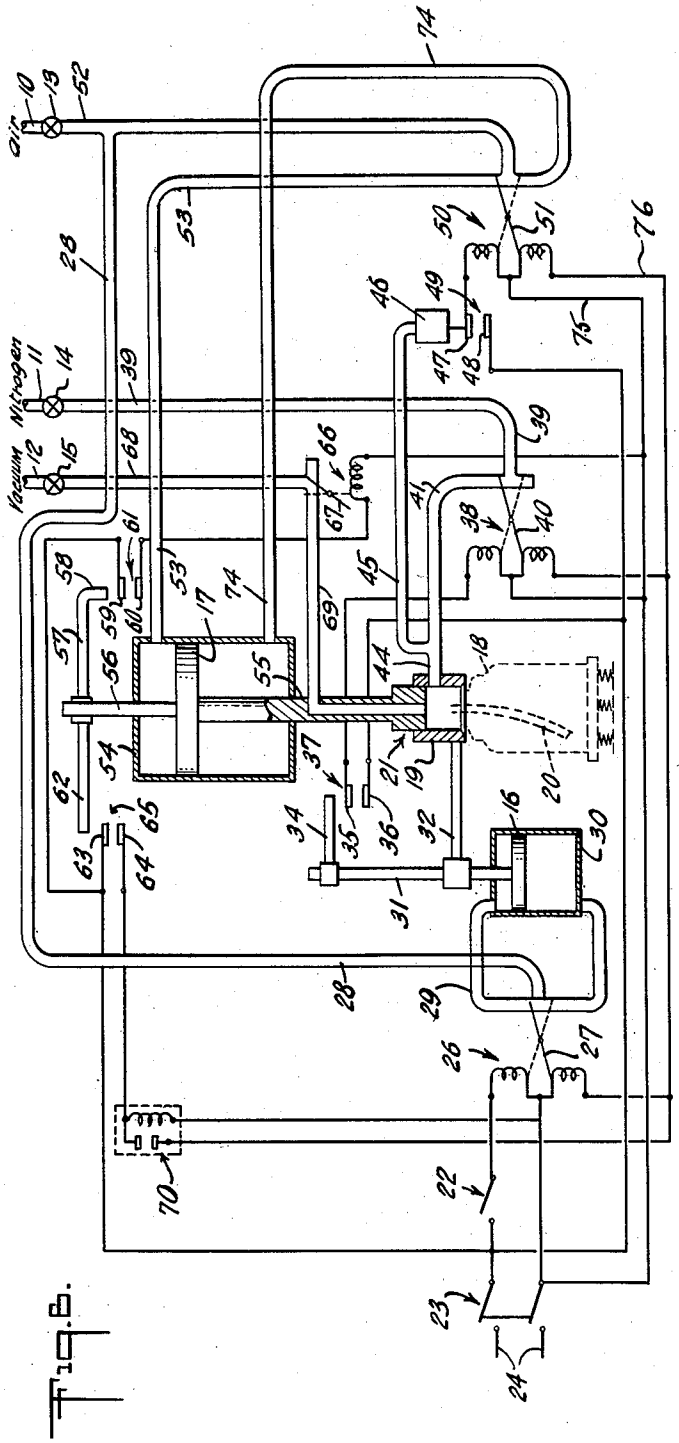


Fig. 8.

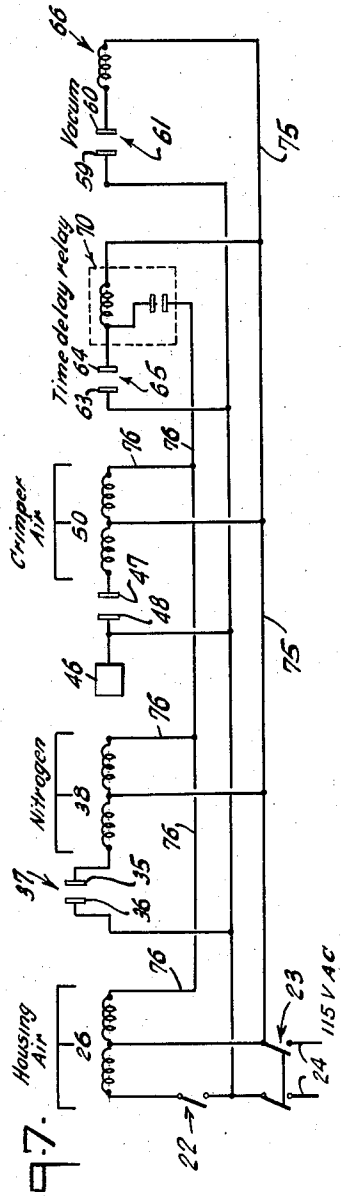


Fig. 7.

