United States Patent

[11] 3,592,244

[72] Inventor **Edward B. Chamberlin**
112 Fifth St., Garden City, N.Y. 11530

[21] Appl. No. **741,075**
[22] Filed **June 28, 1968**
[45] Patented **July 13, 1971**

[54] **FLASK-CHARGING APPARATUS**
6 Claims, 8 Drawing Figs.

[52] **U.S. Cl.** 141/14, 141/3, 141/20
[51] **Int. Cl.** B67c 3/12, B67c 3/26
[50] **Field of Search** 141/3, 14, 19, 20, 348; 137/223, 231, 525; 251/DIG. 1; 230/58, 172

[56] **References Cited**

UNITED STATES PATENTS

1,187,031	6/1916	Black et al.	230/58
2,462,642	2/1949	Jacobson et al.	141/20
2,580,567	1/1952	Martin	141/20 X
2,689,075	9/1954	Marton	141/20 X
3,020,685	2/1962	Kurek	141/3
3,211,191	10/1965	Honisch	141/20
3,357,461	12/1967	Friendship	141/39 X

FOREIGN PATENTS

599,328	6/1960	Canada	141/20

Primary Examiner—Herbert F. Ross
Attorney—Robert Ames Norton

ABSTRACT: Apparatus adapted for charging portable gas-containing flasks adapted for use with spraying devices. The apparatus includes a compressor driven by an electric motor, the operation of the motor being initiated by a switch engaged by the flask when the flask is operatively mounted at the charging station of the apparatus. A pressure-operated switch is disposed in the motor circuit for shutting off the motor driving the compressor when the flask has been charged to the desired predetermined pressure. The apparatus is provided with a novel check valve which is disposed between the compressor and the flask-charging station. The apparatus has a split housing, the parts of the housing being secured together by means which also secures the motor and the compressor to the housing.

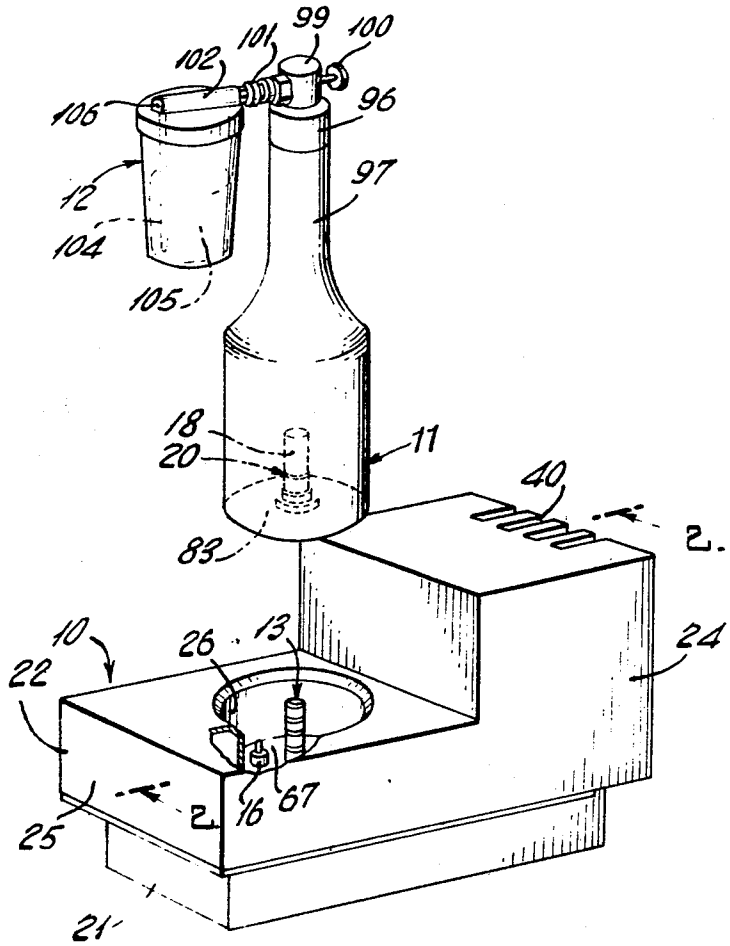


Fig. 1.

