Oct. 10, 1944. W. F. THOMPSON 2,360,085

PUMP

Filed Aug. 14, 1943

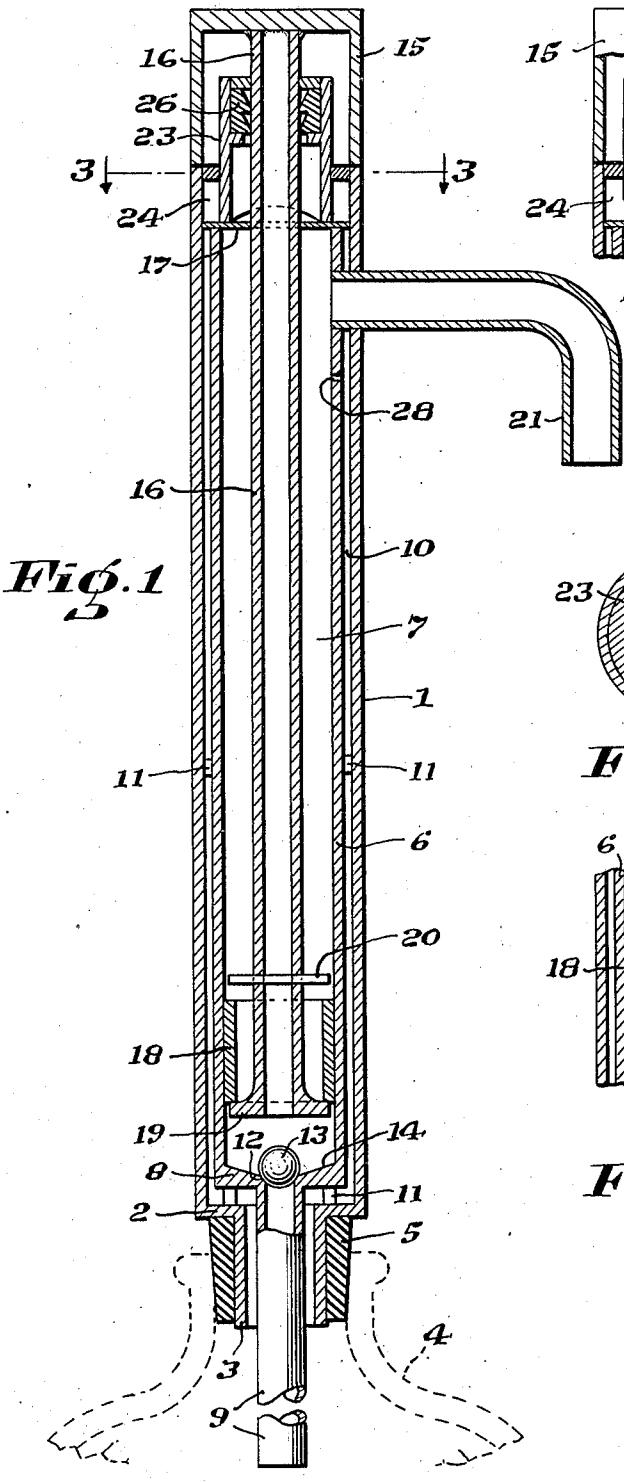


Fig. 1

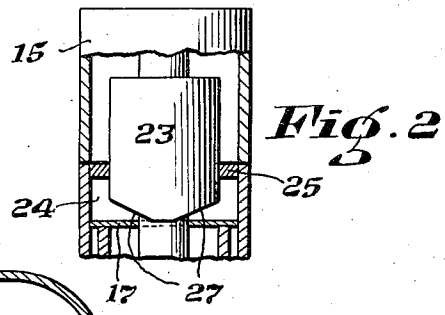


Fig. 2

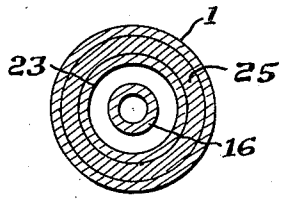


Fig. 3

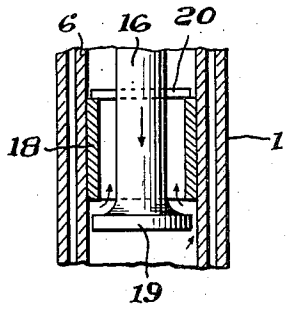


Fig. 4

INVENTOR.
Willis F. Thompson
BY
John E. R. Hayes
ATTORNEY

Patented Oct. 10, 1944

2,360,085

UNITED STATES PATENT OFFICE

2,360,085

PUMP

Willis F. Thompson, Portland, Maine, assignor to The Alden Speare's Sons Co., Cambridge, Mass., a corporation of Massachusetts

Application August 14, 1943, Serial No. 498,689

6 Claims. (Cl. 222—375)

The invention relates to a pump especially adapted for the delivery of corrosive liquids from containers, or carboys.