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APPARATUS AND METHOD FOR FILLING CONTAINERS WITH HIGH PRESSURE GAS

Tully J. Bagarozy, Elizabeth, N. J.

Application August 8, 1956, Serial No. 602,822

1 Claim. (Cl. 53—38)

This invention relates to an apparatus used for filling containers with compressed gas.

The apparatus is used to fill fire extinguishers, using dry powder sodium bicarbonate, with high pressure nitrogen gas as the propellant. The gas pressure of the nitrogen gas used is about 100 to 150 pounds or more. Other uses for containers using an inert non-condensible gas as the propellant are the spraying of dry powder pharmaceuticals, deodorants, fungicides, insecticides and the like.

This invention is shown in the accompanying illustrative embodiment in which:

Fig. 1 is the right side elevation view of the apparatus,

Fig. 2 is the left side elevation fragmentary view of the top of the apparatus of Fig. 1,

Fig. 3 is a vertical section of the crimping-filling head assembly showing the improved crimping-filling head assembly,

Fig. 4 is an oblique view of a conventional crimping finger,

Fig. 5 is a fragmentary section view of the crimper housing,

Fig. 6 is a schematic view of the filling apparatus showing the electrical circuit used to motivate the apparatus in successive sequential steps, and

Fig. 7 is a schematic wiring diagram of the electrical circuit of this invention.

For purposes of clarity, the invention will be described broadly as shown in Fig. 6. Turning to Fig. 6 and to the mechanical apparatus shown therein, there is provided a compressed air supply source conduit **10**, a compressed nitrogen gas supply source conduit **11** and a vacuum supply source conduit **12**. These supply sources **10**, **11** and **12** are turned on and off by valves **13**, **14** and **15** respectively to place the apparatus in operating condition.

The compressed air of conduit **10** is used to operate a housing piston **16** and a crimper piston **17** as needed and as actuated by the electrical circuit shown.

The nitrogen gas of conduit **11** is used to fill the pressure resistant container **18** (shown in dotted outline), being introduced into container **18** through a moveable crimper housing **19** having a bore hole therein to receive the nitrogen gas conduit.

The vacuum conduit is used to seize and hold a syphon tube assembly **20** (Fig. 3) to the moveable crimper **21** during the container filling procedure.

In greater detail, the operation of the apparatus of this invention is performed automatically after an instantaneous contact of the electrical circuit with an electrical power supply shown by switch **22**.

Turning to Fig. 7 and Fig. 6, the stepwise operation of the apparatus of this invention is as follows:

The main switch **23** to house current conduits **24** is closed. Next instantaneous contact of switch **22** is made by hitting the spring levered plate **24** to make contact with contact point **25**.

This instantaneous contact commences a chain of sequential events as follows. First the conventional electro-air switch **26** is actuated causing the air valve plate **27** therein to move from the non-operating or resting position shown to the operating position shown in dotted line. Next the compressed air in conduit **28** is passed through the now opened conduit **29** into the chamber of housing cylinder **30** forcing piston **16** downwardly.

Piston **16** is provided with a fixed piston rod **31** to which there is removably attached an apertured plate **32**. Plate **32** is removeably secured to the crimper housing **19** located in the aperture thereof by means of one or more set screws **33** (Fig. 3). Thus downward movement of piston rod **31** effects an equal downward movement of plate **32** and the crimper housing **19** attached thereto upon the shoulder of container **18** to effect a gas tight seal therebetween as will be described in greater detail hereinafter.

