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PUMP AND VALVE THEREFOR

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FIG. 1

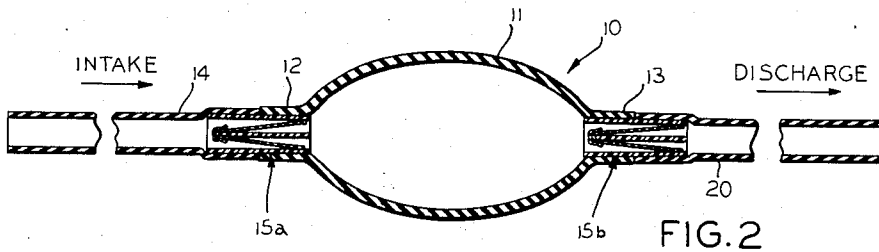
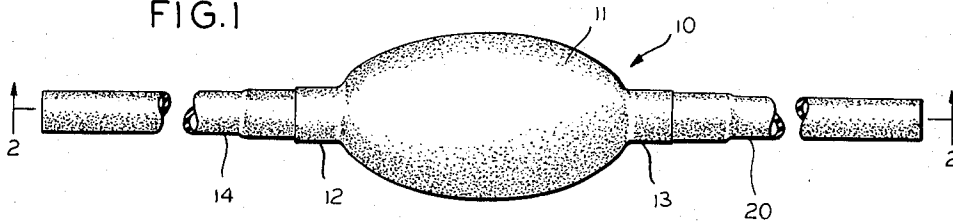


FIG. 2

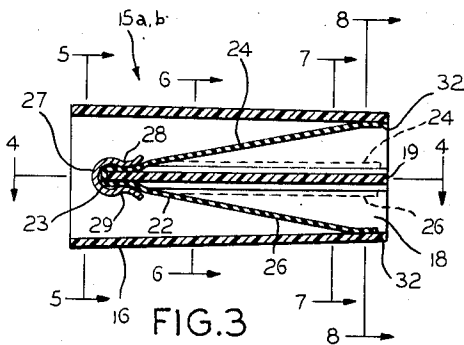


FIG. 3

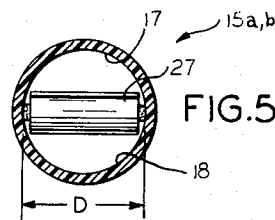


FIG. 5

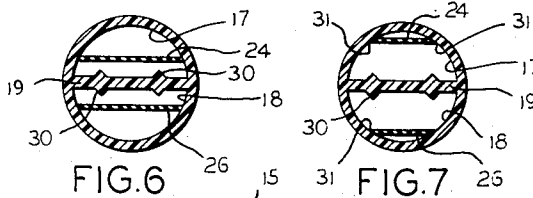


FIG. 6

FIG. 7

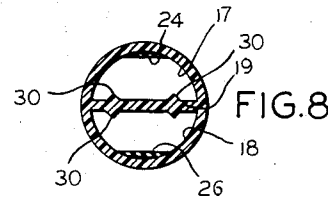


FIG. 8

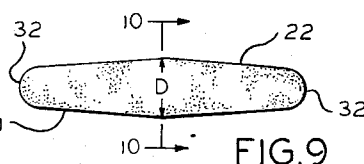


FIG. 9

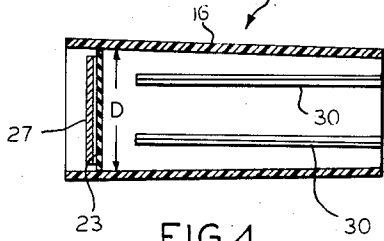


FIG. 4

FIG. 10

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PUMP AND VALVE THEREFOR

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4 Claims. (Cl. 137—512.15)

This invention relates to a pump capable of pumping corrosive or flammable fluids, and particularly to an improved form of valve especially adapted for use with such pump.

The pump according to the present invention consists of parts capable of withstanding the effects of both corrosive and flammable fluids. The valves employed therewith are also capable of withstanding the effects of both corrosive and flammable liquids. According to the invention, the pump comprises suction producing means flanked by intake and discharge tubes, each of the tubes being connected to the suction producing means by a valve wholly concealed at such points of connection. The valves are identical in form, the valve on the intake side of the pump being closed when the pump is discharging, and the valve on the discharge side being closed during the suction operation of the pumping means; the valve disposed in the intake being open.

One of the particular applications of the pump and valve according to the present invention, may be that of removing a quantity of liquid from a tank. An example of such use may be for pumping gasoline from the tank of an automobile into the tank of a portable power tool, such as a power lawn mower or the like. Another use is indicated for initiating a syphon action from a vessel by the initial operation of the pump, the pump thereafter being capable of having a free passage therethrough to maintain the syphon action.

With the foregoing considerations in mind, it is a principal object of the invention to afford an improved pump for both corrosive and flammable liquids, the pump being characterized by parts extremely resistant to both corrosive and flammable liquids, and being characterized by a minimum of metallic parts.

Another object is to afford an improved pump capable of initiating a syphoning operation, and being thereafter free of restrictions therein impeding the flow therethrough.

Yet another object provides a pump characterized by identical valves located in the intake and discharge portions thereof, such valves being constructed of materials resistant to the corrosive action of different kinds of liquids.

Still another and important object of the invention is to provide a valve for a pump of the class described, and consisting of a minimum of moving parts and offering substantially no impediment to the flow of fluid therethrough when the valve is in the open position.

A yet further object is to provide a valve characterized by a valve body made in a simple molding operation and characterized also by a valve element supported therein requiring no pressure to maintain same in the open position.

Another object is to provide a valve including a valve body having a pair of longitudinally extending passageways therein, the passageways being separated from each other by a common diametrically extending partition which provides a support for a freely flexible valve ele-

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ment capable of blocking the passageway upon flow in one direction against the valve body and offering substantially no impediment to flow when in the open position.

Other objects and important features of the invention will become apparent from a study of the specification following taken with the drawing which together describe and illustrate a preferred embodiment of the invention and what is now considered the best mode of practicing the principles thereof. Other embodiments of the invention will be suggested to those having the benefit of the teachings herein, and such other embodiments are intended to be reserved especially as they fall within the scope and purview of the subjoined claims.

In the drawing:

Fig. 1 is an elevational view of an improved pump and valve according to the present invention;

Fig. 2 is a longitudinal section of Fig. 1 taken along the line 2—2 and looking in the direction of the arrows;

Fig. 3 is a longitudinal cross-section to an enlarged scale, taken through an improved valve particularly adapted for use with the pump seen in Fig. 1;

Fig. 4 is a longitudinal sectional view of the valve seen in Fig. 3, taken along the line 4—4 of Fig. 3 and looking in the direction of the arrows, certain parts being shown in plan view;

Fig. 5 is a transverse sectional view taken along the line 5—5 of Fig. 3 looking in the direction of the arrows;

Fig. 6 is a transverse sectional view taken along the line 6—6 of Fig. 3 looking in the direction of the arrows;

Fig. 7 is a transverse sectional view taken along the line 7—7 of Fig. 3 looking in the direction of the arrows;

Fig. 8 is a transverse sectional view taken along the line 8—8 of Fig. 3 looking in the direction of the arrows;

Fig. 9 is a plan view of a freely flexible valve element employed with the valve seen in Fig. 3; and

Fig. 10 is a section taken along the line 10—10 of Fig. 9 looking in the direction of the arrows.

Referring now particularly to Figs. 1 and 2 of the drawing, the improved pump of the present invention is referred to generally by the reference numeral 10 and includes pumping means 11 in the form of an elastic rubber bulb having a flange-like integral extension 12 on one end thereof forming the intake side of the pumping means 11, and an identical flange-like extension 13 on the other end thereof forming the exhaust or discharge side thereof.

The intake extension 12 is joined to an intake tube 14, the coupling of the tube 14 to the flange-like extension 12 being accomplished by means of a valve indicated generally by the reference numeral 15a. The flange-like extension 13 for the exhaust or discharge side of the pump 10 is connected to a discharge tube 16, the coupling of the tube 16 to the discharge extension 13 being accomplished by an identical valve 15b.

It may be noted that the intake tube 14 and the discharge tube 16 are preferably formed from flexible rubber tubing, preferably of a kind resistant to corrosive liquids, and also resistant to hydrocarbons.

Referring now to Figs. 3, 4 and 5, of the drawing, each valve 15a or 15b includes a valve body 16 of circular cross-section and having passageways 17 and 18 therein of semi-circular cross-section, the passageways being separated by means of a diametrically extending partition 19. As seen in Figs. 3 and 4, the valve body 16 has a slight taper so that the necessary draft is provided for withdrawal of the same after a molding process. The valve body 16 is preferably molded from a suitable corrosion resistant plastic material, nylon being an example of such suitable material.

The partition 19 does not extend for the full length of the body 16 but terminates as at 21 a short distance from the larger end of the tapered valve body 16; see

particularly Fig. 4. The partition 21 affords a means of support for a freely flexible valve body 22, see Fig. 9, which is folded at its middle about the partition 19 upon the end 21 thereof within the valve body 16. The valve member 22 thus forms a bight 23 with limbs 24 and 26 extending therefrom, limb 24 extending in the semi-circular passageway 17, and limb 26 extending in the semi-circular passageway 18.

The flexible valve member 22 is held in position to the partition 19 by means of a clip 27 which is bent upon itself to provide clamping limbs 28 and 29 holding the respective limbs 24 and 26 of the valve element 22 against the partition 19. The clip 27 is preferably made of a ductile corrosion-resistant material, such as Monel.

When the flow through the valve body 16, as seen in Fig. 3, is from the left to the right, the limbs 24 and 26 of the valve element 22 lie against the partition 19, occupying the dotted line position seen.

Structure is provided for preventing the adhesion of the valve limbs 24 and 26 to the partition 19, and to this end each face of the partition 19 is provided with longitudinally extending ridges 30. As seen particularly in Fig. 4, ridges 30 have a slight taper, the direction of which is opposite to the taper of the valve body 16 to facilitate the withdrawal thereof at the conclusion of the molding operation. The ridges 30 make it possible for liquid to move between the limbs 24 and 26 and partition 19 to lift the limbs 24 and 26 to a fluid trapping position when flow is from the right to the left as seen in Fig. 3.

The width of the valve member 22 at its center corresponds to the inside diameter D of the valve body at a point immediately adjacent to the end 21 of the partition 19, see also Figs. 4 and 5, so that the limbs 24 and 26 can effect a seal at the partition 19. Any flow from the right to the left through the valve seen in Fig. 3 will be prevented by the limbs 24 and 26 effecting a seal with the curved walls of the respective passageways 17 and 18. Typical sections shown in Figs. 6, 7 and 8 illustrate how edges 31 of the limbs effect a seal. The ends of the valve member 22 are curved as at 32, so that the ends of each of the limbs 24 and 26 will have a tight seal within the passageways 17 and 18.

It will be noted that when there is flow through the valve body 16 there is substantially no impediment to the flow of fluid.

The operation of the pump shown in Figs. 1 and 2 is believed apparent from the description foregoing but, for purposes of clarity, when the intake tube 14 is placed below the surface of a quantity of liquid and the suction means is operated by squeezing of the bulb 11, such squeezing will cause the intake valve 15a to close, and the valve 15b to open, to evacuate the contents of the bulb 11. Release of the bulb 11 causes the pressure of the atmosphere against the valve 15b to close, suction being manifested within the bulb 11 and the atmospheric pressure on the surface of the liquid within the vessel forcing the same into the intake tube 14. Alternate compression and release of the bulb 11 causes the fluid to be lifted from the vessel and to be moved past the bulb 11, past the valve 15b to be discharged by the discharge tube 16.

It will be observed that the pump 10 is entirely self-priming, the valves 15a and 15b being capable of effecting a seal against air as well as liquid. It will be noted also that once the flow has been established through the pump 10 that it can act as a syphon if the opening of the discharge tube is below the level of the vessel containing the fluid, the usual limitations of a syphon obtaining. However, it will be noted that the valves 15a and 15b afford no substantial impediment to flow when they are in the open position as shown by the dotted line position of Fig. 3.

By a suitable selection of materials, the pump 10 is completely resistant to both corrosive and flammable

liquids. If the securing means 27 for the valve element 22 is made of a ductile corrosion resistant material such as Monel or the like, highly corrosive acidic and caustic materials may be pumped. In the case of certain types of hydrocarbons the tubing 14, 16, the pumping means 11 and the valve element 22 may be made of materials such as neoprene or other similar hydrocarbon resistant material. The valve body 16 may likewise be molded of nylon or other corrosion resistant material.

It should be noted also that there are no valve elements involving metal contact, which might give rise to explosive arcing in the case of flammable materials, and there is no contact of the valve elements with seating surfaces as would give rise to undue wear of the co-operating surfaces. It will be noted also that the valve element 22 is of a type that it will seek its best seating position, and that there are no springs offering obstruction to flow when the valve is in the open position.

While the invention has been described in terms of preferred embodiment thereof, its scope is intended to be limited only by the claims here appended.

I claim as my invention:

1. A valve comprising a molded valve body having a pair of longitudinally extending semi-circular cross-section passageways, a longitudinally extending partition molded integrally with said valve body and separating said passageways, valve closing means comprising a freely flexible valve member folded at the middle thereof about said partition, said flexible valve member being considerably longer in dimension than the half diameter defining semi-circular passageway, means for securing said valve member to said partition comprising a clip bent around said partition with said valve member embraced therebetween, the unsecured portions of said valve member extending within said passageways and having both the edges and the surfaces thereof contacting the circular walls of said passageways to effect the closing of said passageways, and raised portions on said partition maintaining said flexible valve member spaced from said partition so as to prevent adhesion of said valve member to said partition and enable the same freely to move from said partition to valve closing position.

2. A valve comprising a molded valve body having a pair of longitudinally extending semi-circular cross-section passageways, a longitudinally extending partition molded integrally with said valve body and separating said passageways, valve closing means comprising a freely flexible valve member folded at the middle thereof about said partition, said flexible valve member being considerably longer in dimension than the half diameter defining said semi-circular passageway and lying substantially along said partition when the valve is in open position, means for securing said valve member to said partition, the unsecured portions of said valve member extending within said passageways and having both the edges and surfaces thereof contacting the circular walls of said passageways to effect the closing of said passageways, and raised means on said partition preventing adhesion of said flexible valve member to said partition to enable said flexible valve member freely to move to valve closing position.

3. A valve comprising a molded valve body having a pair of longitudinally extending passageways, a longitudinally extending partition molded integrally with said valve body and separating said passageways, valve closing means comprising a freely flexible valve member folded at the middle thereof about said partition and extending substantially for the length of said partition when in its open position, means for securing said valve member to said partition, the unsecured portions of said valve member extending within said passageways and having the edges and the surface thereof contacting the walls of said passageways to effect the closing of said passageways, and means disposed between said partition and said valve member for preventing adhesion of said

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valve member to said partition and enabling the valve member freely to move from said partition to valve closing position.

4. A valve comprising a molded valve body having a pair of longitudinally extending passageways, a longitudinally extending partition molded integrally with said valve body and separating said passageways, valve closing means comprising a freely flexible valve member folded at the middle thereof about said partition and extending substantially for the length of said partition when in its open position, the unsecured portions of said valve member extending within said passageways and having the edges and the surface thereof contacting

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the walls of said passageways to effect the closing of said passageways.

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