The object of the invention is to provide a pump of the specified character which will inherently function to safeguard the operator whatever may be the degree of internal pressure developed within the pump. For effecting the pumping operation, the pump is provided with a piston operated by a piston rod. The piston operates within a cylinder, with the piston rod, which actuates the piston, extending outside the cylinder through a gland open to the atmosphere and through which gland the piston rod slides. It is the especial object of my invention to prevent the escape of liquid through this joint by relieving the joint of all pressure which might effect an escape of the liquid through it however fast the pump may be operated, and this without affecting the proper action of the pump.

The invention can best be seen and understood by reference to the drawing in which—

Fig. 1 shows the pump in vertical section, the top of a container or carboy to which the pump is applied being shown in broken lines.

Fig. 2 is a view partly in vertical section and partly in side elevation, of the top end portion of the pump.

Fig. 3 is a cross section on the line 3—3 of Fig. 1; and

Fig. 4 is a view, partly in vertical section and partly in side elevation, of a portion of the pump with contained piston.

Referring to the drawing: 1 represents an outside tubular casing, or jacket, the top end of which is closed, in manner later to be described. The jacket is provided with a contracted bottom end 2 from which extends a tubular extension 3. This extension is adaptable to enter and protrude into the top end, or mouth, of the container, or carboy, 4, and become attachable thereto in the manner of a stopper by means of a collar 5 which snugly embraces the extension 3 of the jacket with top bearing against the contracted bottom end 2 thereof. The collar 5 is made slightly bevelled in order that it may accommodate itself to mouths of different sizes, and fit snugly within any mouth within which it is contained.

6 represents a cylinder having a chamber 7 within which reciprocates a piston, as will later be referred to. The cylinder is provided with a contracted bottom end 8 from which extends a pipe extension 9 of sufficient length to extend to the bottom of the container when attachment has been secured between the outside jacket and the container. The cylinder is of lesser diameter than that of the jacket; its bottom end 8 is spaced from the bottom end 2 of the jacket; and the pipe extension 9 from the bottom end of the cylinder is of lesser diameter than the internal diameter of the jacket extension 3. Thus a chamber or passage 10 is obtained extending from the top of the cylinder with open entry into the chamber of the container or carboy. The spacing of the cylinder within the jacket may be obtained in any suitable manner, as by providing the cylinder with external protuberances or bosses 11 which will operate not only to hold the cylinder properly spaced from the jacket, but will also operate to snugly maintain it within the jacket. The bottom contracted end 8 of the cylinder, around the point of entrance from the chamber 7 of the cylinder into the passage through the pipe 9, is provided with a valve seat 12 upon which normally rests an inwardly opening ball valve 13. This valve is caged in the bottom end of the cylinder between its contracted end 8 and the piston, later to be referred to, the contracted end of the cylinder being provided with an inclined face 14 by which the valve will be directed to normally maintain a closed position.

Surmounting the jacket, and with normal bearing against the top edge thereof, is a cap 15 to the head of which is secured a piston rod 16, the cap forming a hand grip by which the piston rod is reciprocated. The cap is of substantially the same diameter as the jacket, and the jacket forms a stop for limiting the down thrust of the piston rod through engagement of the bottom edge of the cap with the top edge of the jacket. The top end of the cylinder 6 is closed by a displaceable cover 17. The piston rod passes through this cover.

The piston comprises an internal sleeve 18 slidable within the cylinder and with which cooperates both an annular head 19 on the lower end of the piston rod and a pin 20 passed laterally through the piston rod. The pin lies above the sleeve; the head below it. The head is of lesser diameter than the interior diameter of the cylinder. Both the head and pin, however, are of sufficient diameter and length, respectively, that they will engage the sleeve for moving it within the cylinder when the piston is reciprocated. The head and pin are spaced from each other a distance longer than the length of the sleeve so that when the piston rod is raised its annular head 19 will be brought into engage-