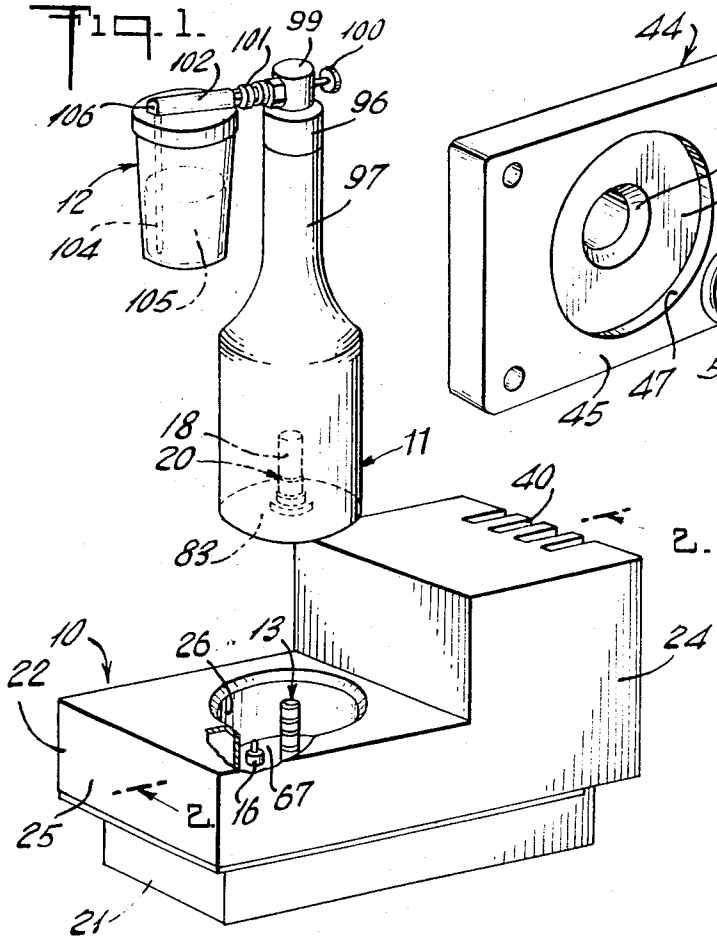


Fig. 6.

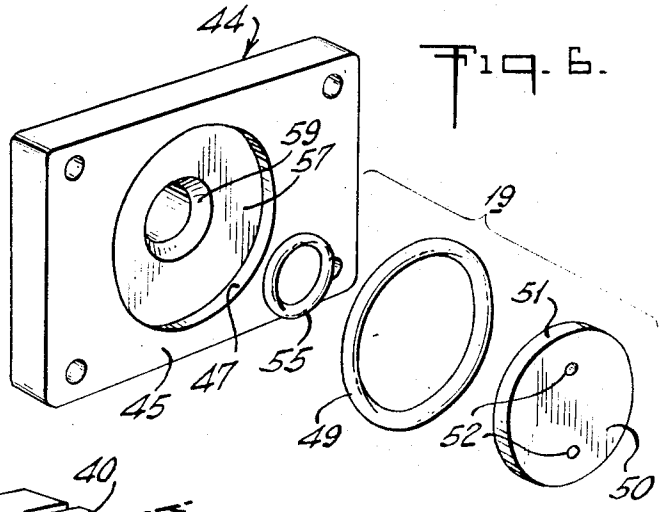


Fig. 7.

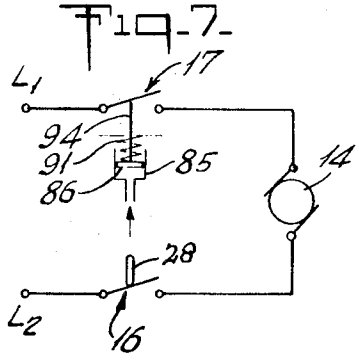
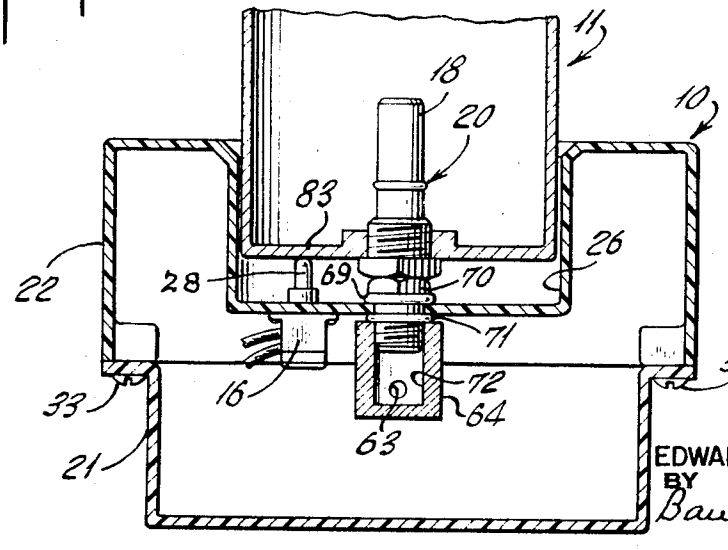


Fig. 8.



