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VACUUM COMPENSATOR VALVE FOR MILKING MACHINES

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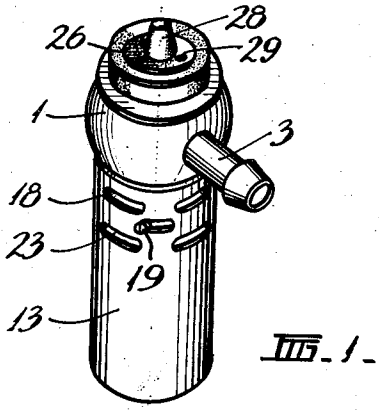

FIG. 1.

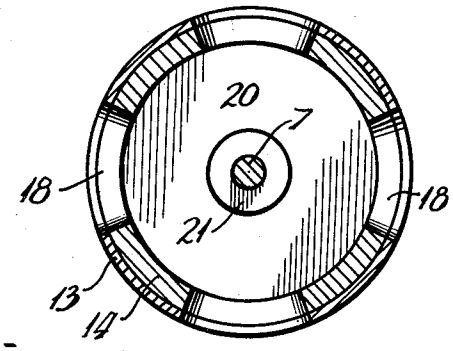

FIG. 4.

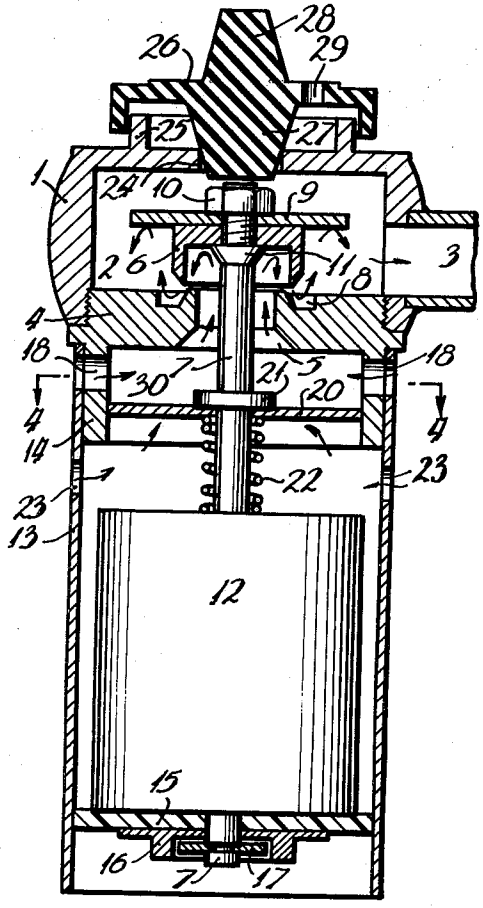

FIG. 2.

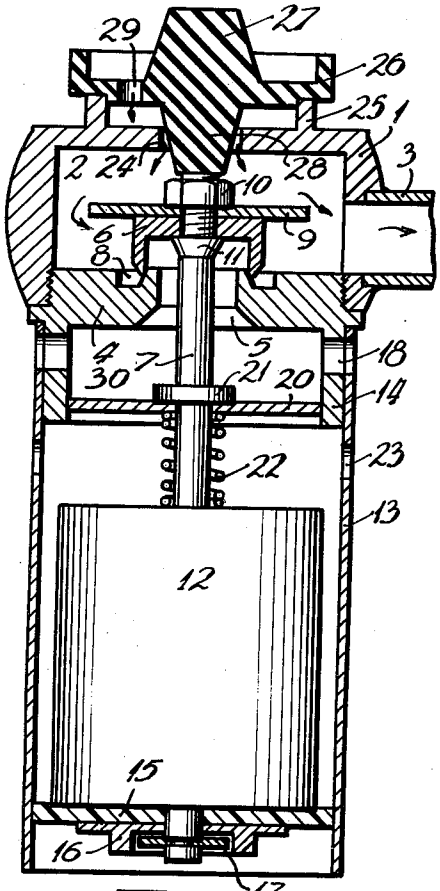

FIG. 3.

