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(54) **WASHER SYSTEM AND PUMP FOR SAME**

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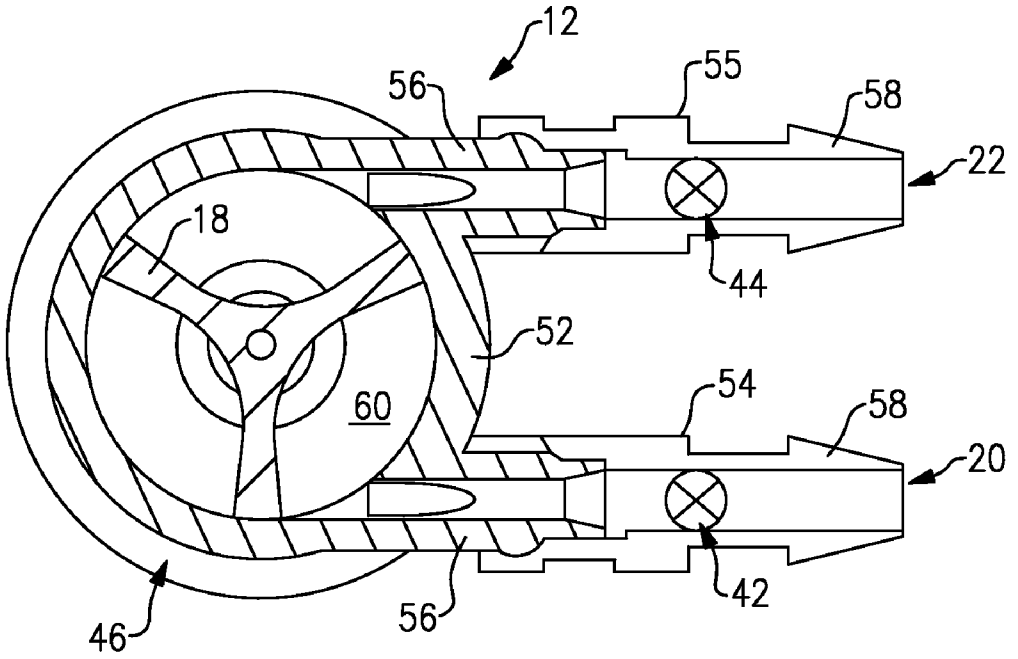
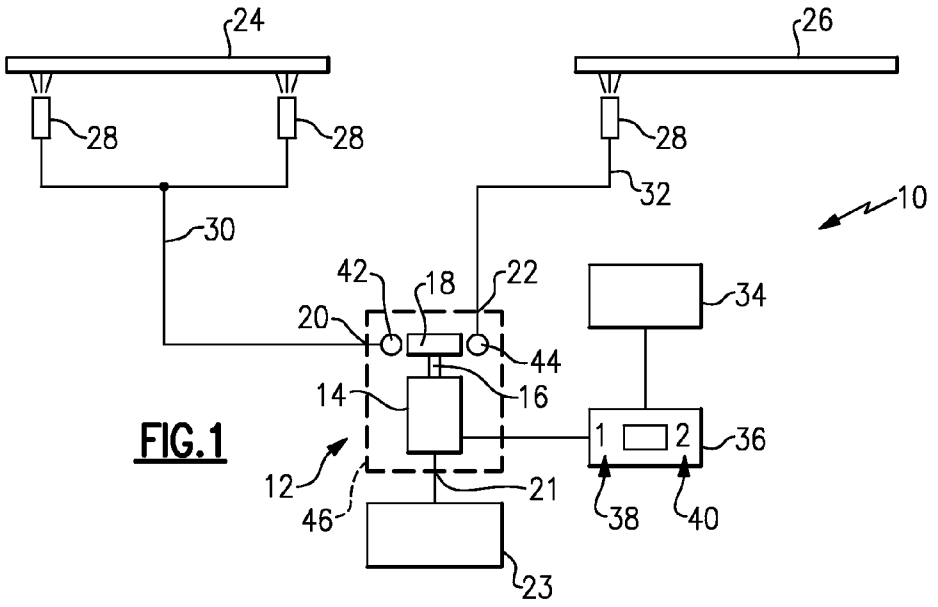
(57) **ABSTRACT**

A pump for a washer system includes a housing enclosing a motor driven pump and providing first and second outlets. First and second check valves are fluidly connected to and downstream from the first and second outlets. In one example, the first and second check valves are arranged in the housing. The check valves are configured such that one of the check valves is open to provide the fluid through the one of the outlets while the other check valve is closed to block fluid through the other of the outlets. In operation, a pumping element is rotated to pump fluid through an open first check valve, with the second check valve in the closed position. Reversing rotation of the pumping element pumps fluid through an open second check valve with the first check valve in the closed position.