INVENTOR
EDWARD B. CHAMBERLIN
BY
Bauer & Seymour
ATTORNEYS

Fig. 2.

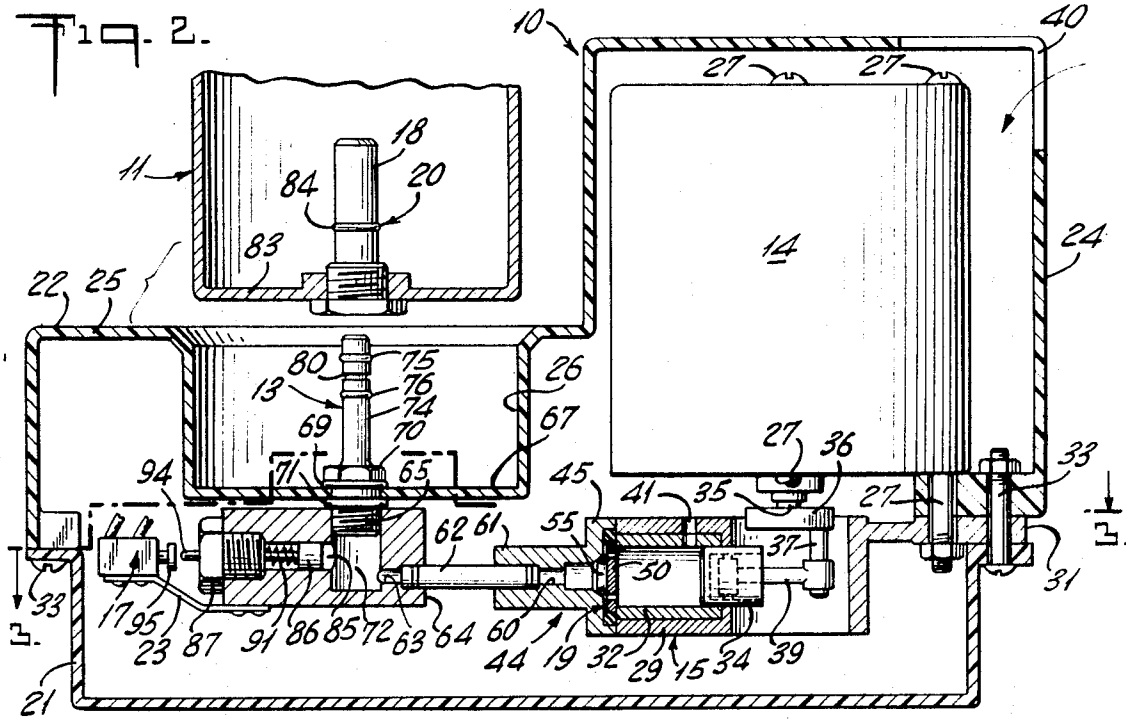
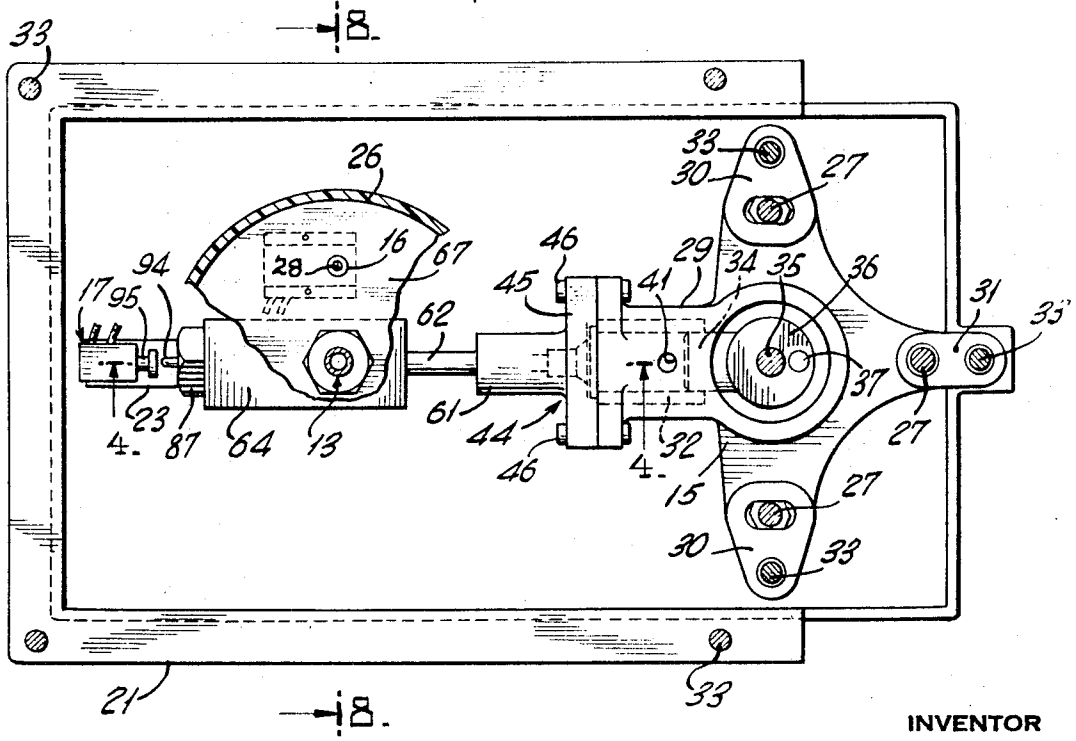


