

[54] **SINGLE DOSE, REPLACEABLE SUPPLY AIR PRESSURE OPERATED DISPENSER**

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[56]

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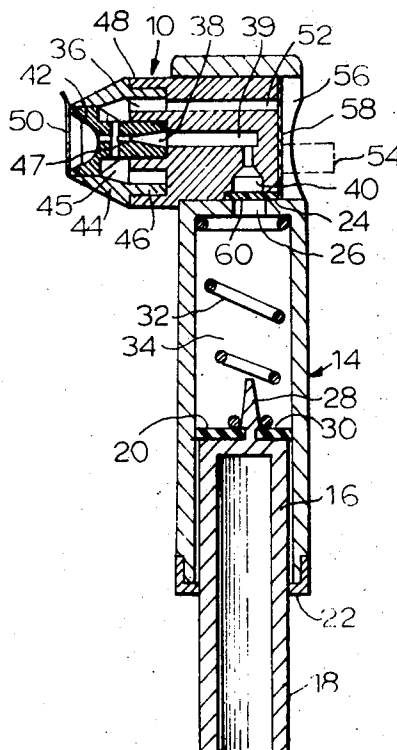
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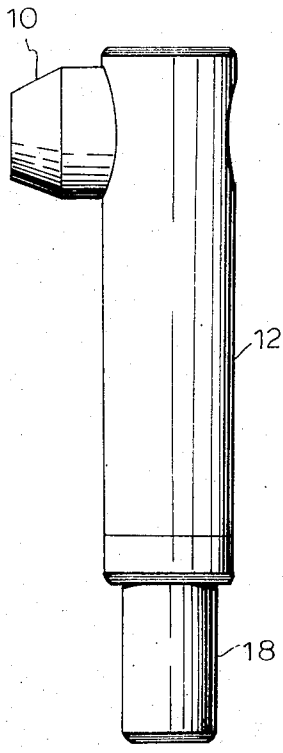
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[57] **ABSTRACT**

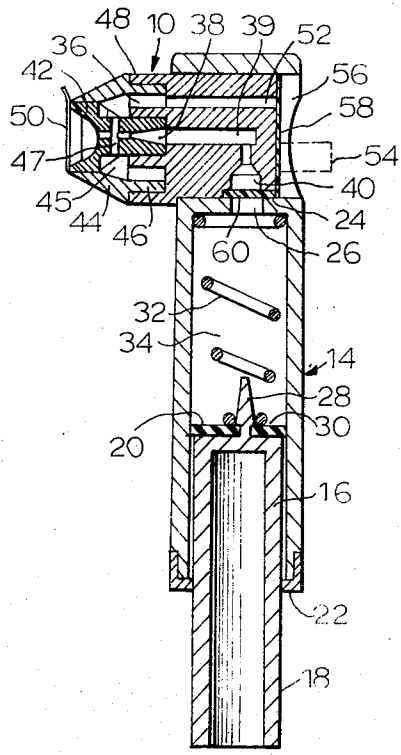
A single dose dispensing device for aspirating a product located in a replaceable container by means of compressed air is disclosed. The device includes a piston-cylinder assembly having a movable member and a fixed member and has a compressed air flow path therethrough with an aperture at the free end of the fixed member. A product dispensing member, also having a compressed air flow path therethrough is connected to the piston-cylinder assembly, the respective compressed air flow paths being in communication with one another. The dispensing member further includes a product storing chamber and an aspirating means in communication with both the product storing chamber and the compressed air flow path. A diaphragm member normally blocks the compressed air flow path and is adapted to open when the movable member substantially completes a compression stroke, thus allowing product to be dispensed by means of compressed air.

**10 Claims, 2 Drawing Figures**





**FIG. 1**



**FIG. 2**

## SINGLE DOSE, REPLACEABLE SUPPLY AIR PRESSURE OPERATED DISPENSER

### BACKGROUND OF THE DEVICE

#### 1. Field of the Invention

The invention relates to a dispenser and particularly to a device for dispensing a single dose of material preferably powder, by means of aspiration using compressed air, and in which the supply of dispensed material is readily replaceable.

#### 2. Description of the Prior Art

The art of dispensing material is highly developed. Recently there have been great advances in the art of dispensing materials by means of a compressed propellant while keeping the material and propellant separate prior to dispensing. This is typified by the recently developed so-called double aerosol type dispensers which are quite satisfactory, but nevertheless have some disadvantages, particularly where they must be made in small sizes.