Piston rod **31** also is provided with a top fixed arm **34** which upon lowering suitably of rod **31** effects a contact between the contact points **35** and **36** of an electrical micro-switch **37**.

The closing of microswitch **37** actuates the conventional electro-gas valve **38** which is connected in the nitrogen conduit **39**, moving valve plate **40**, thereby permitting nitrogen gas of about 100 to 150 pounds per square inch to pass through conduit **41** into crimper housing **19** and into container **18**. Preferably and optionally a gas gauge **42** (Fig. 2) is placed in conduit **41**, to check on the nitrogen gas pressure to see if it is 100 or 150 pounds per square inch as feed into conduit **11**.

Conduit **41** enters through a Y-stem **43** (Fig. 3) into a right angle fitting **44** which latter is secured to housing **19**. The nitrogen gas in conduits **11**, **39**, **41** and in fittings **43** and **44** is that pre-selected for filling the container **18** and is preferably 100 pounds per square inch.

When the pressure of nitrogen gas builds up to 100 pounds per square inch in housing **19** and in container **18** clamped thereto in gas tight relationship, the gas pressure is transmitted through conduit **45** to a conventional gas operated pressure switch **46** set to operate at 100 pounds per square inch of gas pressure. The operation of valve **38** moves plate **40** to the dotted line position, thereby permitting nitrogen gas to pass into conduit **41**.

Operation of gas pressure switch **46** effects a contact of points **47** and **48** of microswitch **49**, said microswitch **49** being located in switch unit **46**. Operation of microswitch **49** actuates conventional electro-air valve **50** and the valve plate **51** therein permitting air to pass from air conduit **52** into the top chamber of crimper cylinder **54**. The air conduit **28** is secured to air conduit **52** so that both the crimper piston **17** and the housing piston **16** are operated from the same compressed air line or conduit **10**. The plate **51** of valve **50** is shown in its operable position in dotted outline, permitting the compressed air of conduit **53** to lower crimper piston **17**.

Piston **17** has secured fixedly thereto a bottom piston rod **55** and also a fixedly secured top piston rod **56**. Top piston rod **56** has a fixed arm **57** disposed to the right of the apparatus, said arm having a long slide rod **58** for effecting a suitably long sliding contact with contact points **59** and **60** of microswitch **61**. A second arm **62** is secured fixedly to the left of rod **56** effecting contact between points **63** and **64** of microswitch **65**.

Switch **61** is hooked up to a conventional spring-loaded electrically operated single throw valve **66** having a valve plate **67** therein. The vacuum conduit **68** passes into valve **66** and the vacuum conduit **69** from valve **66** passes into crimper piston rod **55**. Microswitch **59** operates to break the vacuum holding syphon assembly **20**

and the container 18 crimped thereto after the assembly is crimped to the can, thereby preventing retention of the filled container in the filling head after the gas filling operation. This breaking of the vacuum thus permits the filled can to rest on the base plate of the apparatus after the filling head is lifted away from the container by movement of piston 17 upwardly by introducing compressed air below piston 17 as will be described below.

Contact of points 63 and 64 of microswitch 65 effects operation of a conventional time delay relay 70 having contact points therein which effect contact upon expansion of an element being heated in a select period of time. The use of a time delay relay prior to returning all operable units to their normal or nonoperating position is to allow the crimping finger 71 to distort and compress the metal of the syphon cap 72 into a firm seizure relationship beneath head 73 of the mouth of container 18. A rapid hit or strike of the fingers does not distort and compress the metal cap 72 sufficiently well to effect a gas tight seal when using high pressure gas.

Electro-air valves 26, 38 and 50 are of the conventional double throw type wherein one solenoid winding is actuated to throw a valve plate in one direction and a separate solenoid winding is actuated to throw the valve plate in the reverse direction. Actuation of time delay relay 70 throws and returns the electro-air valves 26, 38 and 50 back to their normal or nonoperating position, permitting compressed air to flow through valve 50 into conduit 74 and thence into crimper cylinder 54 to return piston 17 to its raised or normal non-operating position.