Fig. 3.



INVENTOR
EDWARD B. CHAMBERLIN
BY
Bauer & Seymour
ATTORNEYS

FIG. 5.

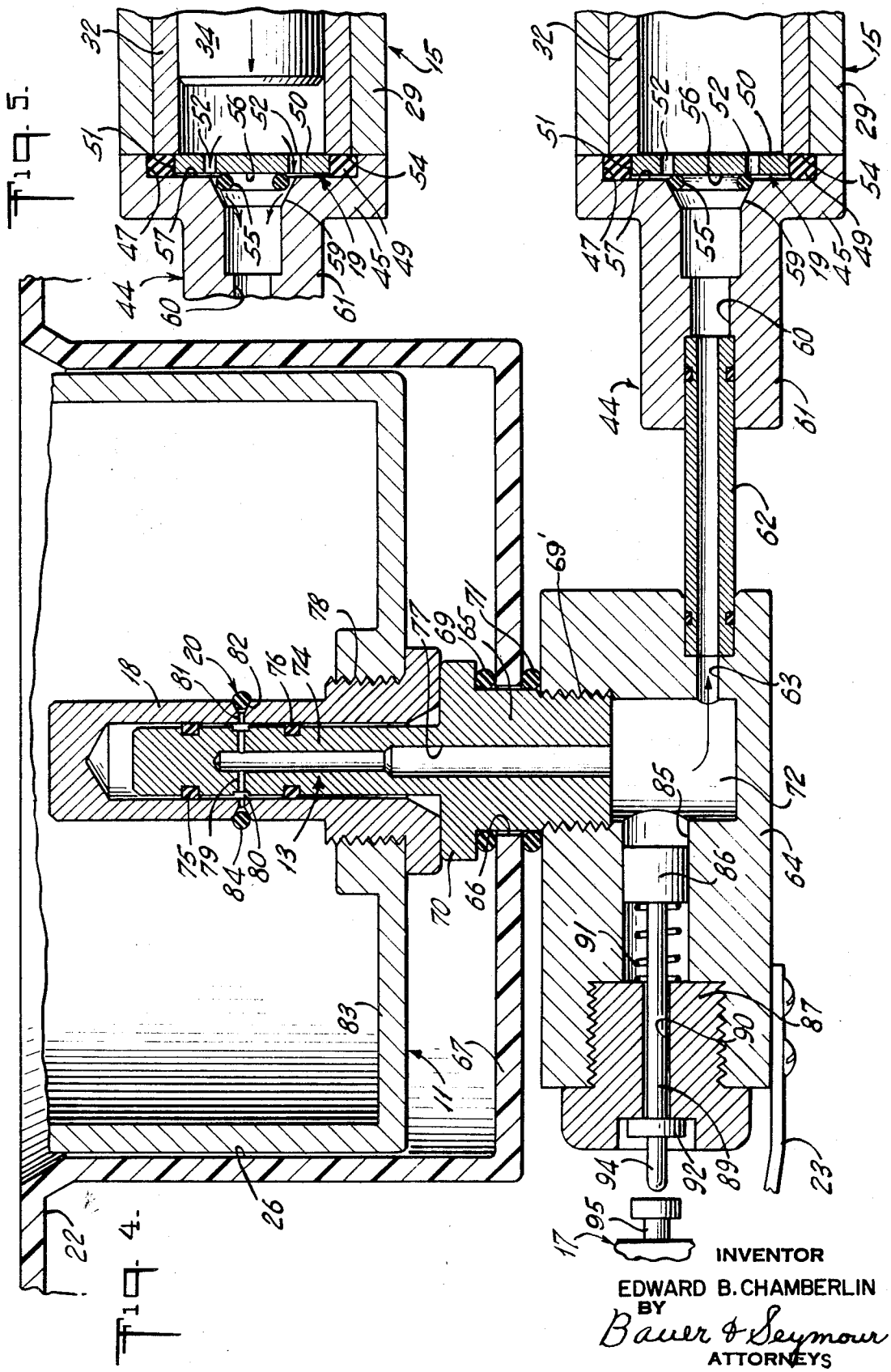


FIG. 4.

INVENTOR
EDWARD B. CHAMBERLIN
BY
Bauer & Seymour
ATTORNEYS

FLASK-CHARGING APPARATUS

This invention relates to a gas-compressing apparatus, and more particularly relates to a gas compressor for charging portable flasks for spraying devices and the like.

The invention has among its objects the provision of an apparatus of the type indicated which includes means mounted at the flask-charging station thereof for starting the compressor upon the positioning of a flask in operative position at the station.

A further object of the invention lies in the provision of a gas compressor having a novel pressure-operated means for shutting off the compressor when the flask has been charged to the desired predetermined pressure.

Yet another object of the invention lies in the provision of an improved check valve which is disposed at the delivery end of the compressor, such check valve being particularly characterized by its simplicity and positiveness of action.

Still a further object of the invention lies in the provision of an apparatus having a compressor powered by an electric motor which forms an integral part of the apparatus, the apparatus having a split housing, the parts of the housing being held together in a novel manner by means which also secures the pump of the compressor and the electric motor to the housing.

The above and further objects and novel features of the invention will more fully appear from the following description when the same is read in connection with the accompanying drawings. It is to be expressly understood, however, that the drawings are for the purpose of illustration only, and are not intended as a definition of the limits of the invention.

In the drawings, wherein like reference characters refer to like parts throughout the several views,

FIG. 1 is a view in perspective showing an apparatus in accordance with the invention with an air flask about to be mounted at the charging station of the apparatus, a portion of the wall of the housing of the apparatus at the charging station being broken away;