24
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38
40
23

FIG.1

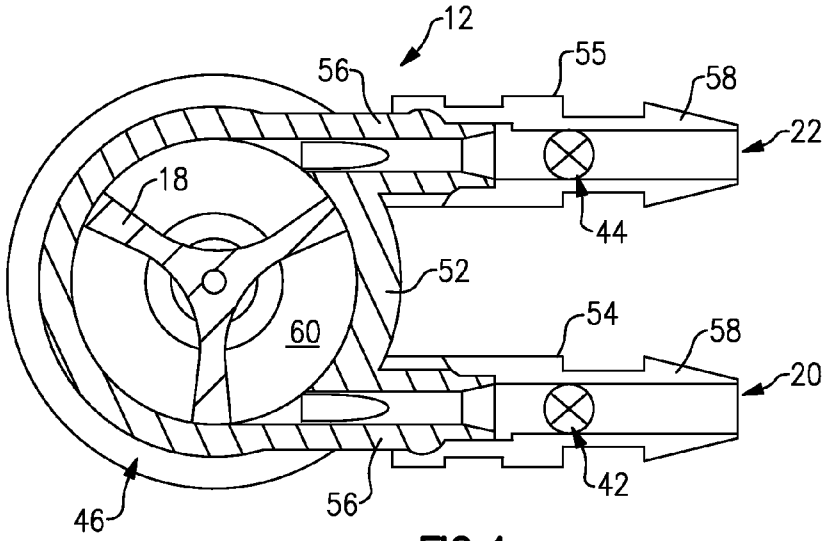
12
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FIG.4

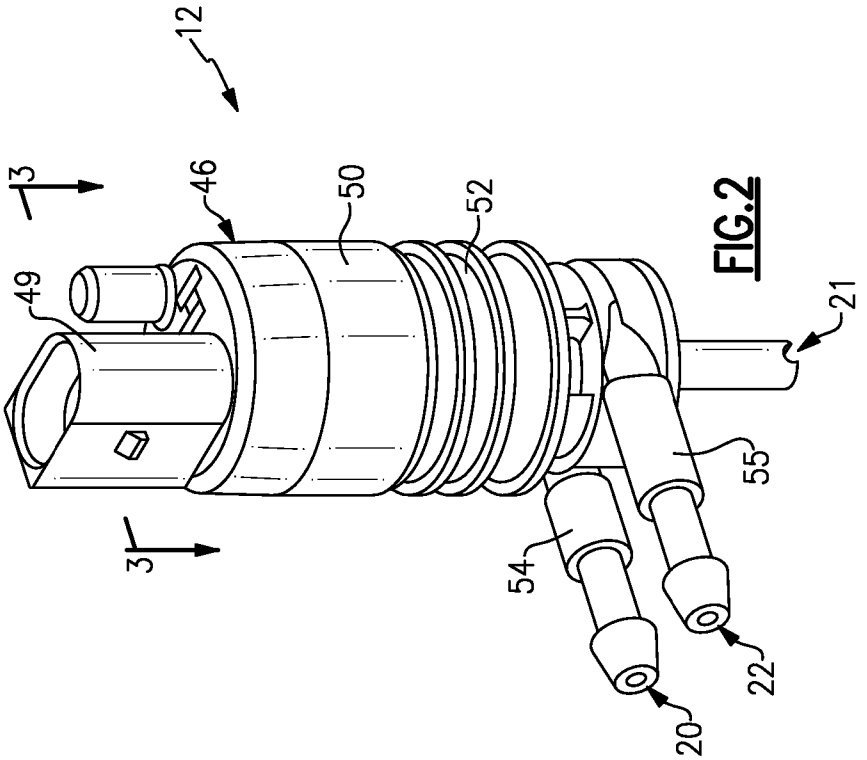
12
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FIG.2