As shown in Fig. 7 a ground or return wire 75 leads from all the units 26, 38, 50, 70 and 66 to switch 23. Also a wire conduit 76 leads from time delay relay 70 to the reverse operating solenoid of conventional switches 26, 38 and 50.

The process of this invention is therefore an automatic process wherein a container 18 containing a suitable amount of dry powder fire extinguishing material is placed below a filling head and wherein a syphon tube assembly is inserted by hand into a filling head and retained therein against gravity by vacuum means disposed in the filling head. In actual operation, the syphon tube assembly is placed in the filling head and retained therein by the vacuum and the container with its contents is disposed beneath the filling head by inserting the plastic syphon tube 77 into the container as the container is being seated below the filling head.

With the prepared syphon tube assembly 20 held in the filling head and the housing 19 thereof and with the container 18 disposed axially with relation to the cap 72 of the assembly 20, the switch 22 is momentarily hit and the cycle of operations described above is rapidly completed in a few seconds.

The steps of this process are those of securing a syphon tube assembly to a filling head by vacuum, clamping the housing 19 to the beveled shoulders 78 of container 18 in a high pressure gas tight manner, introducing a predetermined pressure of gas into the housing clamped to the container and into the container itself, opening a compressed air valve by means of the gas pressure of said container, passing the compressed air into a crimper piston chamber to lower the piston thereof, crimping said syphon tube assembly to said container, delaying the release and returning of the crimping fingerings to effect a seal resistant to high pressure of 100 to 150 pounds per square inch and release automatically and simultaneously all operating units to their non-operating condition and position, thereby yielding a released sealed container containing high pressure gas therein.

The apparatus of the invention is shown in detail in Figs. 1 to 5. Referring to Figs. 1 to 5 and particularly to Figs. 1 and 3, the apparatus is disposed upon, through and beneath a work bench 77. A support structure is provided and secured to the top of the work bench 77. The support structure comprises a base having a rear section 78 and a front section 79 (Fig. 1). The base front section 79 has secured to the top thereof a holding plate 80 having a notch cut therein to accurately locate the container 18 below the crimper piston rod 55. The plate 80 is secured to front section 79 by welding or other conventional means. Below the notch base, front section 79 is provided with a suitable round cavity of a diameter slightly greater than the diameter of the container 18. The cavity is provided with a plurality of spring wells, each well containing a suitable coil spring 81 therein. A float plate 82 is placed onto said springs 81. The purpose of the float plate 82 and springs 81 is to assure sealing of containers having slightly irregular or deformed mouths with beads 73 thereon. Thus in lieu of being absolutely horizontal bead rim 73 may be slightly sloped, nevertheless such containers are sealed perfectly because springs 81 and float plate 82 co-actingly offset and compensate for such irregularities of the container 18 during the crimping operation.

The support structure also comprises a T-shaped vertical section 83 having a back stem plate 84 and a front face plate 85. A supplementary front face plate 86, is secured by bolts 87 to the top of plate 85.

A fixed platform 88 is fixedly secured to a depending plate 89 as by welding and plate 89 is secured to the front face plate 85 by threaded bolts 90.

As shown in Fig. 3, platform 88 is provided with an aperture in which crimper housing 19 moves up and down.

Turning to Fig. 1, the conventional compressed air crimper cylinder 54 is secured by conventional means to face plate 86. Also conventional apparatus such as a moisture filter 91, gauge 92 and oil entrainer 93 are secured to the compressed air line 53 in order to remove moisture and to supply air with oil at the correct pressure to operate crimper piston 17 and the lubrication thereof.

Referring now to Fig. 3, the crimping device of this invention is shown in detail. The depending crimper piston rod 55 is provided with an axial bore-hole 94 having a lateral aperture in which threaded tubular fitting 95 is secured. Vacuum conduit 69 is in turn secured to fitting 95.

A cylindrical tubular unitary crimper mandrel 96 is provided with a flange 97, a beveled nose 98, a shoulder 99 and a sloped circular area 100. The top of cylindrical mandrel 96 fits snugly into the cylindrical bore-hole 94 of piston rod 55 and is fixedly secured therein by set-screw 101.

