

Aug. 19, 1969

L. F. NELSON ET AL
DIAPHRAGM HAND PUMPS

3,461,808

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4 Sheets-Sheet 1

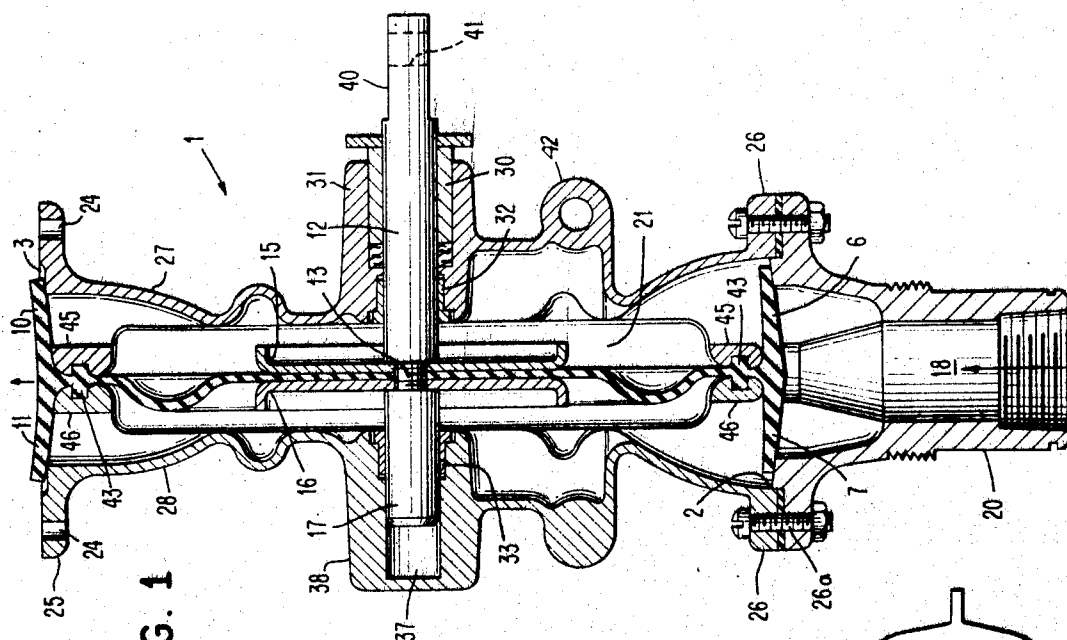


FIG. 1

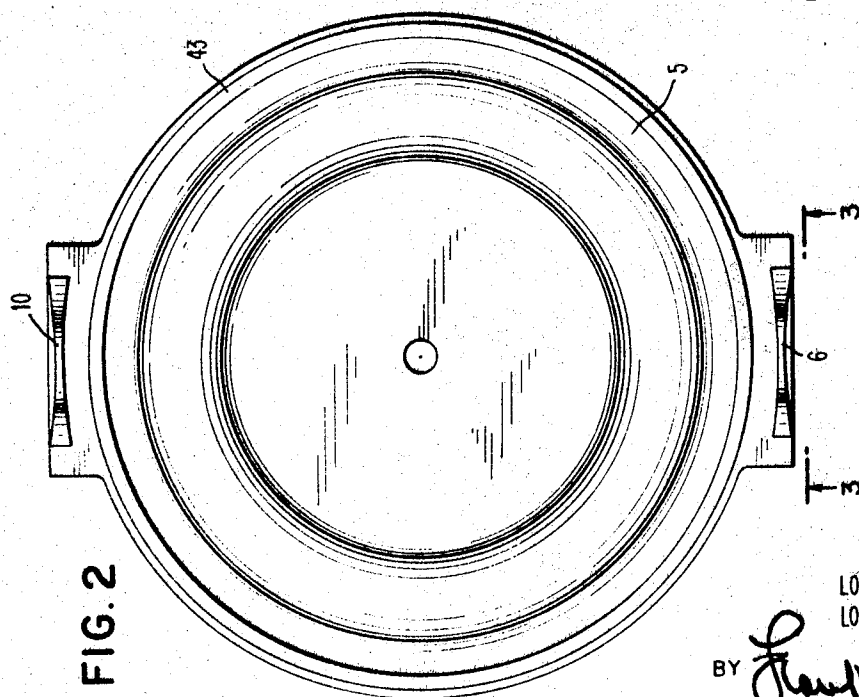


