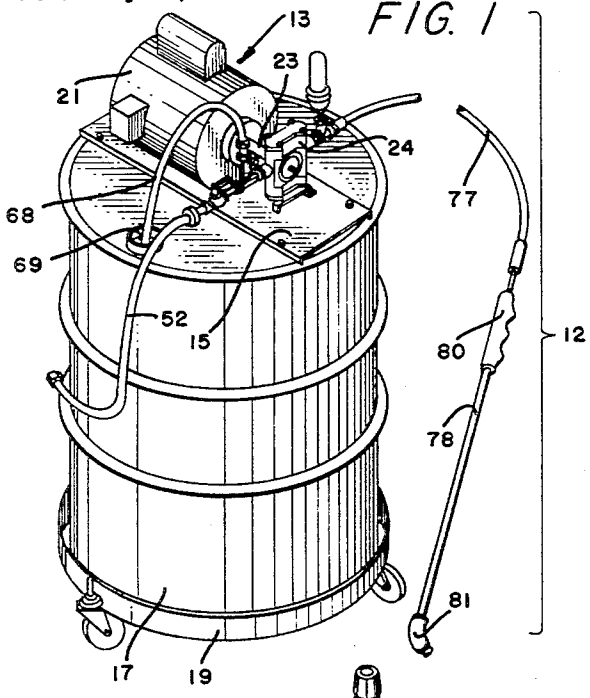
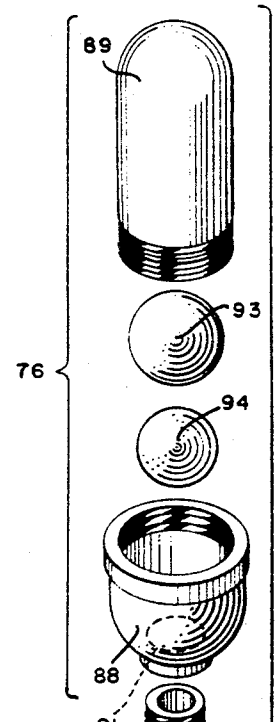
Oct. 21, 1969 K. E. KOLLMAI 3,473,480