ment with the bottom edge of the sleeve 18 and make closed engagement therewith. Accordingly, as the piston rod is drawn up, the sleeve will be moved upwardly within the cylinder by the drawing engagement of the head, and the combined head and sleeve then operating as a piston, will induce a partial vacuum in the chamber of the cylinder below the piston causing liquid in the container to enter by way of the pipe 9, opening the valve 13, and filling the chamber of the cylinder up to the point of the ascending piston. Upon the return of the piston through lowering of the piston rod all upward flow of liquid from the container will cease, the valve 13 will resume its normal closed position, the head 19 will separate from the sleeve, thereby forming communication through the piston, and the pin 20 will be brought into engagement with the sleeve, moving it downwardly through the cylinder to the limit of the downward stroke of the piston rod. During this downward movement of the piston rod the piston rod and piston will pass through the column of liquid which has been drawn into the chamber of the cylinder and which is kept therein by the closure of the valve 13, whereupon this column of liquid will be displaced in part by the descending parts including especially the piston rod, and the amount of liquid thus displaced will flow out of the cylinder chamber through a spout 21, which is connected to the cylinder near its top and proceeds outwardly through the passage 10 and through the jacket. When the piston is again raised liquid will be drawn into the chamber of the cylinder below the piston the same as before, and at the same time all undisplaced liquid lying above the piston will be forced to outlet through the spout. Thus the pump is a double-acting pump causing flow of fluid from the spout during both the upward and downward stroke of the piston.

As previously explained, the top end of the cylinder is closed by a displaceable cover 17. This cover is held in its normal position of closure by a keeper 23 through which the piston rod extends. The jacket is longer than the cylinder extending above the covered top end of the cylinder forming a chambr 24. The keeper is located in part within this chamber and in part within the chamber of the cap 15. The keeper is fixedly connected to the jacket by an annular flange 25 which connects with the jacket at a point adjacent its top edge. The flange 25, keeper and piston rod form a top closure for the chamber 24, which closure is further supplemented by a packing 26 located within a suitable packing gland formed within the keeper and through which gland the piston rod extends. Little or no pressure can be developed in the chamber 24 inasmuch as this chamber is in open communication with the passage 10 which leads back into the chamber of the carboy as previously explained. Accordingly liquid admitted to this chamber will flow back into the container or carboy. The cover is displaceable by pressure generated from within the cylinder during the pumping operation. This pressure will tend to open the cover a sufficient amount to relieve the pressure and liquid will flow by the cover from out of the cylinder into the chamber 24 and be returned to the container or carboy. The displaceability of the cover is effected by making the cover of some stiff but elastic material. The keeper is formed to have a broad diametric bearing against the cover enabling the opposite sides of the cover to bend upwardly, opening the cover when subjected to pressure developed within the cylinder. The opposite sides of the cover are allowed to bend only in an amount sufficient to relieve the pressure, any excess bending being prevented by the bevelled bottom faces 27 of the keeper against which the turned or bent sides of the cover when displaced may have bearing. In ordinary operation the cover will be displaced but little, if any. In any event, however much the cover is displaced to allow the escape of liquid it will not affect the proper action of the pump. With the pressure within the cylinder thus relieved no pressure can be generated, however fast the pump may be operated, which will permit of an escape of liquid through the packed gland in the keeper through which the piston rod is passing, this being the only gland open to the atmosphere which might endanger the operator if any liquid is permitted to escape through it.

In order that the liquid may not continue to drip from the spout after the pumping operation has been completed the cylinder at a point just below the entrance to the spout is provided with an opening 28. After the pumping operation of the liquid has been completed liquid remaining in the top of the pump and spout will be enabled to flow back through this opening into the passage 10 and be returned to the carboy. The opening 28 in the cylinder possesses the further advantage of assisting in relieving pressure within the cylinder. The opening, however, is so small as not to interfere with a proper delivery of fluid through the outlet, or spout, during the pumping operation.

I claim:

1. In a pump the combination comprising a cylinder with delivery outlet for liquid drawn into the cylinder from a container, means whereby liquid may be drawn into the cylinder from the container including a reciprocable element, a jacket inclosing the cylinder and co-operating therewith to form a chamber overlying the end of the cylinder with open passage leading therefrom for the return into the container of liquid admitted to the chamber, means affixed to the jacket providing a top closure for the chamber and including a packed gland open to the atmosphere through which the reciprocable element extends, means for preventing an escape of liquid through said gland during the operation of the pump including a displaceable cover for the end of said cylinder, which cover is located at the bottom of said chamber, and through which cover the reciprocable element extends, said cover being displaceable by liquid pressure generated within the cylinder whereby upon displacement of the cover liquid will escape from the cylinder into said chamber and passage leading therefrom and be returned to the container, and means for retaining the displaceable cover in a normal closed position.