FIG. 2

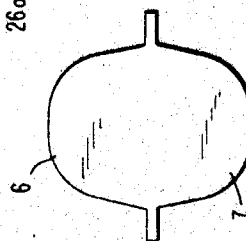


FIG. 3

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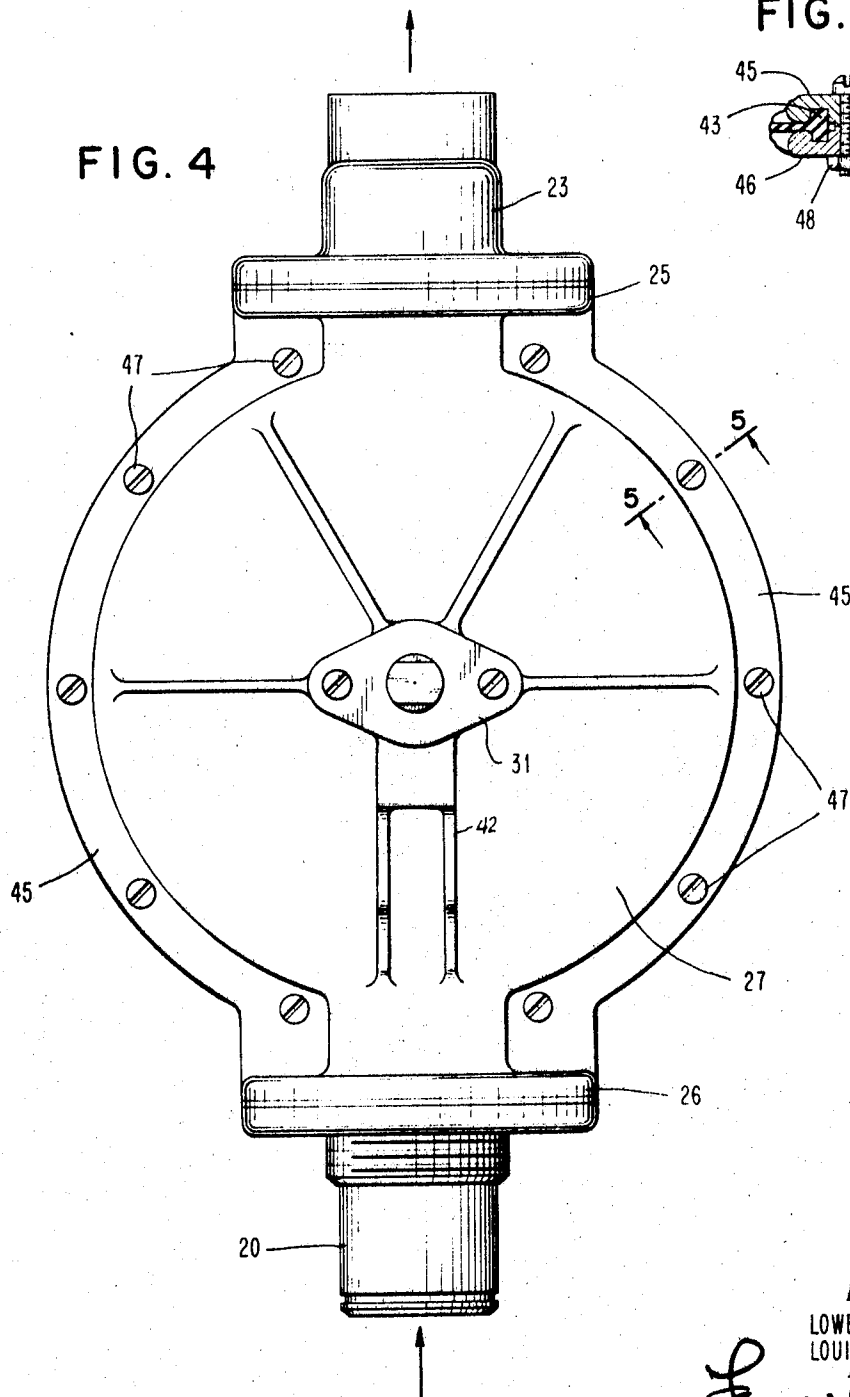
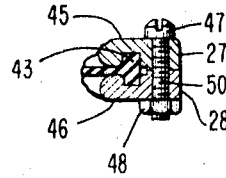