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VACUUM COMPENSATOR VALVE FOR MILKING MACHINES

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This invention relates to an improved vacuum compensator valve for use with milking machines for relieving or smoothing out fluctuations of vacuum in the system.

Relief or compensator valves of this kind function to automatically admit atmospheric air to the system when the degree of vacuum increases above that at which the machine is designed to operate. Existing constructions, however, are slow acting and generally not very efficient. The lifting of a weight or spring loaded valve solely by the action of the increased vacuum is not in itself sufficient for effective compensation.

The present invention has for its object to provide a valve of the type mentioned which will be found very efficient in use and functions to give instant compensation, even when large fluctuations occur in the vacuum of the system.

According to the invention, there is provided a vacuum compensator relief valve in which a weight or spring loaded valve is lifted by primary, secondary and tertiary means, the primary and secondary means being under set adjustment and providing for small fluctuations of the vacuum and the tertiary means being such as will come into use automatically when relatively large fluctuations beyond the effective capacity of the primary and secondary means occur in the vacuum, thus giving additional valve lift for instant compensation under such conditions.

The invention also provides a valve as above having incorporated means by which the user can readily ascertain whether the machine or system has the desired reserve of vacuum under which it is designed to operate. Testing of this reserve is not conveniently possible with existing apparatus yet it is highly desirable in milking machine operation.

The invention is more fully described aided by reference to the accompanying drawings wherein:

FIG. 1 is a perspective view of the improved compensator valve.

FIG. 2 is a vertical section showing the valve in open position.

FIG. 3 is a similar view to FIG. 2 but with the valve closed and showing the vacuum testing means in use.

FIG. 4 is a horizontal section of the valve taken through the ports 18.

As is shown in these views, the valve comprises a hollow head casing 1 provided on the underside with an internal chamber 2 which is connected via tube 3 with the vacuum system of the milking installation. Fitted into said chamber 2 is a base member 4 having a central air passage 5 normally closed by a cap valve 6 carried by a vertical stem 7 which extends downwardly centrally through said air passage. The cap valve 6 engages an annular seating 8 which is recessed and shaped to direct entering air upwardly against a reaction disc 9 arranged above the cap valve and also carried by the stem 7. Said reaction disc and also the cap valve 6 may be secured by a nut 10 applied to the upper screwthreaded end of the stem 7, the cap valve engaging against an abutment 11 formed on the stem.

The stem 7 at its lower end supports a weight 12 enclosed within a cylindrical skirt 13 carried by an annular flange 14 depending from the base member 4 of the head

casing. The weight 12 is supported by a plastic or like disc 15 sliding within the skirt 13 and suitably secured to the stem as by means of a recessed washer 16 and circlip 17.

The annular flange 14 and the skirt 13 have co-registering slots providing air admission ports 18 to the central air passage 5, and the skirt 13 is made rotatable on the annular flange so that the area of the air admission ports 18 cn be adjusted as desired according to requirements. The adjustment is set by screw and slot means 19.

Beneath the air admission ports 18 is a disc 20 which slides on the internal surface of the annular flange 14 and is pressed against a shoulder or abutment 21 on the stem 7 by means of a coiled spring 22 encircling the stem above the weight 12. Beneath said disc 20 are further air ports 23 in the skirt 13, said ports being constantly open to the full extent and not affected by the rotatable adjustment setting of said skirt for the other air ports 18. Said open ports 23 and the disc 20 constitute the tertiary valve assisting means.

In the top of the head casing 1 above the cap valve 6 there is provided a port 24 surrounded by an upstanding annular flange 25. Seated on said annular flange is a disc member 26 preferably of rubber having two studs 27 and 28 projecting to opposite sides. One stud 27 is of such size that it will seal the port 24 and it terminates well above the cap valve 6 so as not to interfere with the operation of the latter. The other stud 28 is narrower so that it does not seal the port and it is also made longer so that it contacts the upper end of the cap valve and prevents the latter from opening.