FIG. 2 is a view in vertical longitudinal axial section through the apparatus, the section being taken along the line 2–2 of FIG. 1;

FIG. 3 is a view in horizontal section through the apparatus, the section being taken along the broken section line 3–3 of FIG. 2, certain of the parts being fragmentarily shown;

FIG. 4 is an enlarged view in vertical longitudinal section through the charging station of the apparatus with the bottom end of a flask being shown mounted at such station, the view also showing a portion of the compressor of the apparatus with the piston thereof having been retracted and the check valve of the compressor in operative position;

FIG. 5 is a view similar to FIG. 4 of the portion of the compressor and the check valve shown therein but with the piston of the compressor being shown in an operative stroke and the check valve thereof being shown in its inoperative position;

FIG. 6 is an exploded view in perspective of the head of the cylinder of the compressor and the parts cooperating therewith to form the compressor check valve;

FIG. 7 is a schematic wiring diagram showing the manner of control of the motor which drives the compressor; and

FIG. 8 is a view in vertical transverse section through the apparatus with an air flask mounted thereon, the section being taken along the line 8–8 of FIG. 3.

GENERAL DESCRIPTION

The illustrative apparatus, which is generally designated by the reference character **10**, is shown in FIG. **1** in conjunction with an air flask **11** which is about to be mounted upon the apparatus to be recharged. Such air flask is here shown as being employed to power a spray device generally designated **12**. The combination of flask **11** and spray device **12** is completely portable when separated from the apparatus **10**. Such apparatus may serve as the source of compressed air for a

number of flasks employed in any particular operation or operations.

