BIDIRECTIONAL PISTON PUMP

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ABSTRACT
A two-way mechanical pump for a steam appliance having a main body having a boiler with a water inlet and a steam outlet positioned therein in provided. The bidirectional pump on two-way piston pump in accordance with the invention includes a cylinder separated into two chambers by a piston coupled to a piston rod or appliance handle. An inlet having a one-way valve and an outlet having a one-way valve are connected to each change. Movement of the piston from the first end of the cylinder to the second end expels liquid out of the second end and outlet and draws water into the first chamber through the first inlet and one-way valve and movement of the piston towards the first and expels water out of the first chamber and outlet through the first outlet valve and draws water into the second chamber through the second inlet and inlet valve.
BIDIRECTIONAL PISTON PUMP

CROSS-REFERENCE TO RELATED APPLICATIONS


BACKGROUND OF THE INVENTION

[0002] The invention relates generally to a pump, and more particularly to a bidirectional piston pump that is actuated by the movement of the piston in either direction to pump water, and more particularly to a pump for pumping water from a reservoir to a boiler for generating steam to be distributed to a steam nozzle of a steam mop for application to a surface to be cleaned.

[0003] Conventional mops have been widely used for cleaning floors. However, conventional mops have not been effective at cleaning dirt in small crevices and floor gaps. In addition, conventional mops require frequent rising since mops can only effectively clean a small surface area at a time.

[0004] Steaming devices used to apply steam to household objects are well known. The uses of the devices vary widely, and may include the application of steam to drapes or other fabrics to ease wrinkles, and the application of steam to objects to assist in cleaning the objects.

[0005] Typical steam devices have a reservoir for storing water that is connected to an electrical water pump with an on/off switch. The exit from the electric water pump is connected to a steam boiler with a heating element to heat the water. The heated water generates steam, which may be directed towards its intended destination through a nozzle which controls the application of the steam. Variation of the shape and size of the nozzle allows for preferred distribution of generated steam to an object to be cleaned. The nozzles may be disconnectable from the steam generator to allow different nozzles to be utilized, based on the object to be steamed. The nozzle may be either closely coupled to the steam generator, or located at a distance from the steam generator, requiring tubing or other steam transfer structures to be interconnected between the steam generator and the discharge nozzle. Typically, it is beneficial to provide suitable connectors between the steam generator and the nozzle to allow the nozzle to be connected to the steam generator, or to allow the interconnection of transfer tubes or hoses between the steam generator and the nozzle.

[0006] In general, the nozzles used with the steam cleaners do not have large surface areas and a cloth to absorb the liquid condensate of the steam. Here, the fabric pad is secured to the nozzle by Velcro strips to a plurality of cleats on the bottom of the nozzle. In another embodiment, a flat fabric piece is folded around a flat brush or nozzle in order to increase the cleaning surface area. The folded fabric on top of the brush or nozzle is secured by a clip on top of the piece. Often steam injected behind the cloth passes through the cloth at the points the bristles contact on the cloth. This tends to wet the cloth and reduce the cleaning effectiveness of the steam. In addition, the cloth covers must be carefully attached not to cover the front or back of the brush attachment.

[0007] Notwithstanding the wide variety of pumps suitable for a steam generating appliance available, there exists the need to provide an efficient, compact and easy to use bidirectional piston pump for pumping water in response to movement of an appliance handle and effectively improve the pumping action to improve effective steam generation in steam appliances.

SUMMARY OF THE INVENTION

[0008] Generally speaking, in accordance with the invention, a bidirectional piston pump for selectively injecting water from a reservoir to a boiler in response to the push-pull movement of a mop is provided. The mop includes a housing with an electric boiler and a water pump wherein a user’s back and forth movement of the mop pumps water to the boiler for distribution of steam to a steam pad frame attachment for cleaning. A fabric steam pad is mounted on the steam pad frame to provide an improved cleaning surface.

[0009] The bidirectional pump or two-way piston pump in accordance with the invention includes a cylinder separated into two chambers by a piston coupled to a piston rod or appliance handle. An inlet having a one-way valve and an outlet having a one-way valve are connected to each chamber. Movement of the piston from the first end of the cylinder to the second end expels liquid out of the second end outlet and draws water into the first chamber through the first inlet and one-way valve and movement of the piston towards the first end expels water out of the first chamber and outlet through the first outlet valve and draws water into the second chamber through the second inlet and inlet valve.

[0010] Accordingly, it is an object of the invention to provide an improved bidirectional piston pump.

[0011] Another object of the invention is to provide a steam mop including the improved pump.

[0012] A further object of the invention is to provide a mechanical pump that is actuated by movement of the piston in either direction pumps liquid from the pump.

[0013] Yet another object of the invention is to provide a steam mop including the improved bidirectional piston pump.

[0014] Still other objects and advantages of the invention will in part be obvious and will in part be apparent from the specification.