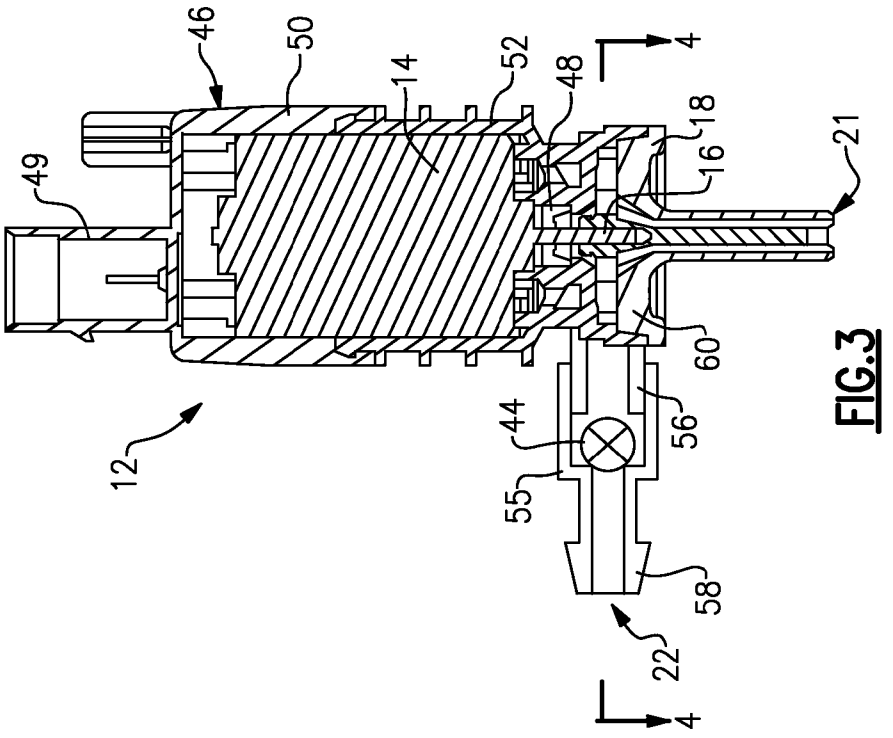
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FIG.3

WASHER SYSTEM AND PUMP FOR SAME

BACKGROUND

[0001] This disclosure relates to a washer system and a pump. The disclosure also relates to a method of delivering fluid within a washer system.

[0002] Washer systems, such as those used in vehicles, have become increasingly complex. A typical modern washer system provides washer fluid to multiple components, such as the front and rear vehicle glass. One approach to providing washer fluid to multiple locations uses a single pump driven by a reversible motor. Two outlets are provided in a housing that encloses the motor which drives a pumping element. Each outlet is supplies washer fluid to one of the components. The user changes the polarity of the power provided to the motor using one or more switches to select a rotational direction of the motor that corresponds to fluid delivery to one of the components.

[0003] It is desirable to block the unused outlet while fluid is pumped through the other outlet. In one example configuration, a valve assembly is provided between the outlets. One example valve assembly includes a diaphragm arranged between the outlets and supports a structure on each of its opposing sides. Rotation of the pump in a particular direction causes the fluid to move the diaphragm and block the unused outlet, which prevents air from being ingested into the pump through the unused outlet. Additionally, the translation of the diaphragm can create a spitting effect out of the nozzle as the diaphragm vibrates, which is undesirable to some customers.

SUMMARY

[0004] A pump for a washer system includes a housing enclosing a motor driven pump and providing first and second outlets. First and second check valves are fluidly connected to and downstream from the first and second outlets. In one example, the first and second check valves are arranged in the housing. The check valves are configured such that one of the check valves is open to provide the fluid through the one of the outlets while the other check valve is closed to block fluid through the other of the outlets. In operation, a pumping element is rotated to pump fluid through an open first check valve, with the second check valve in the closed position. Reversing rotation of the pumping element pumps fluid through an open second check valve with the first check valve in the closed position.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] The disclosure can be further understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

[0006] FIG. **1** is a schematic of an example washer system.