POWER WASHING APPARATUS INCLUDING AN ACCUMULATOR

Filed May 31, 1966 2 Sheets-Sheet 1

FIG. 1





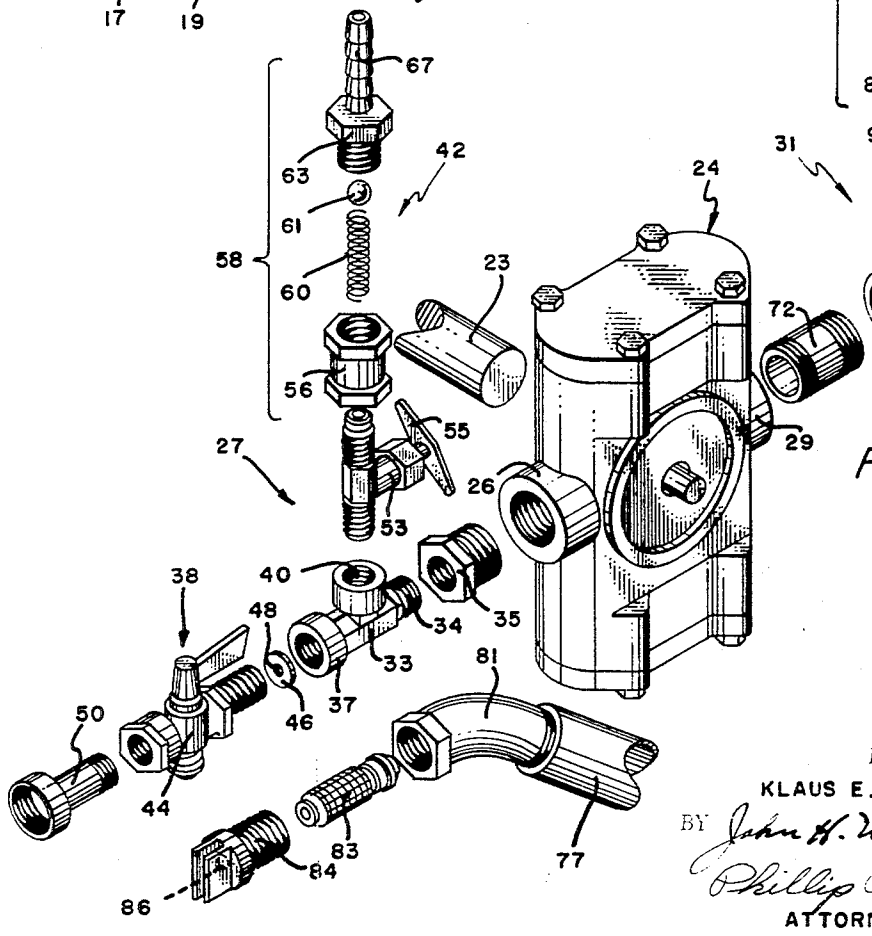


FIG. 2

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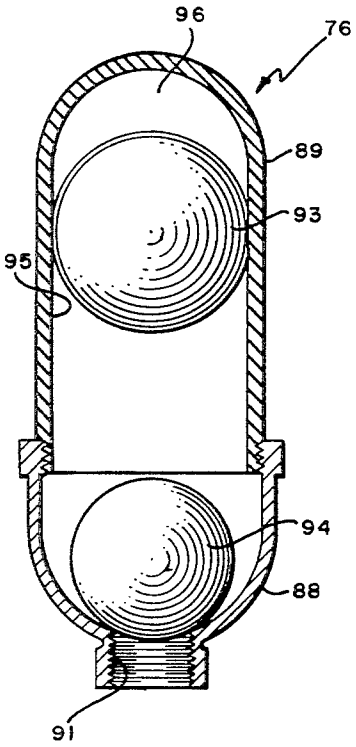
FIG. 3



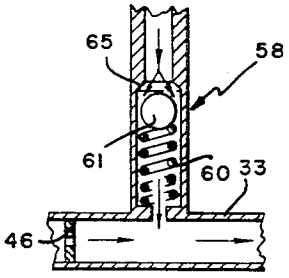


FIG. 4

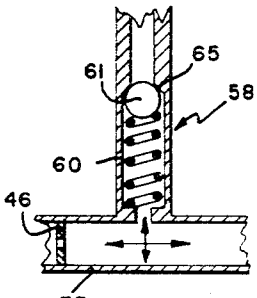


FIG. 5

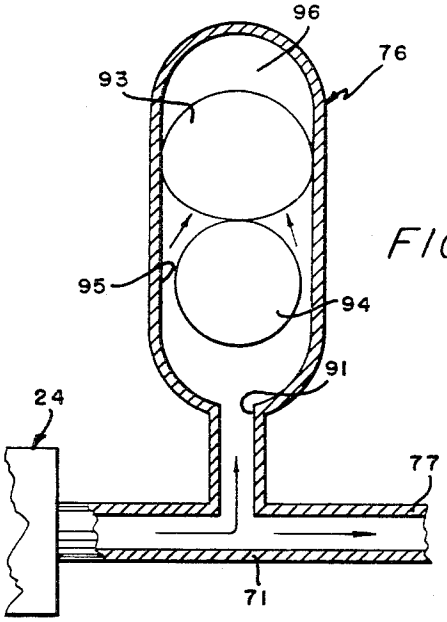


FIG. 6

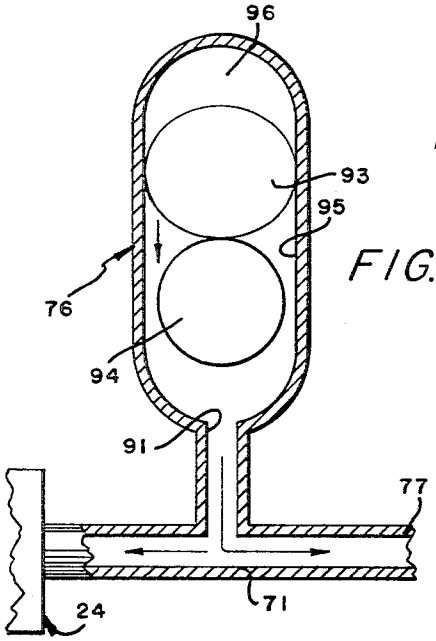


FIG. 7

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POWER WASHING APPARATUS INCLUDING AN ACCUMULATOR

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U.S. Cl. 103—223 3 Claims

ABSTRACT OF THE DISCLOSURE

This invention is a power washing apparatus utilizing pressure differential to supply and restrict the flow of detergent to an inlet section of a pump member and an accumulator means operable to shock absorb the normal pulsating pressure fluid output therefrom. More specifically, this invention is an accumulator means utilizing a resilient member within a housing operable to compress an air pocket therein to provide a self adjusting shock absorbing function to the pulsating fluid output.