[0015] The invention accordingly comprises a product possessing the features, properties, and the relation of components which will be exemplified in the product hereinafter described, and the scope of the invention will be indicated in the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] For a fuller understanding of the invention, reference is made to the following description taken in connection with the accompanying drawing(s), in which:

[0017] FIG. 1 is a perspective view of a steam mop including a steam pad frame attachment for receiving a fabric steam pad including a bidirectional piston pump constructed and arranged in accordance with the invention;

[0018] FIG. 2 is a schematic view of a two way valve suitable for use with the steam mop of FIG. 1; and

[0019] FIG. 3 is a schematic view showing a pump with the two way valve of FIG. 2 connected to the boiler with steam pad frame and fabric steam pad of the steam mop of FIG. 1.

DETAILED DESCRIPTION OF THE INVENTION

[0020] FIG. 1 is a perspective view of a steam mop 10 constructed and arranged in accordance with one embodiment of the invention. Mop 10 includes a housing or main
body 16 connected to a steam pad frame 21 at one end of a pipe 20 and having a handle 11 at the other end of pipe 20. Housing 16 includes a water container or tank 14 as shown in FIG. 2 as part of the upper part of housing 16 and is connected to a boiler 46 by a pump 29 having a one-way outlet valve 45. Any type of mechanical pump or some other means of transporting the water to the boiler may be used with steam mop 10. Preferably, pump 29 is a mechanical pump, such as a bellows pump or a piston pump, that is actuated by movement of mop 10 by a user pushing and pulling handle 11 at the end of pipe 20. An upper cord hanger 17 is mounted on handle 11 and a lower cord hanger 18 for easy storage of a power cord 47 is mounted on pipe 20.

[0021] Steam pad frame 21 is substantially rectangular in shape and includes a central steam opening 23 as shown on FIG. 5. Steam generated in steam boiler 46 shown in FIG. 2 dispenses steam into frame 21 to central steam opening 23 of frame 21. A substantially rectangular fabric steam pad 24 is mounted on frame 21 by attaching a pair of Velcro strips on pad 24 to a plurality of clients mounted on frame 21.

[0022] Referring now to FIG. 2, a “two way” valve 250 suitable for use in a steam mop. Valve 250 will pump water when an appliance or handle 11 coupled to piston 254 is displaced both in the forward motion and also in the return or backwards motion. Pump 250 includes a pump cylinder 251 having an upper chamber 252 and a lower chamber 253 divided by a piston 254 that is connected to a piston rod 255 which moves up and down in response to movement of handle 11.

[0023] A first inlet unidirectional duct bill valve 256 and a first outlet unidirectional duct bill valve 257 are connected to upper chamber 252. A second inlet unidirectional duct bill valve 258 and a second outlet unidirectional duct bill valve 259 are connected to lower chamber 253. As shown in FIG. 3, both inlet duct bill valves 256 and 258 are connected in parallel to a water inlet pipe 261 having a water inlet fitting 262 for securing a hose from a reservoir in housing 16. Water outlet duct bill valves 257 and 259 are connected in parallel to a water outlet pipe 263 that is secured to a water outlet hose 266 connected to a boiler 267 at an inlet 268. In order to create the pumping action to force water out of valves 257 and 259, volume changes in chambers 252 and 253 must be created.

[0024] A steam hose 269 is connected to steam generator 267 of any suitable design, which can be used to distribute the steam in the desired pattern. Water inlet 261 can be connected with any suitable connection (rubber hose, direct connection to a water tank, etc) to the water supply to enable pump 251 to pump and deliver water to steam generator 267.

[0025] As piston 254 is moving downward, the volume of lower chamber 253 decreases which causes the water which is inside to exit chamber 253 through duct bill valve 259. Water flow direction is determined by the direction of a duck bill valve. Water can flow only in one direction through a duck bill valve. At the same time water flows through outlet valve 259, the volume of chamber 252 increases. This increase of the volume causes water to flow from the reservoir into chamber 252 through inlet duck bill valve 256 as shown by arrow A.

[0026] A steam appliance including a bidirectional piston pump provides many advantages for ease of use because it eliminates the need for an electric water pump and an on/off switch to activate the electric water pump. Here, the user has more control over the amount of water needed to be discharged into the boiler and consequently, how much steam is needed by moving the mop forward and backwards. In addition, the appliance can be designed as a low pressure or non-pressurized system so it is safer for the user to use. Further, since the amount of water routed to the boiler is controlled, the boiler can create steam in a short amount of time.

[0027] It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in the above product without departing from the spirit and scope of the invention, it is intended that all matter contained in the above description and shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

[0028] It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

What is claimed is:
1. A two-way mechanical pump, comprising:
a pump cylinder having a first end and a second end;
a piston moveably positioned in the cylinder and dividing the cylinder into a first chamber at the first end, and a second chamber at the second end;
a first inlet connected to the first chamber of the cylinder with a first one-way inlet valve in the first inlet, and a second inlet connected to the second chamber of the cylinder with a second one-way inlet valve on the second inlet;
a first outlet connected to the first chamber of the cylinder with a first one-way outlet valve in the first outlet, and a second outlet connected to the second chamber of the cylinder with a second one-way outlet valve in the second outlet.
2. The two-way pump of claim 1, wherein the first and second inlets are connected to a common water source.
3. The two-way pump of claim 1, wherein the first and second outlets are connected to a common outlet.
4. The two-way pump of claim 1, wherein the outlet is connected to a steam generator.

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