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(54) WASHER SYSTEMS FOR VEHICLES

(71) We, TRICO-FOLBERTH LIMITED, a British Company, of Great West Road, Brentford, Middlesex, TW8 9HF, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a washer installation for the windscreen or other glass surface of a motor car or other vehicle, and more particularly to a washer installation of the kind for supplying liquid to a jet or jets arranged to direct the liquid on to the glass surface in the area of wipe of a wiper blade. The jet or jets may be arranged at fixed positions e.g. on the cowl of a motor car, or may move with the outer end of the wiper arm.

In countries in which winters are severe, motorists accept the necessity of supplying the jets with anti-freeze liquid which has a freezing point substantially below that of water. However, in countries in which winters are mild and freezing conditions may occur spasmodically, there may be many motorist reluctant to use anti-freeze liquid in the supply to the jets, perhaps because of the expense. Nevertheless it is at least desirable that the washer shall be serviceable even without anti-freeze liquid in the supply, There is risk of exposed parts of the washer, i.e. the jets and the piping unprotected by the metal skin or other bodywork of the vehicle, becoming blocked by ice under freezing conditions when the system is not in use. An object of the invention is to reduce that risk.

A washer system according to the present invention comprises a reservoir, a pump, and a jet or jets, the pump being arranged to draw liquid from the main reservoir and deliver liquid to the jet or jets through a main passage, the system including a return passage leading from the main passage to the reservoir and containing a means for restricting or preventing liquid flow through the return passage during pump operation.

The system is intended to be installed in a vehicle including a body. The return passage being housed wholly within the body, and arranged to drain liquid by gravity from the jet or jets via the main passage and the return passage from the reservoir.

The return passage is preferably controlled by a valve which maintains the return passage closed whilst the liquid is being delivered to the jet or jets by the pump, and opens the return passage when the pump has stopped.

The valve is preferably of the type often used as a non-return valve and comprising a valve member arranged to close against a seating in opposition to resilient force when the pump is delivering the liquid to the jet or jets, and to open and allow drainage of the liquid from the jet or jets via the main passage when the pump has stopped.

As an alternative to the valve, particularly in a washer installation employing a plurality of jets, the return passage may be permanently open and contain a constriction, for example the flow area of substantially that of one of the jets.

Examples according to the invention will now be described with reference to the accompanying diagrammatical drawings in which:

Figure 1 shows a washer installation as applied to fixed jets operated simultaneously;

Figure 2 shows on a larger scale a partly sectioned valve in the installation in Figure 1; and

Figure 3 shows a washer installation as applied to two sets of travelling jets operated alternately.

In the washer installation shown in Figure 1, a pump 10, associated with a non-return valve (not shown) is arranged to draw liquid from a reservoir 11 through a pipe 12 and deliver through pipe 13 which serves as a main passage in the washer and divides at 13a to supply a pair of spaced fixed jets 14 of equal orifice size. In the present example the jets 14 are mounted on the outside of the metal skin or cowl 15 of a moter car at locations adjacent to the lower edge of the windscreen. The jets 14 are connected to

respective hollow fittings which project through corresponding openings in the cowl 15 and communicate with the pipe 13 below. The jets are for directing liquid on to the respective areas 16 swept by a pair of wiper blades 17 carried on oscillatable wiper arms 18.

A gravity return passage or pipe 19 connects the main pipe 13 below the junction 13a to the reservoir 11. The pipe 19 is controlled at 20 by a valve, detailed in Figure 2, or by a construction.

The valve Figure 2 comprises a chest 21 connected in the return pipe 19, flow through pipe 19 being controlled according to the position of a valve member 22 which is normally urged off a seating 23 by a spring 24 but closed on the seating in opposition to the spring 24 by pressure of liquid in pipe 19 when pump 10 is operating.

Liquid is drawn by pump 10 from reservoir 11 through pipe 12 and delivered through main pipe 13 past junction 13a to the jets 14 and onto the areas 16 of the windscreen. Liquid driven by pump 10 also enters return pipe 19 from main pipe 13 and closes the valve member 22 onto seating 23 in opposition to spring 24. As soon as pump 10 is stopped, spring 24 recovers and unseats member 22. Return pipe 19 thereupon immediately drains liquid from above it from the jets 14 via the main pipe 13 and back to the reservoir 11. The risk of jets 14 becoming blocked by liquid freezing therein when the jets are not in use is thereby minimised.

If a constriction is used at 20 in place of the valve, liquid is bled continually through pipe 19 to reservoir 11 during pump operation; and when the pump 10 stops, pipe 19 drains liquid to reservoir 11 from jets 14 via main pipe 13. The flow area of the constriction is substantially that of one of the jets.

In the washer system shown in Figure 3 there are counterparts of the system shown in Figure 1, and these have corresponding references.

The washer installation in Figure 3 contains some duplication to enable the washer to supply alternately-operating sets of jets 14^1, 14^{11}. The jets are indicated collectively by arrow heads 14^1, 14^{11} but in fact are formed at the free ends of a pair of wiper arms 18 which are linked to oscillate in phase. The jets 14^1, 14^{11} are of equal orifice size and in total can number twelve, there being in that case six on the free end of each wiper arm 18, the six being arranged three to a side of the respective wiper blade (not shown) and each three being directed, respectively, perpendicularly to the windscreen on which a wiper blade on the arm 18 would operate, radially outwardly, and radially inwardly of the wiper arm.

Pump 10 in Figure 3 delivers into a distributor 25 having two outlets 26, 27 which are opened alternately by a linkage (not shown) for oscillating the arms in phase. One such outlet, 26, is connected to pipe 13^1 which provides one of the main passages of the washer and divides at 13^1a to deliver on the left of each of the two wiper arms 18, whereas the other such outlet 27 is connected to another main pipe 13^{11} providing another main passage of the washer and dividing at $13^{11}a$ to deliver on the right side of each of the wiper arms, pipe 13^{11} being shown in broken line to distinguish it clearly from pipe 13^1. Each pipe 13^1, 13^{11} is flexible and extends through a respective opening in the cowl 15 and along the respective wiper arm 18 to the jets at the free end of the arm.

Respective gravity return passages or pipes 19^1, 19^{11} (pipe 19^{11} being shown in broken line) connect respective main pipes 13^1, 13^{11} at locations below cowl 15, to reservoir 11. Each return pipe 19^1, 19^{11} is controlled at 20^1, 20^{11} by a respective valve or a constriction, the valve being of the form shown in Figure 2 and arranged to respond in a similar manner. Each such constriction in Figure 3 can have a flow area cross-section equivalent to substantially that of one of the jets on the wiper arms.

When the wiper arm 18 and the pump 10 are in operation, the distributor 25 opens to deliver liquid ahead in the path of movement of the wiper blades whilst making no delivery to the rear of them. Assuming wiper arms 18 in Figure 3 are making a clockwise stroke, the liquid will be delivered only through outlet 27 of distributor 25 to the set of jets 14^{11} through pipe 13^{11}, outlet 26 being closed. At reversal of the wiper arms at the end of the stroke, the distributor 25 switches to deliver only through outlet 26 to the set of jets 14^1 through pipe 13^1, and to close outlet 27.

When pump 10 stops, the valve 20 in each return pipe 19^1, 19^{11} will open and liquid will drain from the jets 14^1, 14^{11} via the respective main pipes 13^1, 13^{11} back to reservoir 11, thereby minimising the risk that the jets 14^1, 14^{11} or the portions of the pipes 13^1, 13^{11} exposed above the cowl 15, will be blocked by liquid freezing therein.

If a constriction is used at 20 in each return pipe 19^1, 19^{11} in place of the valve, liquid is bled through the pipes 19^1, 19^{11} back to the reservoir 11 during pump operation, and bleeding continues through pipe 19^1 between successive deliveries of liquid by operation of the distributor 25 through the main pipe 13^1, similar considerations applying to pipes 19^{11} and 13^{11}. There is therefore likely to be a short pause in the resumption of delivery from jets 14^1 (or 14^{11}) at each reversal of the wiper arms 18, during which pause a portion of the pipe 13^1 (or 13^{11}) is being reprimed by the pump 10,

but the pause, if objectionable, can be minimised by advancing the phase of operation of the distributor 25 in relation to the phase of the wiper arms. When pump 10 stops, pipes 19^1, 19^{11} drain liquid to reservoir 11 form jets 14^1, 14^{11} via pipes 13^1, 13^{11}, respectively.

As the return pipes 19 (Figure 1) and 19^1, 19^{11} (Figure 3) are wholly arranged behind cowl 15, the main pipes and jets drained by the return pipes have some measure of protection against frost.

WHAT WE CLAIM IS:—

1. A washer system for a glass surface of a vehicle, comprising a reservoir, a pump, and a jet or jets, the pump being arranged to draw liquid from the reservoir and to deliver liquid to the jet or jets through a main passage, the system including a return passage leading from the main passage to the reservoir and containing a means for restricting or preventing the liquid flow through the return passage during pump operation.

2. A system according to claim 1, in which the said means for preventing liquid flow is a valve which maintains the return passage closed while the liquid is being delivered to the jet or jets by the pump, and opens the return passage when the pump has stopped.

3. A system according to claim 1 or 2, in which the main passage, jet or jets, and return passage are duplicated, and the pump communicates alternately with the two main passages via a distributor arranged to be actuated by a wiper mechanism.

4. A vehicle incorporating a washer system according to any claims 1 to 3, the vehicle including a body, and the return passage being housed wholly within the body, and arranged to drain liquid by gravity from the jet or jets via the main passage and the return passage to the reservoir.

5. A system according to claim 1, substantially as described with reference to Figures 1 and 2, or Figure 3 of the accompanying drawings.

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Sheet 1

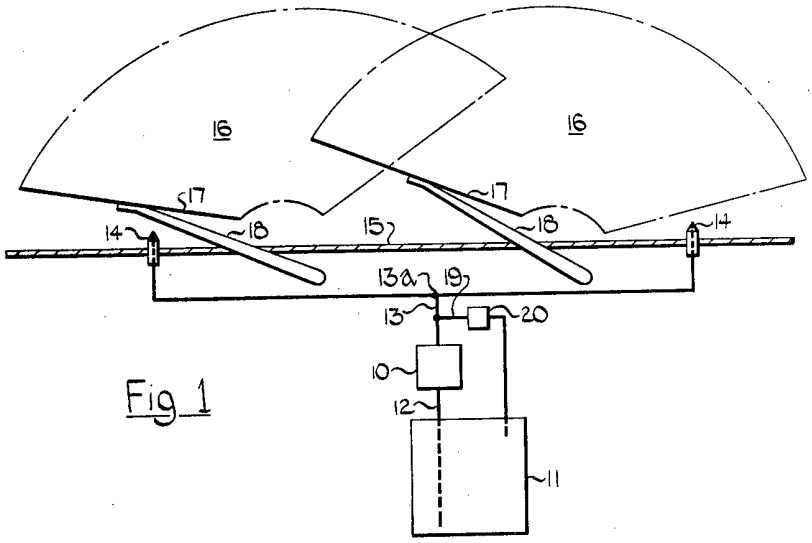

Fig 1

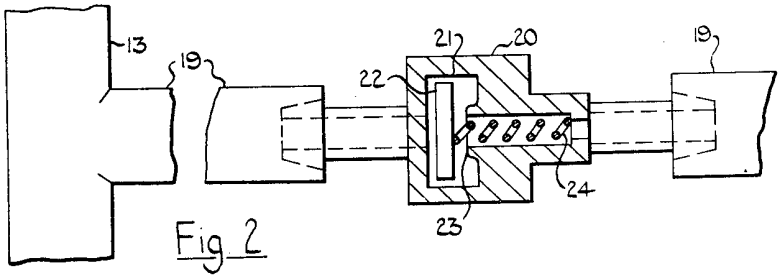

Fig 2

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Sheet 2

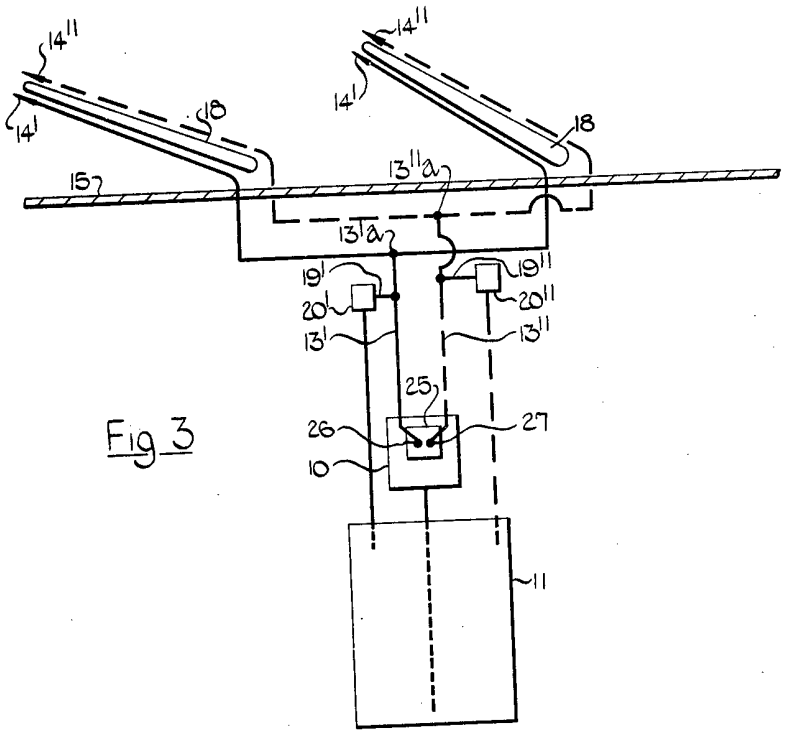

Fig 3