A cylindrical tubular crimper 102, the tube of which is threaded at its top portion is provided, said tube being also provided with a transverse wall 103. A retaining ring 104 is disposed upon wall 103 and a plurality of conventional moveable crimping fingers 71 (Fig. 4) are circularly disposed thereon. A cylindrical apertured retainer collet 105 is disposed on the top beveled edge 71X of the crimper fingers 71. Collet 105 is provided with a bevel edge 105X adapted to mate with edge 71X of fingers 71. A coil spring 106 is disposed about mandrel 96 between mandrel flange 97 and the collet 105.

The mandrel 96 is captively and moveably retained is crimper 102 by means of an apertured threaded cap 107 secured in the tube of the crimper 102 and bearing on the top of integral flange 97 of mandrel 96.

A gas tight seal between the crimper 102 and the crimper housing is accomplished by providing a suitable circular groove 108 in the lower exterior surface of crimper 102. A suitable O-ring is disposed in groove 108 and bears in a gas-tight relationship upon the inner wall of housing 19. Housing 19 is provided with a screw threaded aperture 19X to which fitting 44 is attached and through which the high pressure nitrogen gas is introduced into container 18. Thus aperture 19X

is lowered below sealer O-ring 109 by the lowering of housing 19 by plate 32 secured thereto.

Crimper housing 19 is provided with a circular sloped base 110 having a slope equal to and adapted to mate with sloped shoulder 18X of cylindrical container 18. A flat rubber sealer ring 111 is secured to base 110 by adhesive and by a circular retaining L-shaped in cross section ring 112. A plurality of spaced-apart screws 113 secure the retainer ring 112 to integral housing flange 19Y disposed outwardly and horizontally away from base 110. Flange 19Y is disposed completely about base 110 except where it would interfere with Y-fitting 43.

While one O-ring 109 is sufficient for operation of this invention and to maintain a gas-tight seal between the crimper 102 and its sliding contact housing 19, it is optional and preferable to use two widely spaced apart sealer O-rings. For this purpose a circular groove 114 is cut into the interior wall of the housing near its top and a suitable second sealer O-ring 115 disposed therein.

In the operation of housing 19, the downward movement of the housing 19 effects a gas-tight and seated seal between container shoulder 18X and rubber ring 111 and a gas-tight seal between the crimper 102 and its exteriorly disposed housing is accomplished by O-ring 109 and optionally with a second O-ring 115. Thus the nitrogen gas at 100 pounds per square inch is confined in aperture 19X, housing 19 and container 18 thereby filling the container at this pressure.

In lieu of flat sealer ring 111, the sloped base 110 may be provided with a groove 116 and a suitable sealer O-ring 117 (Fig. 5) disposed therein. Ring 117 functions in the same manner as flat sealer ring 111 to effect a gas seal between O-ring 116 and container shoulder 18X.

After the housing 19 has been seated on container shoulder 118X and the high pressure nitrogen gas introduced into container 18, the crimper rod is actuated to move downwardly bringing the syphon cap 72 and the syphon tube 77 attached thereto, and held against the crimper 102 by vacuum applied through conduit 69 and the tube of mandrel 96, into the mouth of container 18. In lowering conventional cap 72 into the mouth of the container 18, the curvatured cap rim 72X containing sealer rubber 118 deposited therein is seated upon container rim bead 73. Thereupon further downward movement of piston rod 55 and the mandrel 96 secured thereto causes mandrel to move downwardly in sliding contact between beveled mandrel nose 104 and the inner walls of crimper fingers 71 thereby causing the bottoms of fingers 71 to swing outwardly forcing the metal of the conventional cap 72 to be expanded under container rim 73. Upward movement of mandrel 96 returns the fingers 96 to their original position shown in Fig. 3.

When the nitrogen gas at 100 pounds or more than 100 pounds per square inch is used, it was found that when the housing 19 is seated on container 18 in gas-tight manner, the gas pressure is exerted on the underside of cap 72 thereby compressing spring 106 causing the bottoms of fingers 71 to move outwardly even through piston 94 with its attached mandrel 96 was not moved downwardly.

Clearly the strength of spring 106 was not sufficient to offset the force of the high pressure nitrogen gas during the filling operation of the can and before the lowering of the cap 72 upon the container 18.