FIG. 5



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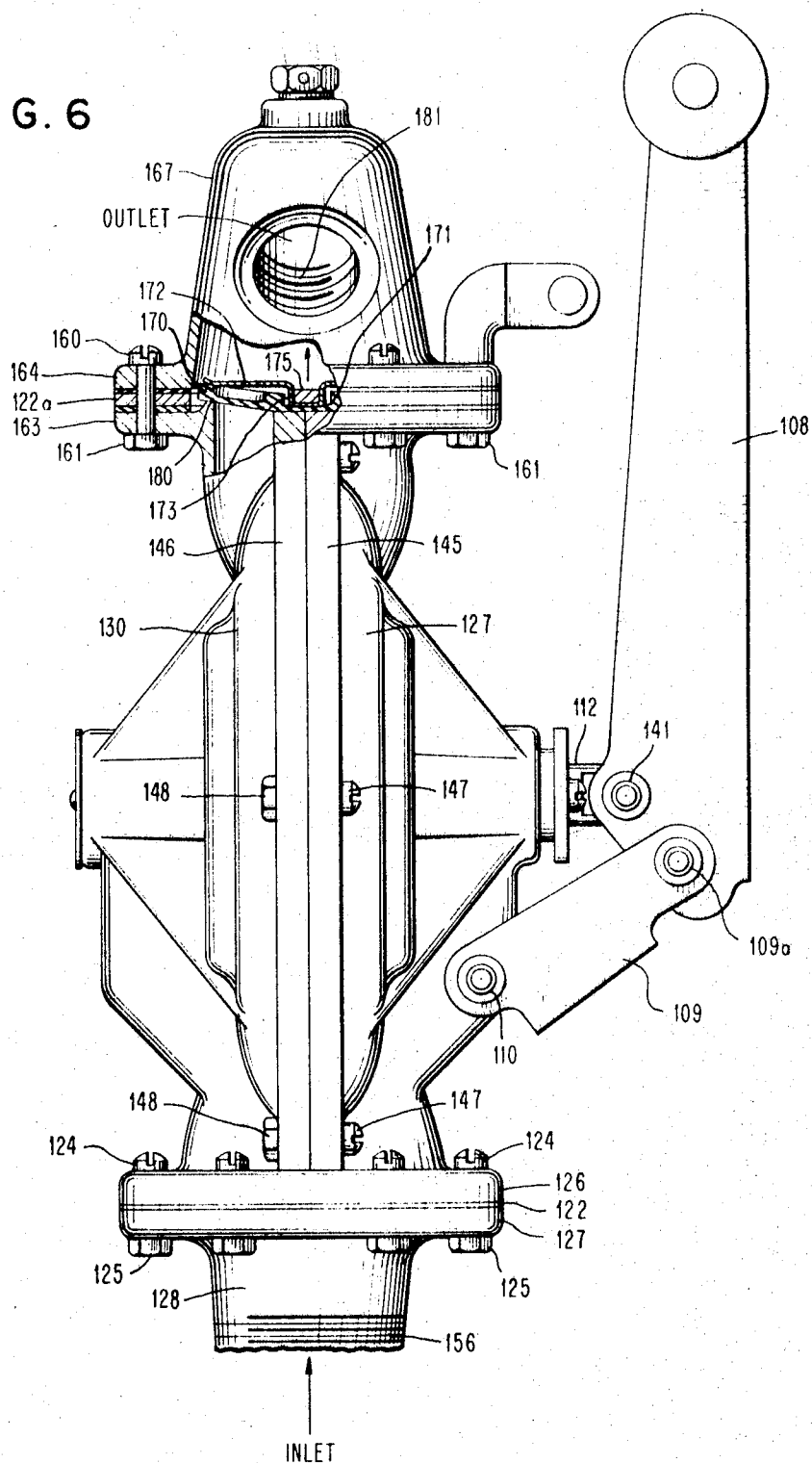
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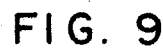
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FIG. 6



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DIAPHRAGM HAND PUMPS

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4 Claims

ABSTRACT OF THE DISCLOSURE

A double-action diaphragm-type hand pump for fluids such as gasoline, kerosene, oil, alcohol, etc., which pump includes within an outer housing a flexible rubber, or the like, diaphragm having inlet and outlet flapper valves molded integrally therewith at the opposite ends for the pump inlet and outlet. The diaphragm is reciprocated manually by push and pull strokes on handle means connected with a plunger operatively connected to the diaphragm.