2. In a pump the combination comprising a cylinder with delivery outlet for liquid drawn into the cylinder, means whereby liquid may be drawn into the cylinder including a reciprocable element, a jacket inclosing the cylinder and co-operating therewith to form a chamber overlying the end of the cylinder with open passage leading therefrom for the escape of liquid admitted to the chamber, means affixed to the jacket providing a top closure for the chamber and including a packed gland open to the atmosphere through which the reciprocable element

extends, means for preventing an escape of liquid through said gland during the operation of the pump including a displaceable cover for the end of said cylinder, which cover is located at the bottom of said chamber, and through which cover said reciprocable element extends, said cover being displaceable by liquid pressure generated within the cylinder whereby upon displacement of the cover liquid will escape from the cylinder into said chamber and passage leading therefrom, and means for retaining the displaceable cover in a normal closed position.

3. In a pump the combination comprising a cylinder with delivery outlet for liquid drawn into the cylinder, means whereby liquid may be drawn into the cylinder including a reciprocable element, means inclosing the cylinder and co-operating therewith to form a chamber overlying the end of the cylinder with open passage leading therefrom for the escape of liquid admitted to the chamber, said inclosing means providing also a top closure for said chamber and including a packed gland open to the atmosphere through which said reciprocable element extends, means for preventing an escape of liquid through said gland during the operation of the pump including a displaceable cover for the end of said cylinder, which cover is located at the bottom of said chamber, and through which cover said reciprocable element extends, said cover being displaceable by liquid pressure generated within the cylinder whereby upon displacement of the cover liquid will escape from the cylinder into said chamber and passage leading therefrom, and means for retaining the displaceable cover in a normal closed position.

4. In a pump the combination comprising a cylinder with delivery outlet for liquid drawn into the cylinder, means whereby liquid may be drawn into the cylinder including a reciprocable element, means inclosing the cylinder and co-operating therewith to form a chamber overlying the end of the cylinder with open passage leading therefrom for the escape of liquid admitted to the chamber, said inclosing means providing also a top closure for said chamber and including a packed gland open to the atmosphere through which said reciprocable element extends, means for preventing an escape of liquid through said gland during the operation of the pump including an elastic cover for the end of said cylinder, which cover is located at the bottom of said chamber, and through which cover said reciprocable element extends, said elastic cover being displaceable by the bending thereof by liquid pressure generated within the cylinder whereby upon displacement of the cover liquid will escape from the cylinder into said chamber and passage leading therefrom, and means for retaining the displaceable cover in a normal closed position comprising a keeper engaging the cover and with relationship to which said cover may bend when displaced as aforesaid.

5. In a pump the combination comprising a cylinder with delivery outlet for liquid drawn into the cylinder, means whereby liquid may be drawn into the cylinder including a reciprocable element, a jacket inclosing the cylinder and co-operating therewith to form a chamber overlying the end of the cylinder with open passage leading therefrom for the escape of liquid admitted to said chamber, a cap surmounting the jacket with normal bearing against the top edge thereof and to the head of which cap said reciprocable element is secured whereby said element may be reciprocated by one grasping said cap, a closure for the top of said jacket and chamber overlying the end of said cylinder as aforesaid, said closure having within it a packed gland through which said reciprocable element extends, and means displaceable by liquid pressure generated within said cylinder for closing the top end thereof whereby liquid may escape from the cylinder into said chamber and passage leading therefrom and liquid pressure be excluded from said gland.

6. In a pump the combination comprising a cylinder with delivery outlet for liquid drawn into the cylinder from the container, means including a reciprocable element whereby liquid may be drawn into the cylinder from the container and deliver through said outlet, a jacket inclosing the cylinder and co-operating therewith to form a chamber overlying the end of the cylinder with open passage between the cylinder and jacket leading from said chamber for the return into the container of liquid admitted to the chamber, means affixed to the jacket providing a top closure for said chamber and including a packed gland open to the atmosphere through which the reciprocable element extends, a displaceable cover for the end of said cylinder and through which cover the reciprocable element extends, said cover being displaceable by liquid pressure generated within the cylinder, means for retaining the displaceable cover in a normal closed position, said cylinder being provided with an opening to said open passage, said opening being located below its delivery outlet whereby pressure within the cylinder will be lessened during the pumping operation and liquid remaining in the cylinder and delivery outlet after the pumping operation will drain through said opening and drip from said delivery outlet be thereby obviated.

WILLIS F. THOMPSON.