A most serious disadvantage arises from the fact that so-called aerosol propellants are used to dispense the material. When medicaments are dispensed from the inhaler type devices, these propellants are inhaled by the user along with the medicament. It has recently been reported that fluorocarbon propellants, e.g. Freon which is a commonly used propellant, may be highly toxic, and the same situation may be found to hold true for other propellants. Pharmaceutical marketers would thus prefer to have the product dispensed by air instead of the chemical vapor conventionally used as a propellant.

A further disadvantage of the prior art dispensing devices is leakage of propellant from the propellant cartridge during storage, which reduces the shelf life of the dispenser. Additionally, the problem of exactly matching the amount of propellant with the amount of material to be dispensed is often difficult because of leakage problem. Also because of differences between the various materials being dispensed a proper amount of propellant for the material will not suffice or will be in excess of that necessary for dispensing all of another material. In the first instance, part of the product is wasted and in the second instance part of the propellant is wasted.

A further disadvantage is that, with compressed gas type propellants when the propellant is running low, the dispensing of the last of the material to be dispensed can be carried out only at a very slow rate, as compared to when the dispenser is initially filled with propellant, when dispensing takes place rapidly.

Many of these disadvantages could be overcome if, instead of using compressed conventional propellant gases, air was used as a propellant and was compressed each time the dispensing operation was to be carried out. Conventional squeeze bulb and piston-cylinder atomizers operate somewhat in this fashion but have the serious drawback that the compression is carried out gradually, the amount of material dispensed being dependent on how fast and with what force the squeeze bulb or the piston-cylinder means is operated. They very often include a check valve at the delivery end of the cylinder, but this valve does not provide any significant resistance to flow of compressed gas once the piston starts to move into the cylinder.

A number of devices have recently been invented which use charges of compressed air which are produced at each actuation of the device. However, these devices tend to be somewhat complex and hence rather expensive to make.

Technical progress would be achieved if there could be provided a simply constructed device which would dispense single doses of product with air compressed as the device is actuated under the control of a very simple and easily made means, the parts of which device would be simple to mold in plastic, and which could have the product supply readily replaced.

### OBJECTS AND SUMMARY OF THE INVENTION

It is an object of the present invention to provide a simple and compact single dose dispensing device having a replaceable supply cartridge, which utilizes compressed air for aspiration in a manner so as to overcome all of the recited disadvantages of the prior art dispensers.

It is further object of the present invention to provide a simple and compact single dose dispensing device having a replaceable supply cartridge which utilizes compressed air that is compressed as the dispensing takes place, but which releases the compressed air only after the pressure has built to a desired level.

It is a still further object of the present invention to provide a simple and compact dispensing device which can be stored without loss of a propellant and without a product container, therefore having an unlimited shelf life, which can also be stored without fear of an explosion of a compressed propellant and which can be shipped in interstate commerce as a non-pressurized item, thereby eliminating the need for special packaging and labeling.

It is a still further object of the invention to provide a simple and compact single dose dispensing device having a replaceable supply cartridge, preferably for a powdered medicament, which has a positively operated simple diaphragm member in a compressed air flow path between a piston and aspirating means. The diaphragm member seals the compressed air flow path when product is not being dispensed.

These objects are achieved by providing a dispensing device having a piston-cylinder assembly defining a compressed air flow path therethrough and having a piston slidable therein. A single dose, replaceable product dispensing member having aspirating means is removably connected to the piston-cylinder assembly such that the aspirating means communicates with the compressed air flow path therein. The product dispensing member has a diaphragm member operatively positioned across the compressed air flow path. The piston-cylinder assembly preferably has a cylinder around the compressed air flow path and has a piston slidable therein. A piston rod is connected to the piston for moving the piston into the cylinder. When the piston reaches substantially the inner end of the cylinder, the diaphragm member and consequently the compressed air flow path opens, thus releasing the compressed air from the cylinder. The actuation of the aspirating means in response to the compressed air causes the product to be dispensed. The dispensing member is then replaced by a full one. All of the parts of the device are easily molded in plastic and easily assembled.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view of the device constructed in accordance with a subject disclosure;

FIG. 2 is a sectional elevation view of the device of FIG. 1 with the parts in the rest or non-dispensing position.

## DETAILED DESCRIPTION OF THE INVENTION

Referring first to FIG. 1, a side view of a configuration of the subject invention is disclosed. A single dose, replaceable product dispensing member 10 is inserted within and retained by a dispenser 12 and operatively communicates therewith. The dispenser 12 has a piston which is operated by means of piston rod 18 to produce a compressed air supply which is fed to the product dispensing member 10 for aspiration of the material, preferably powder, contained in the member.

