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LIQUID ATOMIZER

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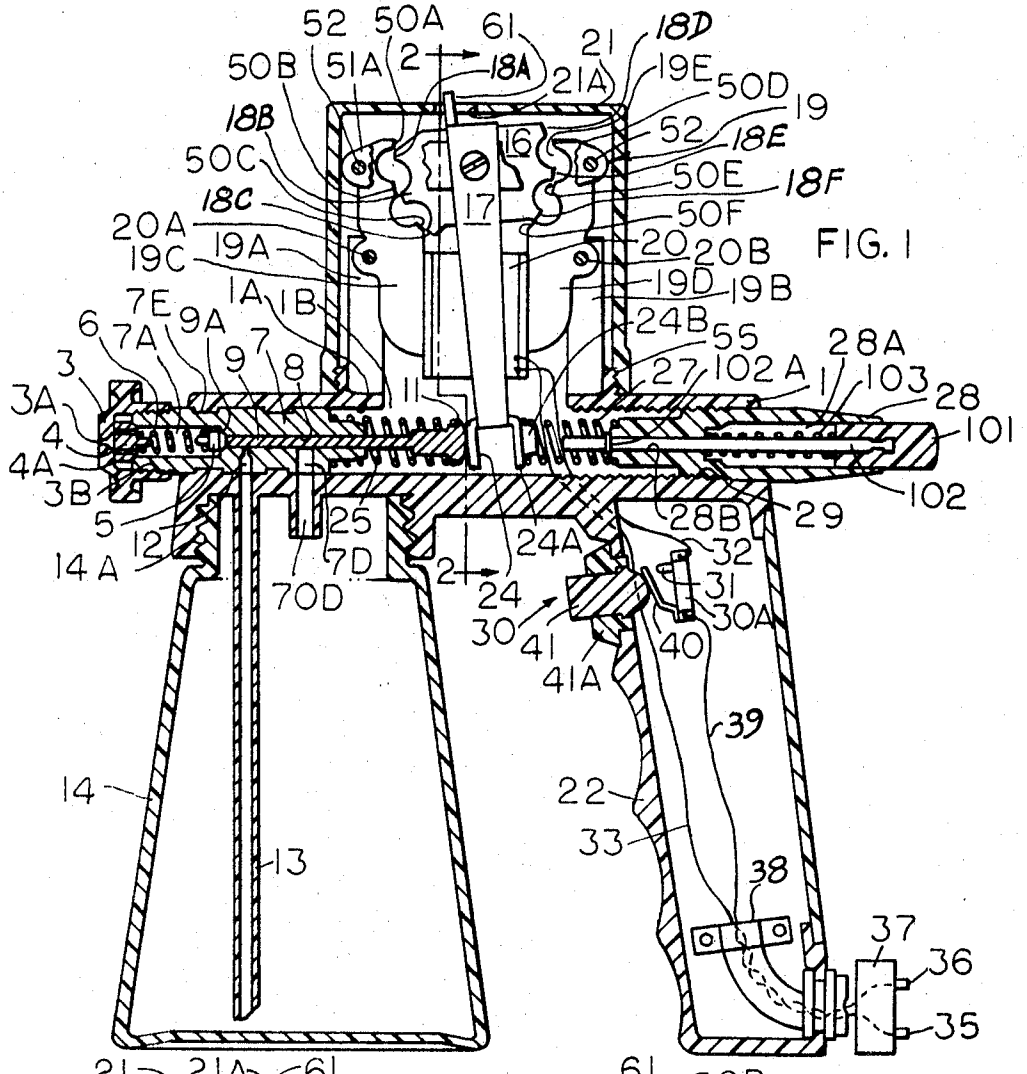


