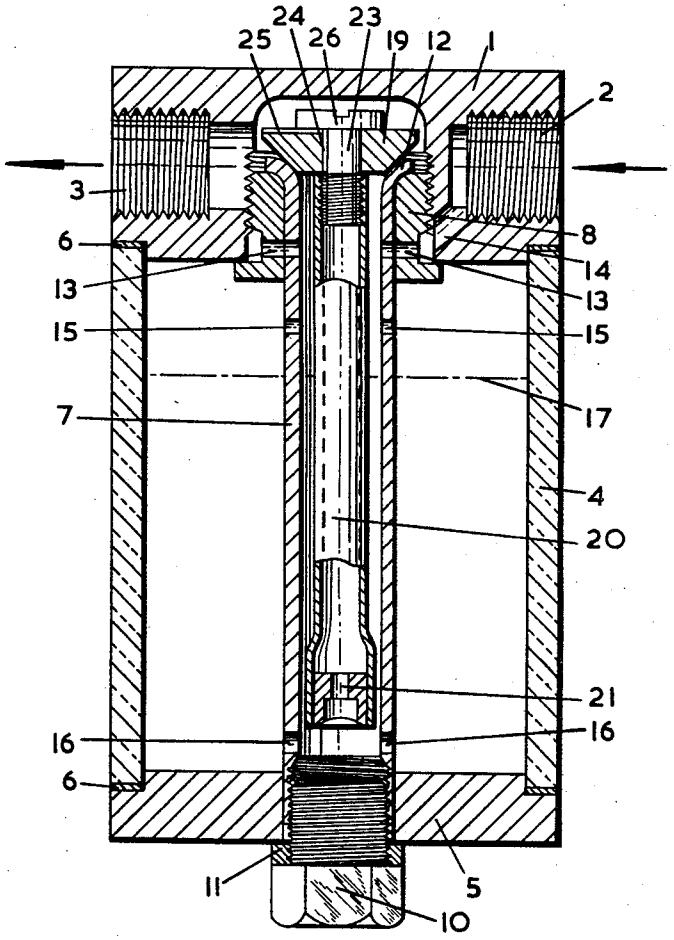
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DEVICE FOR INTRODUCING A LIQUID INTO A STREAM OF PRESSURISED GAS

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DEVICE FOR INTRODUCING A LIQUID INTO A STREAM OF PRESSURISED GAS

Ronald Thomas Lawrence, Chilloway, Pankridge St., Crondall, England

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5 Claims. (Cl. 137—205.5)

The invention relates to a device for introducing a liquid into a stream of pressurised gas to provide a mixture of liquid and gas of predetermined proportions and is concerned with an improvement in or modification of the invention described and claimed in U.S. patent application No. 26,873, filed May 4, 1960, now Patent No. 3,068,885 issued Dec. 18, 1962.

An object of the present invention is to provide a device which is more compact and cheaper to produce than the devices described in the aforesaid specification.

According to the present invention a device for introducing a liquid into a stream of pressurised gas comprises a housing having an inlet and an outlet through which, in operation, a stream of pressurised gas is passed, the housing having an internal partition positioned in the flow-path between the inlet and the outlet and containing an annular valve seat; the device also comprising a valve member, engageable with the seat and arranged to be lifted therefrom against a bias by the flow of gas through the housing, the valve member being mounted on a guiding stem having a longitudinal throughway therein, arranged to communicate at the end thereof remote from the valve member with a source of liquid at a pressure substantially equal to the pressure of the gas upstream of the valve seat and at the other end thereof with an orifice in the valve member, arranged to discharge liquid into the gas stream in a region of reduced pressure produced by the flow of gas past the seat, the bias opposing the lifting of the valve member being such as to produce a pressure drop in gas flowing through the seat, which will produce a liquid and gas mixture of the desired proportions.

The seat is conveniently arranged substantially horizontally and the bias opposing the lifting of the valve member is effected by the total weight of the valve member and the stem.

Preferably the liquid is contained in a reservoir, positioned below the valve seat, and the stem extends downwardly into the reservoir, the reservoir communicating above the level of liquid therein with the upstream side of the seating.

By way of example a lubricator device, for introducing a metered quantity of oil into a stream of compressed air, will now be described with reference to the accompanying drawing, which is an axial section through the device.