Next, referring to FIG. 2, which discloses a cross sectional elevation view of the device of FIG. 1, the compressed air is generated by an air compressing piston-cylinder means which may be a hollow cylinder 14 having an aperture at one end and an aperture in the lateral surface of the cylinder at the opposite end thereof. A piston member 16 is slidably positioned within the cylinder 14 and the piston rod 18 is an extension thereof which extends through the end aperture of the cylinder 14. The piston member 16 has a piston face 20, the piston being slidably retained within the cylinder by means of retaining cap 22. The cylinder further includes a partition member 24 having an aperture 26 therein. A probe member 28 protrudes from the face 20 of the piston in alignment with the aperture 26. Compression ring 30 seals the piston head in its movement within the cylinder 14 and a return spring 32 within the cylinder normally urges the piston away from the partition member 24. The piston, the partition and the cylinder define a chamber 34 for compressing air.

Product dispensing member 10 is a separate replaceable body which is insertable through the first lateral aperture in the cylinder as shown. The dispensing end of the member 10 has an outer annular channel 36 and an inner recessed region 38 having a central passageway 39 extending from the recessed region 38 and intersecting a lateral opening 40 of a larger diameter which opens laterally out of the member 10. A Venturi nozzle insert 42 is seated in the inner recessed region 38 and an aperture cover 44 sits within the annular channel 36 and fits over the Venturi nozzle insert 42; an elongated extension 46 fitting tightly against the peripheral wall 48 of the dispensing member 10. A tab seal 50 is provided over an aperture in the cover and the Venturi nozzle and is removed prior to operation of the device. This tab seal insures that the product will not become contaminated and also prevents the unintentional egress of product from the device.

The Venturi nozzle 42, cover 44 and member 10 define a supply chamber 45 from which passages 47 open into the central passage of nozzle 42. Supply chamber 45 can be filled by loading a preferably powdered product through material supply passageway 52 which communicates with the supply chamber. A thumb knockout pin 54 may optionally be provided on the dispensing member. The cylinder 14 has a second lateral aperture 56 through which extends the thumb knockout pin 54. An air tight seal 58 is provided over the back of mem-

ber 10 to prevent leakage of compressed air, to seal the supply passageway 52, to protect the product contained in the supply chamber from contamination and to retain the product therein.

The air flow path which begins at the passageway 39 is normally blocked by solid, breakable diaphragm member 60 which is preferably seated in a recessed region of the dispensing member 10 in coaxial relationship with lateral opening 40. The diaphragm member may be constructed of paper, plastic or the like and fits snugly within the recess to block the compressed air flow path. The diaphragm member initially acts, in combination with the partition member 24, as an end of a compression chamber; the other end being formed by the piston 16 which moves toward the partition member 24 in the compression stroke. The diaphragm member is designed to prevent the passage of compressed air into the product dispensing member 10 until the piston substantially reaches the end of its compression stroke at which time the probe member 28 extends through the aperture 26 into the lateral opening 40 rupturing the diaphragm member. Obviously, the pressure of the compressed air which is supplied to the dispensing member is determined, inter alia, by the length of the probe member. Once the diaphragm member is broken, compressed air surges through passageway 39 and into the Venturi nozzle 42 and the material in supply chamber 45 is aspirated therefrom and dispensed through the Venturi nozzle 42.

Operation of the device is as follows:

When pressure is exerted by the fingers of the user on the piston rod 18, air is compressed in the cylinder 14 ahead of the piston face 20. The diaphragm member 60 blocks the passage of air until the piston reaches the end of its stroke, at which time the diaphragm member opens and the compressed air in the cylinder is suddenly released to flow through the compressed air flow path and the product dispensing member, causing aspiration of the product as described above.

The member 10 contains a single dose of product and may be removed, for instance by pressing the thumb knockout pin 54, from the dispenser and a new capsule may be coupled thereto in preparation for the next dispensing operation. The piston 16, upon release, returns to its initial position due to the force exerted by the spring 32.

It will be seen that a simple diaphragm is provided in the replaceable member 10 instead of there being a more complex valve and spring arrangement. All of the parts are easily molded of plastic, except for return spring 32, so that the device is easily and inexpensively manufactured.