Various types of washing equipment are known to the prior art operable to discharge a fluid under pressure selectively with or without a cleansing detergent. The prior art devices use complicated and expensive metering means such as solenoid valves and sensitive bleed valves to inject the detergent into the system. Additionally, an accumulator is normally necessary in a power washing apparatus to control the pulsating water column created by the pump means, and the prior art accumulator devices conventionally used are spring loaded mechanisms that are of high precision manufacture and expensive to repair and replace.

In accordance with the present invention, a new power washer apparatus is provided having a motor means driving a piston-type pump means which can conveniently be mounted on a detergent reservoir tank. A water supply means is connected through a metering control means to the inlet or input side of the pump means. The output side of the pump means is connected through a line to a pressure accumulator means having a hose connected thereto leading to a wand assembly. The wand assembly has a discharge orifice through which the fluid under pressure is ejected.

In one preferred specific embodiment of the invention, a power washing apparatus is provided for cleansing automobiles, machinery, and any structure requiring a high pressure detergent spray to remove dirt, oil, grease, and the like. The washing apparatus includes a portable detergent barrel having a support plate secured to the upper end thereof on which is mounted a motor means having a rotatable output shaft. A piston-type, cam actuated, pump means secured to the output shaft is operable to receive an input fluid such as water under conventional water pressure and discharge the fluid at, for example 500 p.s.i., at a volume of approximately two gallons per minute. On the input side of the pump means is a control means including an intermediate T member having a fluid input side connected to a fluid supply line, a central detergent input side connected to a detergent metering means, and an outlet side connected to the input side of the pump means. The fluid supply line has a control valve to cut off fluid supply and a central orifice to regulate the amount of fluid flow into the T member. The detergent metering means has a needle valve to control the amount of detergent flow through a ball and spring assembly which is operable to permit a one way flow of detergent toward the T member. On the output side of the pump means is connected a discharge line having an accumulator means connected thereto intermediate a hose member having a discharge wand assembly connected to the outer end thereof. The accumulator means receives a portion of the output pulsating fluid from the pump means in the discharge line and operates to smooth out the vibration resulting therefrom. The wand assembly includes an elongated rod or wand having a handle and a discharge nozzle connected to the outer end. The nozzle includes a filter element operable to prevent impurities from clogging a discharge orifice in the outer tip thereof.

Accordingly it is an object of this invention to provide a power washing apparatus overcoming the above-mentioned disadvantages of the prior art devices.

Another object of this invention is to provide a power washing apparatus having a simplified and accurate control means operable to regulate the amount of fluid and detergent supplied to the input side of the pump means for the proper operation thereof.

A further object of this invention is to provide a power washing apparatus having a pump means operable to receive a fluid detergent mixture and discharge the same under high pressure, and a detergent metering means operable to inject a pre-determined amount of detergent into the pump means during the input stroke thereof.

Still another object of this invention is to provide a power washer apparatus having a pump means operable to create a pulsating output water column and an accumulator means operable to efficiently and effectively reduce considerably the vibration and pressure variations in the output water column.

A still further object of this invention is to provide a new and novel accumulator means having a pair of resilient members mounted within a housing operable to compress an isolated column of air to resiliently absorb vibration and pulsating pressure acting on the resilient members.

One other object of this invention is to provide an accumulator means that is economical to manufacture, simple to repair and replace, and efficient in operation.

One further object of this invention is to provide a power washing apparatus which is inexpensive to construct, readily portable, and simple to use.

Various other objects, advantages, and features of the invention will become apparent to those skilled in the art from the following discussion taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a perspective view of the power washing apparatus of this invention;

FIG. 2 is an enlarged exploded perspective view of the major elements of the power washing apparatus of this invention;

FIG. 3 is an enlarged sectional view of the accumulator means of this invention;

FIGS. 4 and 5 are schematic diagrams illustrating the operation of the detergent metering means of this invention under various pressure operating conditions; and

FIGS. 6 and 7 are schematic diagrams illustrating the operation and function of the accumulator means of this invention under various pressure operating conditions.

The following is a discussion and description of preferred specific embodiments of the new power washing apparatus of this invention, such being made with reference to the drawings, whereupon the same reference numerals are used to indicate the the same or similar parts and/or structure. It is to be understood that such discussion and description is not to unduly limit the scope of the invention.