FIG. 1

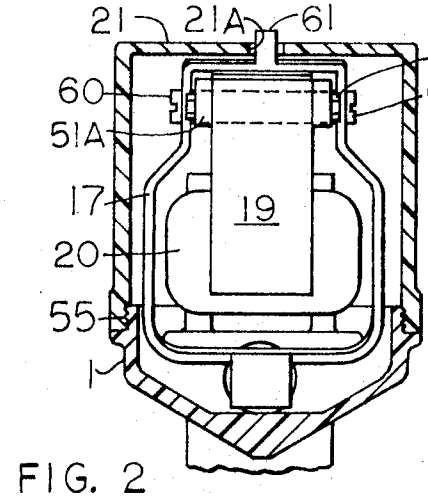


FIG. 2

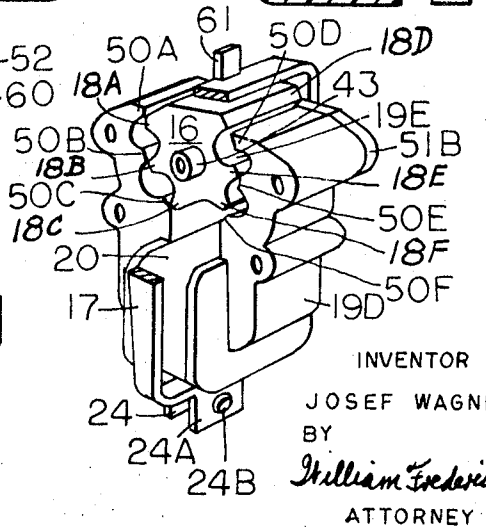


FIG. 3

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LIQUID ATOMIZER

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ABSTRACT OF THE DISCLOSURE

An adjustable stroke oscillating armature drive for a pump piston used in a liquid atomizer, whereby, the oscillating armature actuates the pump piston to create a vacuum to thereby draw fluid out of a container and through a nozzle to the atmosphere.

This invention relates to a liquid atomizer and more particularly to an oscillating armature drive used in cooperation with a pump piston.

An object of the present invention is to provide a new and improved oscillating armature drive for a pump piston used in a liquid atomizer.

Another object of the present invention is to provide a noiseless drive in a liquid atomizer.

The liquid atomizer herein contemplated is used for spraying scent, such as cologne, hair dressing, medicinal throat and oral cavity sprays and skin ointment sprays.

In the past liquid atomizers have employed an oscillating armature actuated by a field coil. The disadvantages of prior constructions was the fact that oscillating armature drivers would strike the field coil members and produce nerve racking noises. Attempts to damp the noise consisted of buffers which cushioned the impact of the driver and thereby reduced the power of the driver on the pump piston. Experience has demonstrated that buffers wear out quickly especially when an oscillating frequency of 60 c./s. (cycles per second) are employed.

It is therefore an object of the present invention to provide a virtually noiseless drive in a liquid atomizer; one which works without any type of impact between driver and field coil.

Other objects of the present invention will become apparent in part and be pointed out in part in the following specification and claims.

In the accompanying drawings wherein like reference characters refer to like parts:

FIGURE 1 is a vertical sectional view through the new and improved liquid atomizer.

FIGURE 2 is a transverse vertical sectional view taken on line 2—2 of FIGURE 1.

FIGURE 3 is a perspective view, with a part broken away, to show the construction of the field coil and oscillating armature.

Reference is now made to all the figures of the drawing, wherein is illustrated the liquid atomizer comprising a main housing 1 provided with a longitudinal passageway 1A having an opening 1B.

A pump cylinder 7 provided with a chamber 7A, a piston bore 8, a valve seat 9A, a drain port 7D and circular recesses 7E, is molded to main housing 1 and retained in position in said longitudinal passageway 1A by means of circular recesses 7E.

A spray nozzle 3, provided with exit port 3A, is rotatively attached to pump cylinder 7 by means of screw threads 3B. An atomizer head 4 provided with a plurality of passageways 4A is located in chamber 7A and is held in position between spray nozzle 3 and pump cylinder 7.

A pump piston 9, provided with an end plate 11 in the form of an enlarged head on one end, is slidably mounted in piston bore 8.

A valve 5 provided with a tapered valve seat which mates with valve seat 9A, is located in chamber 7A and is adapted to block and unblock piston bore 8. An auxiliary coil spring 6 located in chamber 7A is interposed between atomizer head 4 and valve 5 to yieldingly urge the tapered valve seat on valve 5 into engagement with valve seat 9A, thereby to block piston bore 8.

A main coil spring 25 is interposed between end plate 11 and pump cylinder 7, to yieldingly hold the end of pump piston 9 away from engagement with valve 5, and for other reasons which will presently appear.

A storage container 14 is rotatively attached to main housing 1 by means of threads 14A. A suction pipe 13 formed as an integral part of main housing 1, is aligned with an orifice 12 located in pump cylinder 7, so as to provide a passageway for fluid from container 14 to piston bore 8. Housing 1 is also provided with a fluid drain passageway 70D aligned with drain port 7D.

Main housing 1 is provided with a pair of integrally formed upstanding brackets 19A, 19B. A stator, generally indicated by reference numeral 19, is U shaped and consists of a base with two arms 19C, 19D separated by a space 19E. A field coil 20 is wound around said base. A plurality of stationary pole shoes 50A, 50B, 50C, 50D, 50E, 50F are located on said two arms 19C, 19D. Screws 20A, 20B, fasten stator 19, respectively, to brackets 19A and 19B. Two brackets 51A, 51B are fastened on opposite ends, respectively, to opposite sides, respectively, of stator 19 by means of screws 52.

An oscillating armature 16 fastened to a spindle 43 is provided with movable pole shoes 18A, 18B, 18C, 18D, 18E and 18F. Oscillating armature 16 is located in space 19E. Spindle 16 is oscillatably supported in brackets 51A and 51B with movable pole shoes 18A, 18B, 18C, etc., aligned, respectively with stationary pole shoes 50A, 50B, 50C, etc., of stator 19.

A yoke 17 provided on one end with flanges 24, 24A is fastened to the opposite ends of spindle 43 by means of screws 60. Flange 24A is provided with a pad 24B. Yoke 17 may have an extension 61 for purposes which will presently appear. Flange 24 engages end plate 11. Yoke 17 projects through opening 1B locating flange 24 in longitudinal passageway 1A.

A casing 21 encloses the stator 19, field coil 20, oscillating armature 16 and yoke 17 and is rotatively fastened to housing 1 by means of threads 55.

The structure so far described is an article of manufacture subject to the broadest concept of the present invention.

A rotary sleeve 28 located in longitudinal passageway 1A is rotatively mounted in main housing 1 by means of threads 29. A coil spring 27 is interposed between pad 24B and rotary sleeve 28 to yieldingly force yoke 17 in a direction opposite to the direction of the force of spring 25. Rotation of rotary sleeve 28 through threads 29 increases or decreases the tension of both coil springs 25 and 27, and in this manner, the stroke of pump piston 9 can be adjusted or regulated.

Rotary sleeve 28 may be provided with an opened ended cavity 28A and a bearing 28B. A rod 102 provided with a collar 102A is slidably mounted in bearing 28B and is anchored or fastened on one end to a knob 101 which is slidably mounted in cavity 28A. A coil spring 103 located in cavity 28A is interposed between the base of cavity 28A and knob 101 to yieldingly hold collar 102A against rotary sleeve 28.

Knob 101 may be pushed into cavity 28A against the tension of spring 103 to poke rod 102 against pad 24A

in order, when necessary, to apply a "starting-up" impulse to oscillating armature **16** through yoke **17**. Poking rod **102** may also be used to move pump piston **9** should the spray fluid congeal and cause piston **9** to seize or stick in piston bore **8**. Extension **61** on yoke **17** serves the same function as poke rod **102**. Casing **21** is relieved at **21A** to permit extension **61** to extend through and beyond casing **21**.

Any source of electrical current may be employed to energize field coil **20** and cause the described mechanism to function. One arrangement of electrical controls will now be described. A push button switch, generally indicated by reference numeral **30**, is provided with a button **41** slidably mounted in a frame **41A** attached to hollow handle **22** forming an integral part of main frame **1**. A terminal block **30A** is fastened to handle **22** and is provided with stationary terminal **31** and spring terminal **40**. An electrical cable **32** connects terminal **31** with field coil **20**.

An electrical plug **37** provided with two contacts **35**, **36** is adapted to be connected to a main source of electric current. An electrical cable **33** connects field coil **20** with plug contact **35**. An electrical cable **39** connects plug contact **36** with terminal **40** and thru switch **30** and terminal **32** to field coil **20**.

A cable anchorage clip **38** located in hollow handle **22** is fixed therein and to cables **35**, **36** as a support therefor.

Pressing push button **41** against the tension of spring terminal **40** causes spring terminal **40** to contact terminal **31** to thereby close the electrical circuit, whereby field coil **20** is electrically energized.

Electrically energized field coil **20** will electrically energize stator **19** with cycle alternate current, which will be manifested at stationary pole shoes **50A**, **50B**, **50C**, **50D**, **50E** and **50F**. Oscillating armature **16** will rock or oscillate upon spindle **43** as the movable pole shoes **18A**, **18B**, **18C**, **18D**, **18E** and **18F**, align with the, respective, stationary pole shoes **50A**, **50B**, **50C**, etc. Since alternating current is used the stationary pole shoes **50A**, **50B**, etc., are momentarily energized sixty times a second and conversely are free of electrical energy sixty times a second. If as viewed in FIGURE 1, energizing stationary pole shoes **50A**, **50B**, etc., causes oscillating armature **16** to rotate in a clockwise direction so as to align movable pole shoes **18A**, **18B** etc., with stationary pole shoes **50A**, **50B**, etc., then yoke **17** through flange **24** compresses spring **25** when the stationary pole shoes **50A**, **50B**, etc., are energized and the compressed spring **25** decompresses itself during the periods the stationary pole shoes **50A**, **50B**., etc., are without electrical current to rotate oscillating armature **16** in a counterclockwise direction. In this manner pump piston **9** is reciprocated in piston bore **8** to provide a pumping action. With each stroke of pump piston **9**, non-return valve **5** is moved away from valve seat **9A** against the tension of spring **6** to thereby allow the fluid in storage container **14** to pass through suction pipe **13**, orifice **12**, piston bore **8**, into chamber **7A** and through passageways **4A** and exit port **3A** to the atmosphere. Spring **6** forces valve **5** into engagement with valve seat **9A** as pump piston **9** is placed in the position shown in FIGURE 1, under the influence of coil spring **25**. Valve **5** prevents the fluid in chamber **7A** from reentering piston bore **8** and is therefore termed a "non-return" valve. Should fluid accumulate in piston bore **8** it will drain through drain port **7D** and drain passageway **70D** back into storage container **14**.

Thus it will be seen that oscillating armature **16** supported upon spindle **43** and located within the magnetic field of stator **19** provides a noiseless and impactless drive unit for a pump piston in the form of the oscillating armature **16** provided with the yoke **17**.

Flange **24** is adapted to provide a driving surface between the swinging or arcuate motion of yoke **17** and the reciprocating motion of the pump piston **9**.

Having shown and described preferred embodiments of the present invention by way of example, it should be realized that structural changes could be made and other examples given without departing from either the spirit or scope of this invention.

What I claim is:

1. A liquid atomizer comprising a main housing, a pump cylinder provided with a chamber, a valve seat, a piston bore, and an orifice in communication with said bore, means fastening said pump cylinder to said main housing, a spray nozzle having an exit port, means fastening said spray nozzle to said pump cylinder, a tapered valve located in said chamber, a resilient member in said chamber yieldingly urging said tapered valve against said valve seat, a pump piston provided with an end plate, slidably mounted in said piston bore, resilient means between said end plate and said pump cylinder urging said pump piston away from said tapered valve, a storage container, means removably securing said storage container to said main housing, said orifice in communication with said storage container, a stator provided with a field coil means fastening said stator to said main housing, said stator having a plurality of stationary pole shoes, an oscillating armature provided axially with a spindle, and having a plurality of movable pole shoes, means rockably mounting said oscillating armature to said stator through said spindle with said movable pole shoes electrically alignable with said stationary pole shoes, and a yoke provided with a flange, means fastening said yoke to said spindle with said flange abutting said end plate whereby cycled electrical current energizes said stationary pole shoes through said field coil to oscillate said oscillating armature through the alignment of said movable pole shoes with said stationary pole shoes and to oscillate said yoke, whereby said pump piston reciprocates alternately with and against the tension of said resilient means and against said tapered valve to draw fluid from said container through said orifice, piston bore, chamber, and through said exit port when said pump piston moves said tapered valve from said valve seat, a rotary sleeve rotatively mounted in said main housing, said yoke having a second flange opposite said first mentioned flange, spring means interposed between said rotary sleeve and second flange whereby said yoke is yieldingly held against said end plate and rotation of said rotary sleeve increases and decreases the tension on both said spring means and said resilient means.

2. A liquid atomizer comprising a main housing, a pump cylinder provided with a chamber, a valve seat, a piston bore, and an orifice in communication with said bore, means fastening said pump cylinder to said main housing, a spray nozzle having an exit port, means fastening said spray nozzle to said pump cylinder, a tapered valve located in said chamber, a resilient member in said chamber yieldingly urging said tapered valve against said valve seat, a pump piston provided with an end plate, slidably mounted in said piston bore, resilient means between said end plate and said pump cylinder urging said pump piston away from said tapered valve, a storage container, means removably securing said storage container to said main housing, said orifice in communication with said storage container, a stator provided with a field coil means fastening said stator to said main housing, said stator having a plurality of stationary pole shoes, an oscillating armature provided axially with a spindle, and having a plurality of movable pole shoes, means rockably mounting said oscillating armature to said stator through said spindle with said movable pole shoes electrically alignable with said stationary pole shoes, and a yoke provided with a flange, means fastening said yoke to said spindle with said flange abutting said end plate whereby cycled electrical current energizes said stationary pole shoes through said field coil to oscillate said oscil-

lating armature through the alignment of said movable pole shoes with said stationary pole shoes and to oscillate said yoke, whereby said pump piston reciprocates alternately with and against the tension of said resilient means and against said tapered valve to draw fluid from said container through said orifice, piston bore, chamber, and through said exit port when said pump piston moves said tapered valve from said valve seat, a rotary sleeve rotatively mounted in said main housing, said yoke having a second flange opposite said first mentioned flange, spring means interposed between said rotary sleeve and second flange whereby said yoke is yieldingly held against said end plate and rotation of said rotary sleeve increases and decreases the tension on both said spring means and said resilient means, said rotary sleeve having an open ended cavity and a bearing, a rod having a collar, said rod slidably mounted in said bearing, a knob slidably mounted in said cavity, means fastening said knob to said rod, resilient means in said cavity urging said knob in a direction out of said cavity, said collar retaining said

knob in said cavity, said rod adapted to be pushed against said second flange against the tension of said resilient means to pivotally move said yoke.

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U.S. Cl. X.R.

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