It is thought that the invention and its advantages will be understood from the foregoing description, and it is apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing its material advantages, the form hereinbefore described and illustrated in the drawings being merely a preferred embodiment thereof.

I claim:

1. A single dose replaceable product supply dispensing device comprising:

a piston-cylinder means having a movable member and a fixed member having a compressed air flow path therethrough with an aperture at the end remote from said movable member;

a single dose replaceable product dispensing member having a product dispensing aperture and adapted to be operatively connected to said fixed member and having a compressed air flow path there-through, said flow path being operatively positioned relative to said compressed air flow path of said piston-cylinder means when said product dispensing member is connected to said fixed member for communication therebetween, said dispensing member further having a product supply chamber, and aspirating means in said compressed air flow path communicating with said product supply chamber for dispensing said product via said product dispensing aperture; and

a diaphragm member normally blocking the compressed air flow path and adapted to open only when said movable member approaches thereto, during its compression stroke;

whereby as said movable member moves toward said fixed member in a compression stroke, air is compressed in the fixed member, said diaphragm member remaining closed until said movable member substantially reaches the end of its compression stroke whereupon said diaphragm member opens, allowing compressed air to travel along said compressed air flow path into said product dispensing member and through said aspirating means, product being dispensed thereby.

2. In the dispensing device of claim 1, said diaphragm member being a solid breakable member and said device further comprising a perforating member positioned on and extending from said movable member toward said diaphragm member, the length of said perforating member being such that said diaphragm member is ruptured near the end of the compression stroke of said movable member.

3. The dispensing device of claim 2, wherein said product dispensing member has a peripheral recess about the compressed air flow path thereof, said diaphragm member being air tightly seated in said recess.

4. In the dispensing device of claim 3, said cylinder further having an aperture in the lateral surface thereof and said product dispensing member being insertable therethrough whereby said product dispensing member is operatively seated within said cylinder.

5. The device of claim 4, wherein said aspirating means is a Venturi nozzle insert member in said compressed air flow path and having lateral passages extending to said product containing chamber, said product being aspirated by said compressed air flow through said nozzle and being dispensed through said nozzle.

6. The device of claim 5, wherein said product dispensing member further comprises a thumb knockout pin extending from an end of said product dispensing member opposite said product dispensing aperture and said cylinder further having a second lateral aperture opposite said first lateral aperture, said pin extending through said second lateral aperture.

7. The device of claim 6, wherein said product dispensing member further comprises an annular cartridge member having a substantially cylindrical shape,

and having opposite ends, one end thereof having an outer annular channel and an inner recessed portion, said compressed air flow path extending from said recessed portion to the lateral surface of said annular cartridge member, said Venturi nozzle insert being seated within said inner recessed portion, a cartridge cover having a central aperture and having an elongated portion positioned within said outer annular channel, said central passage being positioned in alignment with said Venturi nozzle and said cartridge cover, said Venturi nozzle insert and said cartridge member end forming said product supply chamber.

8. The device of claim 7, wherein said cartridge member further has a material filling passageway communicating with said product supply chamber and the opposite end of said cartridge member.

9. The device of claim 8, further comprising a first removable sealing member positioned over said Venturi nozzle for preventing contamination of the product contained therein and a second sealing member positioned over the opposite end of said member.

10. A single dose replaceable product dispensing member for dispensing a product by means of compressed air supplied by a dispensing device, comprising:

a dispensing member body, one end thereof having an outer annular channel and an inner recessed portion, a first aperture within said inner recessed portion, a second aperture through which compressed air may be admitted to said dispensing member, a compressed air flow path between said first and second apertures, aspirating means comprised of a Venturi nozzle insert member having a central air passageway positioned within said inner recessed portion in operative alignment with said first aperture and receiving compressed air therefrom, said Venturi nozzle insert member further having lateral passageways extending from the central air passageway to the periphery of a cover member having a central aperture positioned over said one end of said dispensing member said central aperture being in alignment with said Venturi nozzle insert member, said cover member, said Venturi nozzle insert member and said dispensing member body defining a product supply chamber, said product supply chamber communicating with the central passageway of said nozzle insert member through said lateral passageways, and a material filling passageway intersecting said product supply chamber in said outer annular channel and intersecting an opposite end of said dispensing member whereby product may be supplied to said chamber and a diaphragm member normally blocking said compressed air flow path and adapted to open when the pressure of said compressed air supplied to said dispensing member exceeds a predetermined value whereby compressed air aspirates product as the compressed air passes through said Venturi nozzle member insert, product being thereby dispensed.

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