The device comprises a valve housing **1**, having an internally screw-threaded inlet **2** and an internally screw-threaded outlet **3** to which pipes for conveying the compressed air can be attached. The housing **1** is mounted on top of a reservoir for oil comprising a cylindrical wall **4** of glass or other transparent material, closed at its lower end by an end-plate **5**. Sealing rings **6** are located at each end of the cylindrical wall **4**. The reservoir contains a concentric tube **7** of which the upper end is belled at **12** and is located by a screwed collar **8** placed around the tube **7** and engaged in a hole **9** in the underneath side of the housing **1**. The lower end of the tube **7** is located in a central hole in the end plate **5** and is engaged and held in tension by a screwed plug **10**. A sealing ring **11** is located between plug **10** and the end plate **5**. The plug **10** is removed when the reservoir is to be drained or filled or when the device is to be dismantled for cleaning. The collar **8** and the tube **7** have a row of radially-aligned holes **13** formed thereon and which communicate with an inclined passage **14**, communicating with the inlet **2**; thus air flowing into the inlet **2** will pass to the interior of the tube **7**. The tube **7** has a second row of holes **15** adjacent the top of the reservoir and a third row of holes **16** adjacent the bottom of the reservoir. Before use, the reservoir is filled with oil to any desired level, indicated by reference **17**, between the rows of holes **15** and **16**; thus the upper part of the reservoir will communicate through holes **15** with the inlet **2** and will contain air at substantially the inlet pressure and oil will flow through the holes **16** and rise until the levels in the reservoir and the tube **7** are substantially the same. The belled end **12** of the tube **7** forms an annular seat for a lift valve member **19**, which is mounted on the top of a tubular stem, located concentrically within the tube **7**. The diameter of the lower end of the stem **20** is slightly smaller than the internal diameter of the tube **7** and thus the lower end of the stem acts to guide the stem for vertical movement within the tube **7**, in response to the rate of flow of air through the inlet **2**. The lower end of the stem **20** also contains an inlet orifice **21**, which permits a metered quantity of oil to flow up the hollow stem **20**, as will hereinafter be described. The valve member **19** is attached to the upper end of the stem **20** by a screw **23**, having a flat **24**, formed thereon along the whole length of the screw. The top face of the valve member **19** has a fine radial groove **25** formed in it and part of this is covered by the head **26** of the screw, thereby forming a small diameter outlet orifice for the oil. The radial groove **25** is directed in the downstream direction, with respect to the air flow, and, as will hereinafter be explained, a fine jet of oil will issue from the groove **25** and will mix with the airstream just downstream of the valve seat and will thereby form a mist.

The operation of the device is as follows, when air is flowing through the inlet **2**, the valve member **19** is lifted from its seat **12** and so air is allowed to flow between the inlet **2** and the outlet **3**. The amount of opening of the valve member **19** depends upon the rate of flow of compressed air. The valve member produces a pressure drop in the air, this depending upon the amount of opening of the valve member **19**. Thus the pressure in the immediate vicinity of the groove **25** is lower than the pressure of air in the upper part of the reservoir and so oil is forced up the tube **20** and emerges as a jet from the groove **25**. Due to the fineness of the jet, the oil is dispersed in the air stream as a mist. The rate of flow of oil depends upon the pressure drop produced by the opening of the valve member **19** and hence depends on the rate of flow through the housing. The loading or bias acting on the valve member in opposition to the lifting force is provided by the combined weight of the valve member **19** and the stem **20**.

The principle of operation of the device is similar to that of the devices described in the aforesaid specification; but the present device is more compact, as the valve stem **20** also constitutes the oil supply pipe and the valve member **19** contains the discharge orifice. Therefore separate components are not required as in the devices described in the aforesaid specification.

The tubular valve stem **20** may be made of very light material so that the effective density of the tube and the oil filling the tube will approximate to that of the oil. Thus as the oil level in the reservoir drops, the effective weight of the tube and the oil filling it will increase, thereby increasing the pressure drop across the valve member to enable the oil to be forced through the greater distance to the discharge orifice in the valve member.