The apparatus **10** is provided with a vertical tube or hollow post **13** which mates with an inwardly closed end tube **18**, which is sealed to the bottom of the flask **11**, when the flask is mounted at the charging station. Tube **18** carries its own check valve **20** so that after being charged with compressed air the flask remains charged after its removal from the apparatus. The apparatus has an electric motor **14** which drives a reciprocating pump or compressor **15** so as to deliver compressed air to the inflation tube **13**. Motor **14** is started upon the placing of the flask **11** in operative position at the charging station, there being a switch **16** interposed in the circuit of the motor for starting the motor when the flask is operatively positioned as shown in FIGS. **4** and **8**. Motor **14** is stopped when the flask **11** has been charged to the predetermined desired pressure, there being a second, pressure-operated switch **17** interposed in the motor circuit so that such circuit is opened when the desired charging pressure is attained. A novel check valve **19** disposed at the head of the reciprocating pump supplements the action of the check valve **20** of the flask **11**. The pressure-responsive means operating the switch **17** is connected to the conduit between the two check valves, so that such pressure-responsive means is subjected to the same pressure as the flask during each operative stroke of the pump of the compressor in at least the later portion of the flask-charging operation.

The apparatus has a housing made up of upper and lower portions **22, 21**. The motor **14** and the compressor or pump **15** are secured together by means which in part includes the means securing the portions of the housing together.

Specific Description

As shown in FIGS. **2** and **8**, the housing of the apparatus **10** is made in two parts, there being a lower flat-bottomed and vertical-walled portion **21** and an upper portion **22** which has a rear, taller portion **24** within which the vertically mounted motor **14** is contained and a forward, shorter portion **25** which contains a circular cylindrical well **26** forming the charging station of the apparatus. The starting switch **16** for the motor **14** is mounted upon the bottom wall of the well **26** in the upper portion of the housing; the pressure-actuated switch **17** is mounted upon an angle bracket **23** affixed to the pump body **29** as shown in FIG. **2**.

The structure of the compressor or pump of the apparatus and the manner in which it, the motor **14**, and the two housing parts **21** and **22** are secured together are more clearly shown in FIGS. **2** and **3**. The pump of the apparatus has a body **29** which is provided with three wings integral therewith and extending horizontally therefrom, two wings **30** projecting laterally in opposite directions while the third wing **31** projects rearwardly. The wings **30** and **31** rest upon flanges at the upper rear end of the lower housing part **21**, a vertical bolt **33** extending through the flange on the bottom housing part **21**, the respective wing **30, 31**, and a flange on the bottom edge of the upper housing part **22**. The lower end of the motor **14** rests upon the upper surface of the flange on the upper housing part, the motor being secured to the housing by long vertical bolts **27**, each of which extends through the stator of the motor and downwardly through the flange on the upper housing portion, the respective wing on the pump body, and the lower flange.

The pump body **29** has a horizontal cylinder provided by a sleeve **32** therein, a piston **34** being reciprocated in the cylinder by the motor **14** through driving means including the vertical motor shaft **35**, a crank disc **36** secured thereto, an eccentrically mounted crank pin **37** on the disc, and a connecting rod **39**. Air is drawn into the housing of the compressor through the grille **40** in the upper rear and top wall of portion **24** of the housing and thence into a port **41** in the sidewall of the body **29** and sleeve **32**, such port being uncovered by the piston when the piston has travelled to the rear to approach its

fully retracted position, as shown in FIG. 2. Upon forward travel of the piston in its operative direction, it covers port 41 and then compresses the air remaining in the cylinder so as to deliver air in compressed condition through the forward end of the cylinder to the check valve 19.

Check valve 19 is particularly shown in FIGS. 4, 5, and 6. Such valve is contained within a cylinder head 44 having larger and smaller diametered portions 45 and 61, respectively. Portion 61 is provided with an axial passage 60 therethrough, the rear end of passage 60 being of forwardly converging frustoconical shape at 59. Portion 59 of the passage forms a first, outer seat of the valve. The larger end 45 of the cylinder head covers and is secured to the body 29 of the pump by head bolts 46. There is a short circular cylindrical cavity 47 in the cylinder head 44 coaxial of the cylinder within sleeve 32 and communicating with the passage 60 through the valve-seat-forming portion 59 thereof. An O-ring 49 is disposed within the cavity 47, the O-ring being of such diameter as to be at least slightly compressed between the forward coplanar forward ends 54 of the pump body 29 and the sleeve 32 and the rear wall 57 of the cavity 47. A disc or wafer 50 having a thickness somewhat less than the axial depth of cavity 47 is disposed in the cavity coaxially thereof with its outer edge 51 in sealing engagement with the radially inner edge of the O-ring 49. The wafer 50 has at least one passage therethrough (two shown at 52), passages 52 being disposed at equal distances from the axis of the wafer with their radially inner edges in approximate alignment with the rear, larger diametered edge of the valve seat 59.