One object of our invention is to provide a double action diaphragm hand pump having but a few number of parts which may be assembled readily by unskilled, or semi-skilled, labor.

Another object of our invention is to provide a double-action diaphragm hand pump which is of relatively low manufacturing cost and which may be sold at a relatively low price to a large number of users.

Another object of the preferred form of our invention is the making of the inlet and outlet valves as an integral part of the molded diaphragm which greatly reduces the manufacturing cost by molding the diaphragm and valves as a single unit.

Referring to said drawings:

FIG. 1 is a vertical sectional view, partly in elevation, of our improved construction of diaphragm hand pump.

FIG. 2 is a plan view of the integral diaphragm and valves shown in FIG. 1.

FIG. 3 is an end elevation view of the valve portion at the opposite ends of the diaphragm.

FIG. 4 is a fragmentary sectional view, partly in elevation, showing the clamping means for the circumferential rib portion formed on the outer portion of the circular diaphragm.

FIG. 5 is a front elevation view of the housing of the diaphragm hand pump shown in FIG. 1, and with the inlet and outlet adaptors for flow of fluid into and out of the hand pump indicated.

FIG. 6 is a front elevation, partly in section, of a modified form of our invention.

FIG. 7 is a vertical sectional view, partly in elevation, of the modified form shown in FIG. 6.

FIG. 8 is an elevation view of the valve and gasket indicated in FIG. 7.

FIG. 9 is a sectional view of the valve and gasket shown in FIG. 8, taken on the line 9—9 in FIG. 8.

Referring to FIGS. 1 to 5, inclusive, of said drawings; the double-action diaphragm hand pump is indicated generally at 1, and is provided with an inlet portion 2 and an outlet portion 3. The diaphragm 5 includes the inlet flapper valve portions 6 and 7, and the outlet flapper valve portions 10 and 11. The flapper valves are molded integrally with the diaphragm 5 and normal thereto, being joined to the body of the diaphragm by ears.

The diaphragm 5 is adapted to be reciprocated manually by means of handle, such as shown in FIG. 6 connected to the clevis bolt 12, which has the reduced portion 13 to which is rigidly connected the diaphragm backing plate members 15 and 16 on opposite sides of the diaphragm 5. The lower end of the reduced portion 13

is screw-threaded and rigidly connected in a screw-threaded opening in the shaft to rigidly clamp the diaphragm 5 and its backing plates 15 and 16 between the clevis bolt 12 and shaft 17. When the clevis bolt 12 and shaft 17 carrying the diaphragm 5 and cup portions 15 and 16 are moved on the inward push stroke, the flapper valve portion 6 is opened to permit fluid from the source of supply, not shown, connected to the inlet 18 of the adaptor fitting 20, through the inlet 2, through the chamber 21, through the outlet 3, and through the open outlet flapper valve portion 11 and fitting 23 connected to the pump housing by any convenient means, such as a series of screws and nuts extending through matching screw-threaded openings 24, in the flange portion 25 formed at the outlet sides of the housing member comprised of the front portion 27 and the rear portion 28. The adaptor 20, correspondingly, is provided with a flange having matching openings formed in the flange 26 formed at the inlet sides of said housing member, for a series of screws and nuts 26a.

We find it convenient to mount the clevis bolt 12 within a packing gland 30 of a well-known construction rigidly secured in the boss 31 on the front portion 27 of the housing. We also find it convenient to provide bearing members 32 and 33 at the respective front and rear portions 27 and 28 for the clevis bolt 12 and shaft 17. The inner end of the shaft 17 is adapted to be reciprocated in a recess 37 formed in the boss 38 of the rear portion 28 of the housing. The clevis bolt 12, conveniently, is provided with a flattened portion 40 with an opening 41 therethrough at its upper portion as a convenient means for fastening a manually operative handle member thereto. The operating handle means, such as shown in FIG. 6, to which the clevis bolt 12 is connected is of the well-known and commonly used type, such as, for example, shown and described in Patent No. 2,843,051, granted July 15, 1958. The lower end of handle means is also pivotally connected by link means to the projection 42 and the front portion 27 of the housing, in the same manner as shown in FIG. 6.

As shown in FIGURES 1 and 5, the outer portion of the diaphragm 5 is provided with an upwardly and downwardly extending rib 43 which is adapted to be clamped between plane portions 45 and 46 at the peripheries of the front and rear portions 27 and 28, which are provided with a circumferential series of screws 47 and nuts 48, the screws extending through matching openings 50 formed in the peripheral flat portions 45 and 46, one of said screw and nut fastening means is shown in the fragmentary view, FIG. 4.