What I claim as my invention and desire to secure by Letters Patent of the United States is:

1. A device for introducing a liquid into a stream of pressurised gas comprising a housing having an inlet and an outlet through which, in operation, a stream of pressurised gas is passed, the housing having an internal partition positioned in the flow-path between the inlet and the outlet and containing an annular substantially horizontal valve seat; the device also comprising a valve member, engageable with the seat and arranged to be lifted therefrom against a bias by the flow of gas through the housing; a guiding stem, extending coaxially from the valve member and having a longitudinal throughway therein, and a reservoir, positioned below the valve seat, said stem extending downwardly into the reservoir, the latter communicating at a position above the level of the liquid therein with the upstream side of the valve seat and said throughway communicating at the end thereof adjacent said valve member with an orifice in the valve member, said orifice comprising a radial groove in the upper surface of the valve member and communicating with the longitudinal throughway in the stem and a cover extending over said groove along at least part of its length, said radial groove being positioned to discharge liquid into the gas stream in a region of reduced pressure produced by the flow of gas past the seat, said bias being effected by the total weight of the valve member and the stem and being such as to produce a pressure drop in gas flowing through the seat, and thereby to produce a liquid and gas mixture of the desired proportion, said stem being made of very light material, whereby the effective density of the stem and the liquid contained therein approximates to that of the liquid.

2. A device for introducing a liquid into a stream of pressurised gas comprising a housing having an inlet and an outlet through which, in operation, a stream of pressurised gas is passed, the housing having an internal partition positioned in the flow-path between the inlet and the outlet and containing an annular substantially horizontal valve seat; the device also comprising a valve member, engageable with the seat and arranged to be lifted therefrom against a bias by the flow of gas through the housing; a guiding stem, extending coaxially from the valve member and having a longitudinal throughway therein, and a reservoir, positioned below the valve seat, said stem extending downwardly into the reservoir, the latter communicating at a position above the level of the liquid therein with the upstream side of the valve seat and said throughway communicating at the end thereof adjacent said valve member with an orifice in the valve member, said orifice being positioned to discharge liquid into the gas stream in a region of reduced pressure produced by the flow of gas past the seat, said bias being effected by the total weight of the valve member and the stem and being such as to produce a pressure drop in gas flowing through the seat, and thereby to produce a liquid and gas mixture of the desired proportion, said stem being movable upwardly and downwardly in a fixed guiding tube extending from the reservoir and having a belled upper end, constituting the valve seat.

3. A device as claimed in claim 2 in which the guiding tube also acts to hold together the housing and the reservoir.

4. A device for introducing a liquid into a stream of pressurised gas comprising a housing having an inlet and an outlet through which, in operation, a stream of pressurised gas is passed, the housing having an internal partition positioned in the flow-path between the inlet and the outlet and containing an annular substantially horizontal valve seat; the device also comprising a valve member, engageable with the seat and arranged to be lifted therefrom against a bias by the flow of gas through the housing; a guiding stem, extending coaxially from the valve member and having a longitudinal throughway therein, and a reservoir, positioned below the valve seat, said stem extending downwardly into the reservoir, the latter communicating at a position above the level of the liquid therein with the upstream side of the valve seat and said throughway communicating at the end thereof adjacent said valve member with an orifice in the valve member, said orifice comprising a radial groove in the upper surface of the valve member and communicating with the longitudinal throughway in the stem and a cover extending over said groove along at least part of its length, said radial groove being positioned to discharge liquid into the gas stream in a region of reduced pressure produced by the flow of gas past the seat and said bias being effected by the total weight of the valve member and the stem and being such as to produce a pressure drop in gas flowing through the seat and thereby to produce a liquid and gas mixture of the desired proportion.

5. A device as claimed in claim 4 in which the stem is made separately from the valve member and is secured thereto by a screw of which the head constitutes the said cover extending over said groove along at least part of its length.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,119,404 January 28, 1964

Ronald Thomas Lawrence

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the grant, lines 1 to 3, for "Ronald Thomas Lawrence, of Crondall, England," read -- Ronald Thomas Lawrence, of Crondall, England, assignor to Nuquip Limited, of Parkshot, Richmond, Surrey, England, --; line 12, for "Ronald Thomas Lawrence, his heirs" read -- Nuquip Limited, its successors --; in the heading to the printed specification, lines 4 and 5, for "Ronald Thomas Lawrence, Chilloway, Pankridge St., Crondall, England" read -- Ronald Thomas Lawrence, Crondall, England, assignor to Nuquip Limited, Parkshot, Richmond, Surrey, England --.

Signed and sealed this 16th day of June 1964.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents