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J. D. CLEVINGER ET AL

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CONTROL VALVE FOR HAND PUMPS

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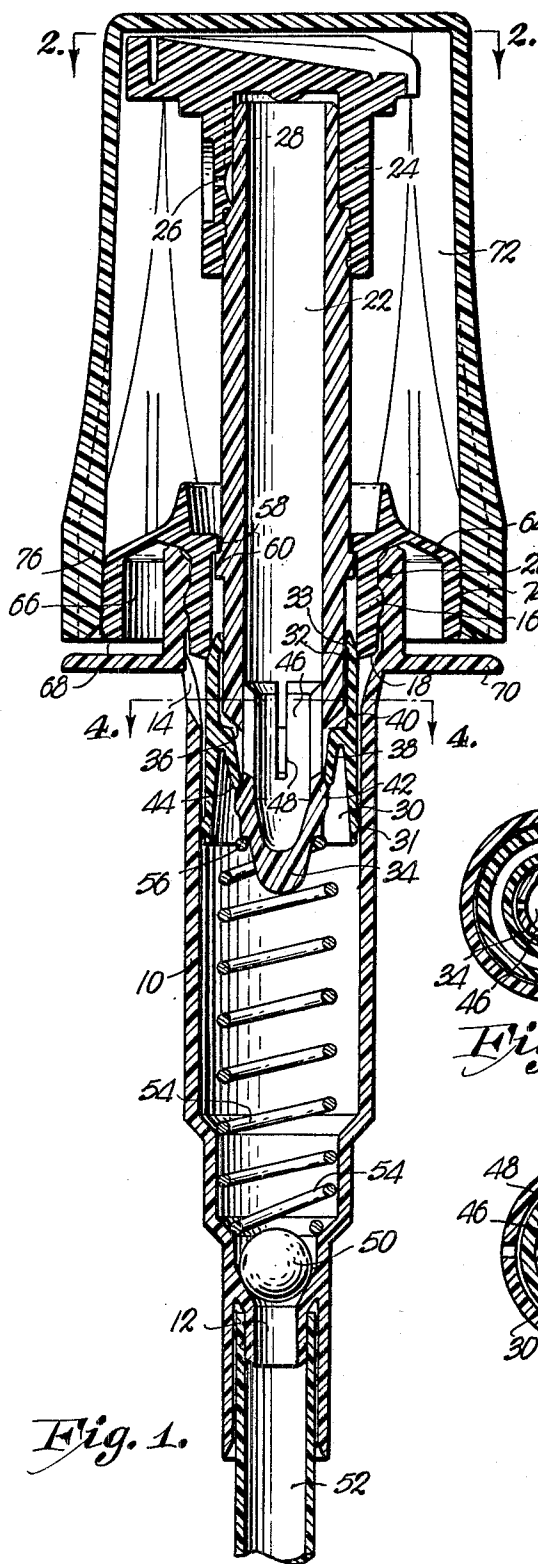


Fig. 1.

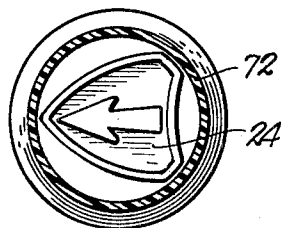


Fig. 2.

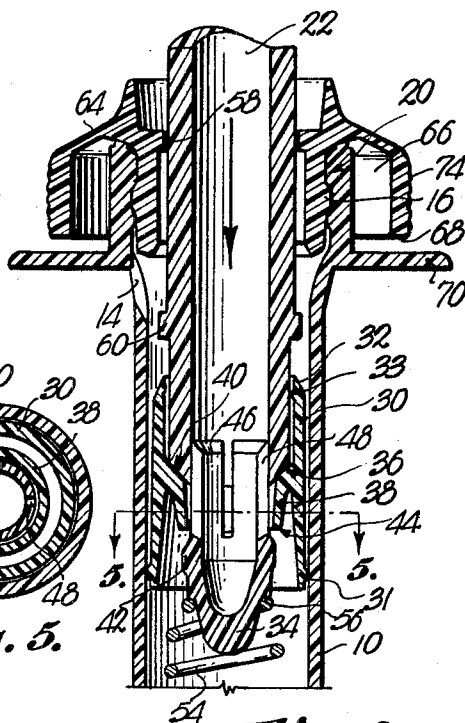


Fig. 3.

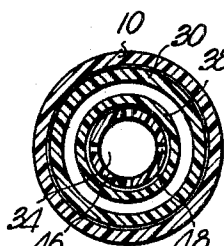


Fig. 4.

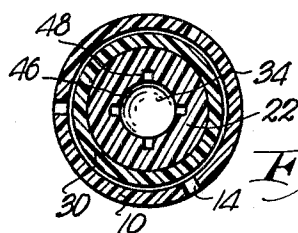


Fig. 5.

INVENTORS
Juel D. Clevenger
Asa Pickinpaugh
Michael A. Waters
BY Schmidt, Johnson, Hovey,
Williams & Bradley
ATTORNEYS

1

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CONTROL VALVE FOR HAND PUMPS

Juel D. Clevenger, Raytown, Asa Pickinpaugh, Kansas City, and Michael A. Waters, Independence, Mo., assignors to Cook Chemical Company, Kansas City, Mo., a corporation of Missouri

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8 Claims

ABSTRACT OF THE DISCLOSURE

A reciprocable plunger hand pump has a floating sleeve slidable in a barrel and limited in axial movement relative to the plunger by a check valve integral with the sleeve, spaced from the plunger and alternately engageable with spaced valve seats surrounding the plunger. A liquid seal is established when the sleeve is wedged between the plunger and a collar; at the same time, the valve closes liquid inlet orifices in the plunger by engagement with one of the seats. The collar has a skirt adapted to support a cover cap and shiftable to mount container caps of various top thicknesses.

It is an important object of our present invention to provide a hand pump for liquids which is instantly responsive upon depression of a reciprocable plunger so as to open a check valve, admitting liquid into the tubular plunger and almost instantaneously admitting air to a vent, preventing collapse of the liquid container into which the pump extends.

Another important object of the present invention is to provide a hand pump having a check valve for the reciprocable plunger which is floatingly carried by the plunger for complete freedom of movement in substantial absence of frictional losses by virtue of disposition of the valve in spaced relationship to the plunger around a reduced diameter portion thereof having liquid inlet orifices therein, the valve being engageable with the plunger only at spaced valve seats surrounding the plunger adjacent the outermost and innermost ends of the inlet orifices.

A further important object of our instant invention is the provision of a hand pump of the aforementioned character which utilizes an outermost marginal end of the pumping piston or sleeve, wedged between the plunger and a collar during non-use such as a to form a liquid seal.

Still another important object of the present invention is to provide a hand pump having a novel collar arrangement which includes a skirt attached to the collar through a flexible web such that the skirt serves to frictionally mount a cover cap and permit mounting of container caps of various top wall thicknesses.

Other important objects will be made clear or become apparent as the following specification progresses, reference being had to the accompanying drawing wherein:

FIGURE 1 is a longitudinal cross-sectional view on an enlarged scale of a control valve for hand pumps made pursuant to the present invention;

FIG. 2 is a transverse cross-sectional view taken on line 2—2 of FIG. 1 but on a smaller scale;

FIG. 3 is a fragmentary cross-sectional view similar to FIG. 1, showing the position of various parts when the plunger is depressed;

FIG. 4 is a cross-sectional view taken on line 4—4 of FIG. 1; and

FIG. 5 is a cross-sectional view taken on line 5—5 of FIG. 3.

The hand pump illustrated in the drawing has a tubular barrel 10 provided with a liquid receiving port 12 at one end thereof and a plurality of air vents 14 adjacent the

2

opposite end of the barrel 10. A collar 16, initially separate from the barrel 10, extends into the open end of barrel 10 opposite to port 12, terminating in an innermost annular edge 18 outwardly of the air vents 14. Interlocking ribs and grooves 20 between the collar 16 and the barrel 10 serve to attach the collar 16 to the barrel 10.

A tubular plunger 22 extends into the barrel 10 through the collar 16 for reciprocable movement toward and away from the port 12. Plunger 22 has a discharge head 24 exteriorly of the barrel 10 which is in turn provided with a liquid outlet 26, communicating with the outermost open end of the plunger 22 by means of a slot 28 in the head 24.

A sleeve 30 loosely surrounding the plunger 22 within the barrel 10 has a small, external, annular bead 31 in sliding engagement with the barrel 10 during reciprocation of the plunger 22. Sleeve 30 has a beveled marginal end 32 and a small, annular, internal bead 33 wedged between the collar 16 and the plunger 22 adjacent the edge 18 of collar 16 to present a liquid seal when the plunger 22 is in its extended position illustrated by FIG. 1.

Plunger 22 is provided with an integral closure 34 at its innermost end. A continuous inwardly facing shoulder 36 of a beveled nature formed on plunger 22 therearound presents one of a pair of seats for a continuous, frustoconical band or valve integral with the sleeve 30 therewithin, band 38 having a first continuous, annular edge 40 adjacent the sleeve 30, such edge 40 engaging the shoulder 36 when the plunger 22 is in the position illustrated by FIG. 3.

Plunger 22 is also provided with a continuous protuberance 42 therearound within the sleeve 30 between the closure 34 and the shoulder 36. Band 38 is provided with a second continuous, free, annular edge 44 spaced from the sleeve 30 and parallel with the first edge 40 thereof in facing relationship to the protuberance 42. The edge 44 engages the protuberance 42 when the plunger 22 is in the extended position shown in FIG. 1, presenting a second seat for the valve or band 38.

Plunger 22 is also provided with a reduced diameter portion 46 within the sleeve 30 between the shoulder 36 and the protuberance 42, portion 46 in turn being provided with a plurality of liquid inlet orifices 48 therearound in the nature of elongated slots extending longitudinally of the plunger 22.

It is particularly noteworthy at this juncture that the band 38 surrounds the reduced diameter portion 46 between shoulder 36 and protuberance 42 but spaced entirely from the portion 46 such as to engage the plunger 22 only at shoulder 36 and at protuberance 42 through edges 40 and 44 respectively of the band 38. Moreover, as noted in FIG. 1, the shoulder 36 is axially spaced from the edge 40 only slightly. Therefore, during initial depression of plunger 22, shoulder 36 immediately moves into engagement with edge 40 of band 38, shifting the sleeve 30 inwardly and thereby instantaneously admitting air to vents 14 as the marginal edge 32 and bead 33 of sleeve 30 slip from between the collar 16 and the plunger 22, breaking the liquid seal. The delay in passage of air to vents 14 is therefore so inconsequential that all collapse of the liquid container is avoided during the pumping operation.

A ball check valve 50 in the barrel 10 at port 12 prevents flow of liquid from the barrel 10 through the port 12 during depression of the plunger 22 and permits flow of liquid from the liquid container into barrel 10 through dip tube 52 and port 12 during extension of the plunger 22. A spring 54 in the barrel 10 between the plunger 22 and the port 12 yieldably maintains plunger 22 extended. One end of the spring 54 surrounds the closure 34 and engages a continuous ledge 56 around the plunger 22 and spaced from the protuberance 42 in facing relationship to the port 12.

Collar 16 has a continuous radial bushing 58 there-
within loosely receiving the plunger 22 and spaced out-
wardly of the marginal end 32 of sleeve 30. Plunger 22 is
provided with a continuous radial stop 60 therearound
within the barrel 10 between the bushing 58 and the mar-
ginal end 32, spaced from the latter. The stop 60 is engage-
able with the bushing 58 as shown in FIG. 1 for limiting
the extent of outward movement of the plunger 22.

Collar 16 is also provided with a continuous integral
web 64 surrounding the plunger 22 exteriorly of the bar-
rel 10, together with a cylindrical skirt 66 integral with
the web 64 and terminating in an annular edge 68. Skirt
66 surrounds the barrel 10 and is spaced therefrom in con-
centric relationship thereto. Barrel 10 has an outturned
flange 70 therearound disposed to present a space between
the flange 70 and the edge 68 for receiving the top of a
container cap (not shown), the latter of which in turn
receives the flange 70 therewithin. The web 64 is flexible,
permitting the skirt 66 to shift away from the flange 70
whereby to accommodate container cap tops of various
thicknesses in the space between edge 68 and flange 70.

A cover cap 72 enclosing the plunger 22, as well as
the head 24, surrounds the skirt 66 as shown in FIG. 1.
Skirt 66 may, if desired, have a series of serrations 74
therearound or axial, and cover cap 72 has a number of
ribs 76 therewithin which frictionally engage the serra-
tions 74 of the skirt 66.

During storage, shipment, and periods of non-use, the
spring 54 holds the plunger 22 extended such as to close
the orifices 48 by virtue of protuberance 42 engaging the
edge 44 of valve 38. At the same time, the spring 54,
through protuberance 42 and edge 44, holds the marginal
end 32 and bead 33 of the sleeve 30 wedged between the
collar 16 and the plunger 22, closing the air vents 14.

The pump is placed in use after removal of the cover
cap 72, and during initial inward movement of plunger 22
against the action of spring 54 the shoulder 36 moves
into engagement with the edge 40, opening the orifices 48
such that liquid in the barrel 10 between sleeve 30 and
valve 50 may enter the plunger 72 circumferentially of
the plunger portion 46 along the edge 44 of valve 38.
The valve 38 then instantaneously imparts inward move-
ment to the sleeve 30, withdrawing its marginal end 32
and bead 33 from between collar 16 and barrel 10, break-
ing the liquid seal and admitting air to vents 14. Con-
tinued downward movement of the plunger 22 maintains
the valve 50 closed, causing flow of the liquid from the
barrel 10 into the plunger 22.

Upon release of plunger 22, spring 54 returns it to its
extended position, the first action being movement of
protuberance 42 into engagement with edge 44, closing
the orifices 48 and preventing flow of liquid from the
plunger 22 into the barrel 10 during outward movement
of plunger 22. Such stroke of the plunger 22 to its ex-
tended position forces the liquid from the plunger 22
through the outlet 26. At the same time, the valve 50
opens for flow of liquid from dip tube 52 through port
12 into barrel 10. The only sliding interengagement of
parts during pumping is between bead 31 and barrel 10.
Bead 33 engages plunger 22 only during sealing and valve
38 never engages plunger portion 46.

Having thus described the invention, what is claimed as
new and desired to be secured by Letters Patent is:

1. In a hand pump:

- a tubular barrel having a liquid receiving port at one
end thereof and an air vent adjacent its opposite end;
- a collar separate from and extending into the barrel
through said opposite end thereof, terminating out-
wardly of the air vent;
- means attaching the collar to the barrel;
- a tubular plunger extending into the barrel through
said collar and reciprocable toward and away from
said port;
- said plunger having a liquid outlet exteriorly of the
barrel;

a sleeve loosely surrounding the plunger within the
barrel and having a part slidably engaging the latter
during reciprocation of the plunger,

said sleeve having parts wedged between the collar
and the plunger when the latter is extended to the
outermost end of its path of travel, presenting a
liquid seal,

said plunger having an integral closure at its innermost
end, a continuous, inwardly facing shoulder there-
around within the sleeve, a continuous protuberance
therearound within the sleeve between the closure
and the shoulder, and a reduced diameter portion
within the sleeve between the shoulder and the
protuberance,

said portion having a plurality of liquid inlet orifices
therearound; and

a continuous, frusto-conical band integral with the
sleeve therewithin, surrounding said portion, and
spaced entirely therefrom between the shoulder and
the protuberance,

said band having a first continuous, annular edge ad-
jacent the sleeves and facing said shoulder, and a
second continuous, free, annular edge spaced from
the sleeve and from said portion, parallel with said
first edge and facing said protuberance,

said shoulder being axially spaced slightly from said
first edge, and said protuberance engaging said second
edge to close the orifices when the plunger is
extended,

said shoulder being disposed to move into engagement
with the first edge of the band upon slight inward
depression of the plunger, whereby to shift said
sleeve parts from between the collar and plunger,
breaking said seal and admitting air to said vent im-
mediately after opening of said orifices by movement
of the protuberance away from said second edge of
the band.

2. In a hand pump as claimed in claim 1; and a ball
check valve in the barrel at said port for preventing flow
of liquid from the barrel through the port during depres-
sion of the plunger, and permitting flow of liquid into the
barrel through the port during extension of the plunger.

3. In a hand pump as claimed in claim 1; and
a spring in the barrel between the plunger and said port
for yieldably maintaining the plunger extended,
one end of the spring surrounding said closure,
said plunger having a continuous, spring engaging ledge
therearound, spaced from the protuberance and fac-
ing said port.

4. In a hand pump as claimed in claim 1,
said collar having a continuous, radial bushing there-
within loosely receiving the plunger and spaced out-
wardly of said marginal end of the sleeve,
said plunger having a continuous, radial stop there-
around within the barrel, between the bushing and
said marginal end, spaced from the latter and en-
gageable with said bushing for limiting the extent of
outward movement of the plunger.

5. In a hand pump as claimed in claim 1, one of said
sleeve parts comprising a continuous bead within
the sleeve surrounding the plunger and spaced therefrom
during pumping.

6. In a hand pump as claimed in claim 1,
said collar having a continuous integral web surround-
ing the plunger exteriorly of the barrel and a cylin-
drical skirt, integral with the web and terminating in
an annular edge,

said skirt surrounding the barrel and being radially
spaced therefrom in concentric relationship thereto,
said barrel having an outturned flange therearound dis-
posed to present a space between the flange and said
edge of the skirt for receiving the top of a container
cap.

7. In a hand pump as claimed in claim 6, said web
being flexible, permitting said skirt to shift away from

5

the flange to accommodate container cap tops of various thicknesses in said space.

8. In a hand pump as claimed in claim 6; and a cover cap enclosing the plunger and surrounding the skirt, said skirt having a series of serrations therearound, said cover cap having a number of ribs therewithin frictionally engaging said serrations.

5

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WILLIAM L. FREEH, Primary Examiner

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