[0007] FIG. **2** is a perspective view of an example pump for a washer system.

[0008] FIG. **3** is a cross-sectional view through the pump taken along line **2-2** of FIG. **2**.

[0009] FIG. **4** is a cross-sectional view through the pump taken along line **3-3** of FIG. **3**.

DETAILED DESCRIPTION

[0010] A washer system **10** is illustrated in FIG. **1**. The system **10** includes a pump **12** having a motor **14** driving a pumping element **18** via a shaft **16**. In one example, the pumping element **18** is an impeller. The pump **12** includes first and second outlets **20**, **22** that selectively provide washer fluid to first and second components **24**, **26**, which may correspond respectively to front and rear glass of a vehicle. First and second fluid circuits **30**, **32** are respectively connected to the first and second outlets **20**, **22**. Nozzles **28** are provided in each of the first and second circuits **30**, **32** to spray washer fluid onto the first and second components **24**, **26**. The pump **12** draws washer fluid through its inlet **21** from a fluid reservoir **23**.

[0011] A power source **34** is operatively electrically connected to the pump **12** through a switch **36**. Although the switch **36** is illustrated as a single switch in FIG. **1**, the switch **36** typically comprises multiple switches that are independently operable from one another. For illustrative purposes, the switch **36** includes first and second polarity positions **38**, **40**. The first polarity position **38** rotates the motor **14** and the associated pumping element **18** in a first rotational direction, and the second polarity position **40** rotates the motor **14** in the opposite direction to reverse the rotation of the pumping element **18**.

[0012] First and second check valves **42**, **44** are respectively associated with the first and second outlets **20**, **22**. The first and second check valves **42**, **44** prevent fluid from being delivered to the nozzles **28** until a predetermined minimum pressure has been reached. The first and second check valves **42**, **44** are discrete, separate elements from one another. A housing **46** encloses the motor **14** and pumping element **18**. The housing **46** typically comprises multiple components secured to one another.

[0013] In the example illustrated in the FIGS. **2-4**, the first and second check valve **42**, **44** are integral with the housing **46**. The first and second check valves **42**, **44** are enclosed by the housing **46**. That is, no flexible hoses are arranged between the first and second check valves **42**, **44** and the first and second outlets **20**, **22** such that the first and second check valves **42**, **44** are in close proximity to the pumping element **18**. Thus, the housing **46**, motor **14**, pumping element **18** and first and second check valves **42**, **44** are integrated to provide a unitary, preassembled component. The first and second check valves **42**, **44** may be non-integral with the housing **46** and connected to the outlets by flexible hose, for example, at some position between the pumping element **18** and nozzles **28** and in close proximity to the pump **12** to prevent drain back. In any event, no diaphragm is used between the first and second outlets **20**, **22**.

[0014] The first and second check valves **42**, **44**, which are normally closed, are configured such that one of the first and second check valves **42**, **44** is open to provide the fluid through the one of the first and second outlets **20**, **22** while the other of the first and second check valves **42**, **44** is closed to block fluid through the other of the first and second outlets **20**, **22**. The first and second check valves **40**, **42** are respectively fluidly connected between the first and second outlets **20**, **22** and the pumping element **18**. In operation, the pumping element **18** is rotated to pump fluid through an open first check valve **42**, with the second check valve **44** in the closed position. Reversing rotation of the pumping element **18** pumps fluid through an open second check valve **44** with the first check valve **42** in the closed position. The first and second check valves **42**, **44** may be any suitable configuration. In one example, a ball and spring check valve arrangement may be used. Other types of check valves, such as diaphragm-type

check valves may be used. Furthermore, the closing forces of the check valves may be customized for each fluid circuit and different than one another.

[0015] Referring to FIGS. **2-4**, the example housing **46** includes first, second, third and fourth housing portions **50**, **52**, **54** and **55**. An electrical connector **49** is provided on the first housing portion **50** to provide electrical communication with the motor **14**. The first and second housing portions **50**, **52** enclose the motor **14**. The second housing portion **52** provides a cavity **60** within which the pumping element **18** is disposed and to which the first and second outlets **20**, **22** are connected. Alternatively, another housing portion may be used to enclose the pumping element **18** and provide the inlet **21**.