Referring to the drawings in detail and particularly to FIG. 1, the power washing apparatus of this invention, indicated generally at **12**, includes a power assembly **13** mounted on a support plate **15** extended across the upper end of a detergent supply barrel **17**. The plate **15** is secured

to the barrel 17 as by bolts or welding and, in turn, the barrel 17 is mounted on a coaster frame 19 providing for easy movement and resultant portability of the power washing apparatus 12 over a supporting surface. It is obvious that shock absorbing elements can be used to mount the plate 15 on the barrel for isolation of noise and vibration of the power assembly 13.

The power assembly 13 includes an electric motor 21 bolted to the support plate 15 having a rotatable shaft 23 to which is secured a pump means 24 as by the use of an Allen screw. The pump means 24 can be any type of a constant volume piston type pump and this is illustrated herein as a readily available "Hypro Twin Pump" manufactured by Hypro Engineering, Inc., of Minneapolis, Minn. This particular pump means 24 is of a dual piston type cam actuated on rotation of the output shaft 23 and capable of working against pressures up to two thousand (2000) p.s.i. but normally used for washing purpose to discharge fluid at a pressure of approximately 500 to 600 pounds p.s.i.

As shown in FIG. 2, the pump means 24 has an inlet section 26 to which is connected a fluid-detergent control means 27 and an outlet section 29 to which is connected a discharge control means 31. The fluid-detergent control means 27 includes an intermediate T member 33 having an outlet end 34 connected through a reducer 35 to the inlet section 26 of the pump means 24, an inlet end 37 connected to a fluid inlet assembly 38, and an intermediate opening 40 connected to a detergent metering assembly 42. The fluid inlet assembly 38 includes a standard stop cock valve 44 having one end threaded into the inlet end 37 of the T member 33 with an orifice member 46 mounted therebetween. The orifice member 46 is of a cylindrical shape having a central opening 48 of a size to selectively regulate the fluid flow available therethrough for reasons to be explained. At the opposite end of the stopcock 44 is connected a coupling member 50 adapted to receive a standard garden-type hose member 52 for supplying fluid, such as water, thereto. It is obvious that the stopcock 44 is operable to control the supply of fluid to the power assembly 13.

The detergent metering assembly 42 includes a needle valve member 53 connected to the intermediate opening 40 having a handle 55 rotatable to accurately regulate the detergent flow therethrough. The upper end of the needle valve member 53 is connected to a spring seat member 56 of a check valve assembly 58. Within the spring seat member 56, the check valve assembly 58 has a spring 60, and a ball 61 held in the assembled position by a ball seat member 63. The ball 61 is biased upwardly by the spring 60 into sealing engagement with an inclined surface 65 (FIGS. 4 and 5) and operable under certain conditions to permit fluid flow downwardly towards the T member 33 against the spring tension but prevent fluid flow upwardly past the surface 65. The upper end of the ball seat member 63 is formed with a stepped outer sealing surface 67 adapted to receive one end of a supply hose 68 having its other end extending through an opening 69 in the detergent barrel 17 and below the detergent level therein to pull detergent therefrom as will become obvious.

The power assembly 13, as shown in FIG. 2, further includes the discharge control means 31 connected to the outlet section 29 of the pump means 24. The discharge control means 31 includes a T connector 71 connected by a first coupling 72 to the pump means 24 and by second coupling 74 to an accumulator means 76. The third opening of the connector 71 is connected to one end of an elongated flexible tubular member 77 having its opposite end connected to a discharge rod or wand 78. As shown in FIG. 1, the wand 78 has a hand grip section 80 for manuverability and a 45 degree elbow 81 connected to the outer end thereof. Within the elbow 81 is a filter element 83 held therein by a discharge tip 84 threaded on the elbow 81. The filter element 83 is operable to prevent impurities from clogging a discharge orifice 86 in the tip 84. The size and shape of the orifice 86 is critical in controlling the pressure and configuration of the spray pattern of the fluid mixture discharged from the wand 78.

As shown in FIG. 3, the accumulator means 76 of this invention includes a cylinder shaped housing having a cap member 88 threaded upon a dome-shaped body 89. The cap member 88 has a central opening 91 with internal threads mounted on the upper end of the second coupling 74. Mounted within the housing are first and second resilient ball members 93 and 94 with the first ball member 93 having a diameter slightly larger than the inner diameter of the body 89. It is seen, therefore, that the first ball member 93 contacts the inner wall 95 of the body 89 to form an air seal and trap air within air air cavity 96. The second ball member 94 is positioned below the first ball member 93 for the function of maintaining the first ball member 93 within the body 89 notwithstanding the pressures acting thereupon. The second ball member 94 is of a much harder material than the first ball member 93 and has a smaller diameter so as to be freely movable within the housing between the first ball member 93 and the central opening 91 of the cap member 88.