To offset this undesirable crimping of the caps 72 while in the raised position away from the container mouth auxiliary springs are applied, to aid spring 106, it being impossible to obtain or make a spring strong enough to counteract the high pressure and fit in the crimper housing 102 or in a reasonably enlarged crimper housing.

To this end a suitably strong first spring retainer plate 119 is fixedly secured to the crimper top by a plurality of screws 120 and a second strong spring retainer plate 121 is disposed on mandrel shoulder 96X and against the bottom of piston rod 55. Plates 119 and 120 may be of any suitable shape but preferably are square.

To prevent rotation of plate 121, 120 and the crimper 102, rod 55 is given small flat face undercut 122 and a flat faced wedge 123 secured to plate 121 by screw 124 is provided with the flat wedge 123 bearing against the flat area 122 of rod 55.

A first extremely strong coil spring 125 is provided between plate 121 and plate 119 and the top of the crimper secured to plate 119. Next a plurality of second strong coil springs 126 are secured between plates 119 and 120 by threading bolts 127 about coil springs 126 and through top plate 120 and into plate 119.

Thus the force of combined springs 106, 125 and springs 126 is necessary to withstand the high pressure of 100 to 150 pounds of nitrogen gas to prevent premature crimping of cap 72.

As shown in Fig. 3 rod 31 is secured to moveable plate 32 but slides through an aperture in fixed platform 88. To assure non-rotation of rod 31 to in turn assure positive contact between contact points 35 and 36, a keyway channel 127 is cut in the top of rod 31. A suitable tubular truncated cone 128 having a keyway channel 129 is disposed opposed to channel 128 and a key lug 130 is disposed in channels 128 and 129. Cone 128 is bolted fixedly to platform 88 by bolts 131. Thus rotation of rod 31 is prevented and positive contact between electrical points 35 and 36 maintained.

In this invention (Fig. 1) the compressed air valve 13 is shown in side view with its valve lever 13X in closed position. Nitrogen valve 14 is identical in structure to the compressed air valve 13 and is disposed behind valve 13, the valve lever 14X of the nitrogen valve 14 is shown in open position (Fig. 1).

This invention has been described with relation to use of nitrogen gas with dry powder fire extinguishing material but it can be applied to any suitable gas and other dry powders, for example for spraying dry insecticides, fungicides, deodorants and the like.

This invention is of generic scope, thus in lieu of vacuum a magnetic means may be used to hold the syphon tube assembly in the filling head. Also the syphon tube assembly may be seated in the filling head without the use of vacuum as by friction seizure of the cap 72 by fingers 71.

Plate 32 (Fig. 2) is provided with a rear aperture having an enlarged top of larger diameter formed by horizontal wall seal 132. Rod 31 is provided with a middle threaded section 133 of lesser diameter than rod 31 therebelow forming thus a flat ledge 134 on rod 31. Plate 32 is seated on ledge 134. A threaded washer 135 is threaded onto rod portion 133 and against wall 132 thereby locking plate 32 to rod 31 so that both move up and down as a unit.

This application is a continuation-in-part of applicant's Serial No. 511,571 filed May 27, 1955, now U. S. Patent No. 2,763,415.

I claim:

An apparatus for filling with high pressure gas single aperture mouth containers containing a beaded mouth rim and thereafter sealing said filled container with a sealer cap while under said high gas pressure comprising a tubular cylindrical housing moveably disposed for contacting said container about said aperture, crimper means moveably disposed within the borehole of said tubular housing, vacuum means disposed within said crimper means for securing a sealer cap, at least one sealer ring disposed around said crimper means and between it and the housing to form a gas tight sliding contact therebetween, said housing having a single opening for introducing high pressure gas into the space formed between said housing and said container, compressed air means for lowering said crimper means with its retained sealer cap into said container aperture, crimper fingers disposed in

said crimper means for crimping said cap to the beaded aperture mouth of said container in said formed space while under high pressure gas, and auxiliary spring means disposed on top of said housing for resisting premature crimping of a sealer cap due to high pressure gas acting upon said cap in said space located between said housing and said container.

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