The second, inner seat of the valve 19 is provided by a small O-ring 55 which is held under at least a slight axial compression, when the pump is idle and there is no air pressure in passage 60, between the first, outer valve seat 59 and the forward surface 56 of the wafer 50, the O-ring 55 constantly thrusting the wafer 50 rearwardly into the position shown in FIGS. 4 and 5 with its rear edge portion engaging the forward end surface of sleeve 32. When the pressure of air in passage 60 exceeds that in the forward end of the pump cylinder, as it does under the condition of FIG. 4 in which the piston 34 is being retracted, the air in passage 60 thrusts the O-ring 55 into forcible sealing engagement with the outer valve seat 59 and the forward surface 56 of wafer 50. When, however, the pressure of air in the forward end of the pump cylinder exceeds that within the passage 60, as during a forward, operative stroke of the piston 34 (FIG. 5), air flows from the cylinder forwardly through holes 52 in the wafer 50 and thence radially inwardly toward the O-ring 55. Such air locally distorts the O-ring 55 in the vicinity of the holes 52 to force the O-ring radially inwardly away from valve seat 59, so that air then flows forwardly into passage 60. When the pressure rearwardly of the valve 19 is reduced to a value substantially below that forwardly of the valve, the valve is again sealed against the rearward flow of air therethrough. The resilience of the O-ring 55 and the holding of it under compression between surfaces 56 and 59 aid the O-ring 55 in its described function in the valve 19.

The forward end of the smaller diametered portion 61 of the cylinder head 44 sealingly receives the rear end of a conduit 62, the forward end of such conduit being similarly received within and sealed to the rear, lower horizontal branch of a branched or T-fitting 64. Conduit 62 communicates with a passage 63 in such fitting 64, passage 63 leading to a central cavity 72 therein. The hollow inflation post 13 has an enlarged lower end 65 thereon; portion 65, which is threaded at its lower end, extends through a hole 66 in the bottom 67 of the well 26 of the apparatus and is threadedly connected to the upper portion of fitting 64 at 69'. Upper and lower O-rings 69, 71 mounted between a flange 70 on member 65 and the upper and lower surfaces, respectively, of the bottom wall 67 cushion the inflating tube 13 and retain it securely in place on the bottom 67 of the well 26. The lower end of the central passage 77 in post 13 directly communicates with the cavity 72 in fitting 64.

The upper end portion 74 of the post 13 is of circular cylindrical configuration, such portion 74 having upper and lower rings 75, 76 disposed in axially spaced upper and lower transverse annular grooves in the outer surface thereof.

The post 13 is provided with a plurality of radial passages 79 through the wall thereof adjacent its upper end, passages 79 being connected at their outer ends with a transverse annular groove 80 in the outer surface of post 13. The passages 79 and the groove 80 constitute a port through which air is delivered under pressure from the cavity 72 and passage 77 to the flask 11 being charged.

When the flask is mounted upon the post 13 in operative position at the charging station as shown in FIG. 4, the annular groove 80 confronts and communicates with a plurality of radial passages 81 through the wall of the tube 18 sealingly affixed to the bottom wall 83 of the flask 11. An annular groove 82 which is of V-cross-section is provided in the outer wall of the member 18, there being an O-ring 84 disposed in such groove. It will be apparent that upon the subjection of the space within the flask 11 to a pressure which exceeds that in passage 77 the O-ring 84 is strongly thrust into sealing engagement with the surfaces of the groove 82 at the cessation of each pumping stroke of the pump. When, however, the pressure of air delivered from the pump to the passage 77 exceeds that within the flask 11, the O-ring 84 is thrust outwardly so as to open the inflating port in the member 18 so that air may then flow into the flask.