In the use and operation of the power washing apparatus 12 of this invention, the stopcock valve 44 is opened to provide fluid, such as water, to the pump means 24 and the needle valve member 53 is adjusted to provide an opening into the check valve assembly 58. On energization of the motor 21, the pump means 24 is actuated to draw a fluid-detergent mixture into the inlet section 26 for discharge through the tubular member 77 and the wand 78 under high pressure. More specifically, as shown in FIGS. 4 and 5, on the intake stroke of the pump means 24, the fluid is drawn through the orifice member 46 in sufficient quantity to create a slight suction within the T member 33 but without starving the pump means 24. This slight suction operates to open the check valve assembly 58 to pull a controlled amount of detergent into the T member 33 for conveyance into the pump means 24. After the intake stroke, more particularly on the exhaust stroke of the pump means 24, the spring 60 and the fluid within the T member 33 are operable to seal the ball 61 with the surface 65 to prevent back flow of fluid into the detergent hose 68. It is seen therefore, that the pulsating water column within the detergent metering assembly 42 is operable to pull detergent from the barrel 17 in the required increments. Additionally ,the size of the opening 48 in the orifice member 46 is selected to correspond with the input fluid pressure (normally, the available water pressure) so as to provide the proper volume amount of water to the T member 33 to achieve the pulsating suction action for feeding in the detergent.

On the output side of the pump means 24, the accumulator means 76 operates to absorb the shock waves of the output water column and, therefore, reduce the vibration which normally causes rapid deterioration of the power washing apparatus 12. As shown in FIG. 6, the high output pressure of the fluid from the pump means 24 is moved through the central opening 91 of the accumulator means 76 concurrently with discharge through the wand 78. This pressure within the accumulator means 76 acts to move the first ball member 93 upwardly to compress the air within the cavity 96 until the operating discharge pressure (determined the size of the orifice 86 in the tip 84) is reached. For example, on assuming an operating pressure of 500 p.s.i., the first ball member 93 is sealed against the inner wall 95 of the body 89 and distorted into a substantially egg-shape by the air and fluid pressure acting on the opposite sides thereof.

On the intake stroke of the pump means 24 as shown in FIG. 7, the first ball member 93 acts as an auxiliary pump to expand toward its original shape under the air

pressure within the cavity **96** to force fluid therein through the central opening **91**, the wand **78**, and the discharge orifice **86**. This achieves a substantially constant output pressure without fluctuation of the output water column and resultant vibration of the pump means **24**. The larger size and fluid capacity of the accumulator means **76** relative to the diameter of the tubular member **77** and the discharge orifice **86** results in a plentiful supply of fluid flow into the discharge control means **31** to maintain a substantially constant pressure therewithin.

After an automobile or the like is sufficiently sprayed with the fluid-detergent mixture under high pressure for cleansing purposes, it is obvious that the needle valve **53** can be closed whereupon only the fluid such as water is discharged therefrom for rising purposes.

As will be apparent from the foregoing description of preferred embodiments, it is seen that the power washing apparatus of this invention presents a compact, portable structure that is easy to use, inexpensive to manufacture, and substantially maintenance free. The accumulator means of this invention presents a novel structure that is simple in operation and can be readily maintained and repaired without special knowledge or tools needed.

I claim:

1. A power washing apparatus having a motor means connected to a pump means, comprising;

(a) accumulator means connected to an outlet of said pump means having a housing, a fluid inlet portion, and resilient means within said housing,

(b) said resilient means contacting the sidewalls of said housing in a sealed, sliding unattached relationship to separate said housing into an air pocket portion and a fluid portion on opposite exterior sides of said resilient means, and

(c) said resilient means operable under fluid pressure to compress the air in said air pocket portion to achieve shock absorbing function and regulate the output pressure of said pump means.

2. A power washing apparatus as described in claim **1**, wherein (a) said resilient means having a ball member is operable to absorb and transmit pressure fluctuation in said outlet.

3. A power washing apparatus as described in claim **2**, wherein (a) said accumulator means has a second resilient ball member within said housing to hold said first resilient ball member in an operable position in contact with said sidewalls of said housing to assure continuation of said air pocket portion.

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U.S. Cl. X.R.

137—568; 138—30