Referring to the modified form of our invention, shown in FIGS. 6 to 9, inclusive, wherein the flapper valve members are not molded integrally with the diaphragm member; the diaphragm 105 is adapted to be reciprocated manually by means of a handle 108, which is pivotally connected to the clevis bolt 112 which has the screw-threaded reduced portion 113 connected to the shaft 117, to rigidly clamp the diaphragm 105 and backing plates 115 and 116 between the clevis bolt 112 and shaft 117 in the same manner as heretofore described in connection with the form of our invention shown in FIGS. 1 to 5, inclusive. The handle member 108 is pivotally connected to the flattened portion 140 of the clevis bolt 112 by pin means 141 extending through openings in a bifurcated portion of the handle 108 and through an opening 141 in the clevis bolt 112. The handle 108 is pivotally connected to the linkage 109 by pin means 109a, and said linkage 109 is pivotally connected at its other end by pin means 110 which extends through an opening 111 formed in the projection 142 in the front portion 129 of the housing.

The diaphragm 105 is provided with outer projecting rib 120 extending from both sides of the diaphragm 105, said rib 120 being close to the periphery of the diaphragm 105. Said rib 120 is adapted to be clamped by the surfaces of the flat clamping portions 145 and 146 of the housing. Said clamping portions 145 and 146 are provided with a circumferential series of screws 147 and nut 148, the screws 147 extending through matching openings formed in the circumferential flat clamping portions 145 and 146 of the front outer housing 129 and the rear outer housing 130.

As viewed in FIG. 7, the lower portion of the plane portions 145 and 146 are reduced in thickness as shown at 151 and 152. The inner flapper valve portions 106 and 107 are formed as part of the valve and gasket element 122 which is adapted to be clamped by means of screws 124 and nuts 125, said screws 124 extending through the flange 126 on the housing members and corresponding flange 127 formed on the adaptor member 128.

As best shown in FIG. 7, the inlet valve member is provided with the flapper valve portions 106 and 107 and is adapted to engage, respectively, the valve seat 106a and 107a formed on the adaptor member 128. The spring member 150, for maintaining the valves on their seat when in closed position, is provided at its center with a cup-shaped portion which is adapted to fit firmly over the reduced portions 151 and 152 formed on the plane portions 145 and 146. The rib 120 of the diaphragm 105 is adapted to be positioned in groove portions formed in the clamping portions 145 and 146, as best shown in FIG. 7.

The valves of the gasket member 122 are prevented from displacement by engagement against the lug 154 formed on the inlet adaptor member 128. The adaptor member 128, similar to the adaptor member 20, is provided with an external screw thread 156 which is adapted to be engaged in a screw-threaded opening in a container, such as a 55-gallon drum. The inlet adaptor member 128 is provided with the internal screw thread 157, which is adapted to receive the screw-threaded end of a depending pipe, not shown, which has its distal end near the bottom of the container, such as a 55-gallon drum.

Referring to FIG. 6; the outlet valve and gasket member 122a is adapted to be clamped by a series of screws 160 and nuts 161 extending through matching openings in the plane portion 163 of the housing and 164 of the outlet adaptor 167. The outlet valve and gasket 122a is similar to the inlet valve and gasket element 122, and said outlet valve and gasket element 122a is provided with similar outlet flapper valve portions 170 and 171. The outlet valve and gasket element 122a is similarly provided with a spring member 172, which is provided at its center with a cup-shaped portion 173 which is adapted to fit firmly over the element 175 formed integrally in the outlet adaptor 167. The flapper valve portions 170 and 171 are adapted to seat on the valve seat 180 formed in the housing members. The outlet adaptor member 167 is a modified form of the outlet fitting 23 shown in FIG. 4. The outlet adaptor 167 is provided with an angularly formed screw-threaded opening 181 which is adapted to receive a screw-threaded fitting at the end of a dispensing hose which has at its distal end a dispensing nozzle, neither the hose nor nozzle being shown, as both are of any of the well-known construction.