[0016] The second housing portion **52** provides stems **56** that provide the first and second outlets **20**, **22**. The third and fourth housing portions **54**, **55** respectively house the first and second check valves **42**, **44**. In the example shown, the check valve housings, provided by the third and fourth housing portions **54**, **55**, are secured to and supported on the stems **56**. The third and fourth housing portions **54**, **55** provide barbs **58** to which flexible hose from the first and second fluid circuits **30**, **32** may be connected. It should be understood that the housing portions may be configured in a manner other than depicted in the Figures. Fewer or greater number of housing portions may be used. The housing portions may be constructed from plastic or metal pieces fused and/or snapped together.

[0017] No valve assembly, including a diaphragm is used, which provides a simpler pump that is not subject to undesired spitting. No additional separate check valves are required in the washer system **10**. The check valves maintain the washer fluid within the fluid circuits, thereby preventing fluid drain back and better enabling the washer system to meet customer or regulatory requirements for providing washer fluid to flow quickly to the nozzles.

[0018] Although an example embodiment has been disclosed, a worker of ordinary skill in this art would recognize that certain modifications would come within the scope of the claims. For that reason, the following claims should be studied to determine their true scope and content.

What is claimed is:

1. A pump for a washer system comprising:

a housing providing first and second outlets;

a motor driven pumping element arranged within the housing, the motor configured to be reversible enabling the pumping element to selectively pump fluid through one of the outlets; and

first and second check valves respectively in fluid communication with the first and second outlets and arranged in the housing, and configured such that one of the check valves is open to provide the fluid through the one of the outlets while the other check valve is closed to block fluid through the other of the outlets.

2. The pump according to claim **1**, wherein the housing includes multiple housing portions secured to one another, a first housing portion providing a cavity within which the pumping element is disposed, the first and second outlets in fluid communication with the cavity.

3. The pump according to claim **2**, wherein the housing includes second and third housing portions respectively enclosing the first and second check valves and secured to the first housing portion.

4. The pump according to claim **1**, wherein pump is without a diaphragm arranged between the first and second outlets, and the first and second check valves are normally closed.

5. The pump according to claim **1**, wherein the housing, motor, pumping element, first and second check valves are integrated to provide a unitary, preassembled component.

6. A washer pump system comprising:

a housing providing first and second outlets;

a motor driven pumping element arranged within the housing, the motor configured to be reversible enabling the pumping element to selectively pump fluid through one of the outlets; and

first and second check valves respectively fluidly connected to the first and second outlets, the first and second check valves respectively fluidly between the first and second outlets and the pumping element, and configured such that one of the check valves is open to provide the fluid through the one of the outlets while the other check valve is closed to block fluid through the other of the outlets.

7. The washer pump system according to claim **6**, wherein the housing, motor, pumping element, first and second check valves are integrated to provide a unitary, preassembled component.

8. The washer pump system according to claim **6**, comprising first and second components, and first and second fluid circuits respectively fluidly connected to the first and second outlets and configured to spray fluid respectively on the first and second components.

9. The washer pump system according to claim **8**, comprising a switching element electrically connected to the motor and configured to reverse the polarity of power provided to the motor to a desired rotational direction of the motor and selectively deliver fluid to one of the first and second components.

10. The washer pump system according to claim **6**, wherein the first and second check valves respectively include first and second closing forces that are different than one another.

11. The washer pump system according to claim **6**, wherein the first and second check valves provide normally closed positions.

12. A method of pumping washer fluid comprising the steps of:

providing first and second check valves associated with the first and second outlets of a pump, the first and second check valves having normally closed positions;

rotating a pumping element to pump fluid through an open first check valve, with the second check valve in the closed position; and

reversing rotation of the pumping element to pump fluid through an open second check valve with the first check valve in the closed position.

13. The method according to claim **12**, wherein the reversing step includes changing a polarity of power provided to the pump.

14. The method according to claim **12**, wherein the rotating step includes delivering fluid to a front vehicle glass, and the reversing step includes delivering fluid to a rear vehicle glass.

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