The pressure-responsive switch 17 is operated by means particularly shown in FIGS. 2 and 4. The fitting 64 has a further, horizontal branch within which there is disposed a horizontal cylinder 85 having a piston 86 reciprocable therewithin. Affixed to the piston 86 there is a piston rod 89 which is guidingly received within a central bore 90 in a bushing 87 which is affixed to the fitting 64 to close the outer end of the cylinder 85. The piston 86 is constantly urged toward its rear, inner position by a coil compression spring 91 which acts between the piston 86 and the inner end of the bushing 87. The piston 86 and piston rod 89 are held in their inner position, shown in FIG. 4, by a collar 92 which is affixed to the piston rod 89 and abuts a surface on the outer end of the bushing. The position of the piston 86 and piston rod 89 serves as a measure of the pressure of air in the cavity 72 during a flask-charging operation. When the pressure in the cavity 72 of air delivered by the pump, and thus the air pressure within the flask being charged, reaches a certain value, the piston and piston rod are thrust outwardly sufficiently for the outer end 94 of the piston rod 89 to engage and thrust forwardly a plunger 95 of the pressure-responsive switch 17. Thereupon switch 17 is opened and the motor 14 is stopped. As will be seen in FIG. 7, switches 16 and 17 are disposed in series with the motor in a motor supply circuit extending between supply terminals L_1 and L_2.

The flask 11 in this instance is employed as a source of air pressure for a spraying device 12, as above indicated. Device 12 is connected to a flask closure member 96 affixed to the outer end of the neck 97 of the flask. Device 96 includes a valve 99, not specifically shown, which is opened upon the depressing of a valve-operating button 100. Connection between the outlet passage from the valve 99 and the spraying device 12 is effected through a quick-operating connector 101. The spraying device shown includes an aspirator 102 which receives liquid 105 in the container through the medium of a dip tube 104. Upon the opening of the valve 99, the mixture of atomized liquid 105 and air from the flask 11 is delivered through the spray orifice 106 of the device 12. It is to be understood that charged flasks 11 may be employed with other types of spraying devices, as well as sources of compressed air for other operations.

It will be apparent from the above that in operating the apparatus of the invention the placing of an empty flask 11 in charging position within the well 26, the plunger 28 of the normally open switch 16 is depressed by engagement with the bottom wall 83 of the flask to close such switch. Since the

pressure-operated switch **17** is now closed, the motor **14** starts. Charging of the flask **11** continues until forward movement of piston rod **89** opens switch **17** to stop the motor. Upon the removal of the charged flask **11** from the charging apparatus **10**, switch **16** opens and switch **17** closes to restore the apparatus to its initial condition, so that it is in readiness for the charging of another flask.

Although only one embodiment of the invention has been illustrated in the accompanying drawings and described in the foregoing specification, it is to be especially understood that various changes, such as in the relative dimensions of the parts, materials used, and the like, as well as the suggested manner of use of the apparatus of the invention, may be made therein without departing from the spirit and scope of the invention, as will now be apparent to those skilled in the art.

I claim:

1. An apparatus for charging portable containers having at one end a hollow gas inlet port provided with a check valve permitting flow of gas only into the container, said apparatus comprising a container-charging station adapted to have the end of a container carrying the gas inlet port positioned thereon, a tubular outlet means fixedly connected to the charging station and positioned and dimensioned to slidably receive the gas inlet port and produce a gastight seal when the container is slid thereon, said tubular outlet means comprising a post having passage means for alignment with said check valve and elastic means for sealingly engaging said hollow inlet port of said container for a predetermined pressure, said elastic means engaging said hollow inlet port on each side of said check valve to preclude said container from being propelled from said post, gas-compressing means and a connection to the tubular outlet means, and means responsive to sliding a container into the charging station to initiate the gas-compressing means, whereby when a container is slid on the charging station compressed gas passes through the tubular outlet and the gas inlet port of the container into the container only when the passage and check valve are aligned.

2. An apparatus according to claim **1** in which the gas-compressing means is driven by a motor and the means responsive to sliding a container on the charging station is a switch connected to start the motor.

3. An apparatus according to claim **1** in which the gas-compressing means is provided with a stopping means actuated when gas pressure into the container exceeds a predetermined amount.

4. An apparatus according to claim **2** in which the gas-compressing means is provided with a switch actuated by gas pressure to the container in excess of a predetermined amount, said switch stopping the motor.

5. An apparatus according to claim **2** in which the switch actuated by sliding a container on the charging station is a spring switch and opens under spring pressure when a charged container is slid off of the charging station.

6. An apparatus according to claim **4** in which the switch actuated by sliding a container on the charging station is a spring switch and opens under spring pressure when a charged container is slid off of the charging station.