OPERATION

Referring to the form of our invention shown in FIGS. 1 to 5, inclusive, the double-action type hand pump is particularly adaptable for use, for example, in connection with fluid in drums of the well-known 55-gallon type. Referring to the form of our invention as shown in FIGS. 1 to 5, inclusive, the internal screw-thread indicated in the adaptor fitting 20 has screwed therein a pipe which depends to near the bottom of a drum. The external screw threaded shown on the adaptor fitting 20 is screwed into either the screw-threaded opening in the top of a drum,

after the normal plug is removed, or screwed into a separate fitting, which in turn is screwed into the screw-threaded opening in the top of the drum.

The outlet fitting 23, as indicated in FIG. 5, is provided with an internal screw thread adapted to receive the externally screw-threaded fitting at one end of a flexible dispensing hose of the well-known type. Such dispensing hose is provided at its distal end with a dispensing nozzle, as is common and well-known in the art.

The handle means pivotally connected at its bottom end by a link to the projection 42, and the handle means is provided in the customary manner with a bifurcated member by which the handle member is connected pivotally to the clevis bolt 12 by a clevis pin which extends through openings in the handle member and through the opening 41 in the flattened portion 40 of the clevis bolt 12, as shown in FIG. 1.

Assuming that the pump is operatively positioned on a 55-gallon drum, for example, as heretofore stated, the handle is moved manually by push and pull strokes to effect a reciprocation of the clevis bolt 12 and shaft 17, with the diaphragm 5 connected thereto, in back and forth motions.

On the push stroke of the handle, the clevis bolt 12 and shaft 7 effects movement of the diaphragm 5 rearwardly, and the inlet flapper valve portion 6 is opened inwardly and fluid flows from the source of supply, through the adaptor 20, through the open valve 6, through the housing chamber portion 21, out the outwardly opened valve portion 11 of the outlet flapper valve; and through the fitting 23. On the pull stroke of the handle which effects outward movement of the clevis pin 12, diaphragm 5, and shaft 17, the flapper valve portion 6 is closed and the flapper valve portion 7 is opened. Fluid flows in the same manner through the inlet fitting 20, through the inwardly opened flapper valve portion 7, through the chamber 21, and outwardly through opened valve portion 10 of the outlet flapper valve. On both the push and the pull stroke, fluid flows under pressure through the fitting 23, and through the dispensing hose and nozzle connected to the internal screw thread, not shown, which is provided in the outer end of the fitting 23.

Referring to the modified form of our invention shown in FIGS. 6 to 9, inclusive; the external screw thread 156 is adapted to be screwed into the screw-threaded opening in the top of a drum, for example, after the normal plug therein is removed, or into a separate fitting which in turn is screwed into the screw-threaded opening in the top of the drum, or container. The handle means 108 is moved manually by push and pull strokes to effect a reciprocation of the clevis bolt 112 and the shaft 117 with the diaphragm 105 connected thereto, in back and forth motions. On the push stroke of the handle 108, the clevis bolt 112 and shaft 117 effects movement of the diaphragm 106 rearwardly and the inlet flapper valve portion 106 is opened inwardly, and fluid flows from the source of supply through the adaptor 128, through the open valve 106, through the housing chamber portion 121, and outwardly opened valve portion 170 of the outlet valve and gasket element 122a, and through the adaptor fitting 167 to the hose and nozzle connected to the screw-threaded opening 181 in said outlet adaptor fitting 167.

On the pull stroke of the handle 108 which effects outward movement of the clevis pin 112, diaphragm 105 and shaft 117, the inlet flapper valve portion 107 is opened and fluid flows through the inlet adaptor 128, open valve 107, through the chamber 121, and outwardly through the open valve portion 171 of the outlet flapper valve and gasket element 122a, in the same manner as heretofore described with reference to FIGS. 1 to 5, inclusive.

We do not desire to limit ourselves to the details of construction and arrangement heretofore disclosed, as it is obvious that various modifications may be made

herein without departing from the essential features of our invention.

We claim:

1. A double-action diaphragm hand pump including an outer housing, having a front portion and a rear portion, provided with an inlet and an outlet for fluid; an adaptor inlet fitting and an adaptor outlet fitting respectively connected rigidly to said inlet and said outlet of said housing, said inlet adaptor fitting having an inlet valve seat and said outlet having an outlet valve seat; generally circular flexible diaphragm which has a projecting rib extending from both sides of said diaphragm near the periphery thereof, said rib extending into annular recesses formed in said front and rear portions of said housing; said diaphragm being rigidly clamped at its periphery between peripheral flat portions formed on said front and rear portions of said housing; opposite reduced thickness portions of said flat clamping portions of said diaphragm at the inlet portion and the outlet portion of said housing; an inlet valve and gasket member rigidly clamped between said adaptor inlet fitting and said housing inlet, said inlet valve and gasket member including two inlet valves adapted to be alternately opened when the diaphragm is reciprocated by manually operated means; an abutment lug in said adaptor inlet fitting preventing displacement outwardly of said inlet valve and gasket member; spring means fastened to said reduced thickness portion and engaging said inlet valves and tending to bias said inlet valves to closed position on their valve seat; an outlet valve and gasket member rigidly clamped between said adaptor outlet fitting and said housing outlet, said outlet valve and gasket member including two outlet valves adapted to be alternately opened when said diaphragm is reciprocated by said manually operated means; an abutment lug in said adaptor outlet fitting; spring means fastened to said adaptor outlet fitting lug and engaging said outlet valves and tending to bias said outlet valves to closed position on their seat; manually operative means for reciprocating said diaphragm, said manually reciprocating diaphragm means including a clevis bolt, the outer end of which is adapted to be operatively connected to a manually operative handle means, having at its inner end a screw-threaded portion; a shaft provided with an inner screw-threaded portion, said shaft being adapted to be reciprocated within a recess formed in a boss of said rear portion of said outer housing; said screw thread in the end of said shaft being adapted to engage the said screw thread formed on the inner end of said clevis bolt; and an axial opening formed in said diaphragm, said diaphragm being adapted to be rigidly secured between said shaft and said clevis bolt when in tight screw-threaded relationship.

2. A structure as in claim 1; wherein said inlet valve and gasket member includes a U-shaped portion and said inlet valve spring means includes a U-shaped portion which is adapted to be positioned in said U-shaped portion of said inlet valve and gasket member.

3. A double-action diaphragm hand pump including a housing provided with an inlet and an outlet for fluid, said inlet having an inlet valve seat and said outlet having an outlet valve seat, comprising a flexible diaphragm having opposed ears extending outwardly of and in the plane of the diaphragm, an inlet flapper valve integrally joined to one of said ears at the outer edge thereof and in a position normal to said diaphragm and adapted to engage said inlet valve seat, and an outlet flapper valve

integrally joined to the other of said ears at the outer edge thereof and opposite to said inlet valve and normal to said diaphragm, said housing providing, by unitary supporting and clamping means, on opposite sides of the diaphragm, support for the valves and clamping for the ears, said outlet valve being adapted to engage said outlet valve seat, manually operative means for reciprocating said diaphragm, said manually reciprocating diaphragm means including a clevis bolt, the outer end of which is adapted to be operatively connected to a manually operative handle means, having an inner end screw-threaded portion; a shaft provided with an inner screw-threaded portion, said shaft being adapted to be reciprocated within a recess formed in a boss of said outer housing; said screw-threaded end of said shaft being adapted to engage the said screw thread formed on said clevis bolt; and an axial opening formed in said diaphragm, said diaphragm being adapted to be rigidly secured between the said shaft and said clevis bolt when in tight screw-threaded relationship.

4. A double-action diaphragm hand pump including a housing, comprising a front portion and a rear portion, provided with an inlet and an outlet for fluid, said inlet having an inlet valve seat and said outlet having an outlet valve seat, comprising a generally circular flexible diaphragm which has molded integrally and transversely therewith axially opposite ears to which are integrally connected portions forming an inlet flapper valve, adapted to engage said inlet valve seat of said housing and an outlet flapper valve adapted to engage said outlet valve seat formed in said outer housing, said inlet and outlet valves being normal to said diaphragm, said diaphragm being rigidly clamped at its periphery between said front and rear portions of said housing; said housing providing, by a unitary supporting and clamping means, on opposite sides of the diaphragm, support for the valve and clamping for the ears, manually operative means for reciprocating said diaphragm, said manually reciprocating diaphragm means including a clevis bolt, the outer end of which is adapted to be operatively connected to a manually operative handle means, having an inner end screw-threaded portion; a shaft provided with an inner screw-threaded portion, said shaft being adapted to be reciprocated within a recess formed in a boss of said outer housing; said screw-threaded end of said shaft being adapted to engage the said screw thread formed on said clevis bolt; and an axial opening formed in said diaphragm, said diaphragm being adapted to be rigidly secured between the said shaft and said clevis bolt when in tight screw-threaded relationship.

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WILLIAM L. FREEH, Primary Examiner

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