The disc member has one or more air admission ports 29 of predetermined size according to the particular vacuum reserve on which the machine is designed to operate.

In normal use, the disc member 26 is so fitted that the shorter stud 27 seals the air port 24, see FIG. 2. Atmospheric air pressure is applied on the underside of the cap valve 6 through the pre-set adjusted air admission ports 18, the chamber 30 above the disc 20 and the central air passage 5. On fluctuations in the vacuum, the cap valve 6 is raised from its annular seating 8 against the influence of the weight 12 by the air pressure and air rushes into the internal chamber 2 in the head casing 1. This action of the air on the underside of the cap valve 6 constitutes the primary valve lifting means. The inrushing air is deflected by the recessed and shaped formation of the valve seating 8 upwardly against the reaction disc 9 to impart secondary lift to the valve stem and cap valve.

The primary and secondary lift means provide for small fluctuations of the vacuum but it will be obvious that such means are dependent on the pre-set adjustment of the air admission ports 18. If a relatively large increase should occur in the vacuum with which the above valve lift means cannot effectively cope, a partial vacuum is created above the lower disc 20. This causes atmospheric air entering through the lower air ports 23 to force the disc 20 upwardly, thus giving a tertiary lift to the cap valve 6. Such lift is very rapid and such that a sufficient volume of air is admitted to smooth out fluctuation.

It will be obvious that by judicious adjustment or presetting of the air admission ports 18 to suit the particular system or installation, the normal small fluctuations of the vacuum can be efficiently smoothed out while relatively large or abnormal fluctuations are taken care of by the tertiary lifting means which come into use instantaneously when the primary and secondary valve lifting means become insufficient to cope with the fluctuation.

When the user desires to ascertain whether the system or installation has the desired vacuum reserve, the disc member 26 at the top of the head casing is reversed so that the longer but narrower stud 28 fits in the port 24, see FIG. 3. The cap valve 6 is thus held closed but the port 24 is not sealed, consequently air passes into the system through the admission port 29 in the disc member 26 and around the narrower stud 28.

As the admission port 29 is of pre-determined size according to the particular vacuum reserve on which the machine or installation is designed to operate, the degree of vacuum as shown by the customary gauge should not substantially vary if the vacuum reserve is correct for the admitted air should approximately balance out the vacuum reserve. If, however, the degree of vacuum shown on the gauge falls, then the system or machine has not the requisite reserve due to a faulty vacuum pump, leakages or other causes.

The complete valve will be found very effective in use and a considerable improvement over prior types both in regard to utility and efficiency of operation. The particular construction with the weight beneath the cap valve 6 and the damping effect of the plastic disc 15 sliding in the skirt 13 also give increased general efficiency.

It will, of course, be understood that instead of the weight 12, the cap valve 6 may be spring loaded by means of a coiled or like spring acting on the lower end of the vertical spindle 7.

What I claim is:

1. A vacuum compensator valve for milking machines comprising a head casing having a chamber with an outlet for connection to a vacuum system, an air admission passage in the base of said head casing, a preloaded valve in said chamber urged to normally close said passage, a vertical stem supporting said valve, a reaction member on the upper end of the stem acted on by the inrushing air when the valve is opened and constituting secondary valve lifting means, a depending annular flange on said casing supporting an outer skirt, both the flange and the skirt having coregistering slots for air admission to the interior of said flange, and a disc connected to said valve and slidably engaging the inner surface of said annular flange, said disc and flange defining a second chamber below said first chamber and whose interior is vented by said slots, said disc being beneath said slots and having its underside exposed to atmospheric pressure, whereby said disc is influenced by the drop in air pressure in said second chamber when the valve is opened and is lifted by atmospheric pressure to constitute tertiary valve lifting means.

2. A valve as claimed in claim 1 wherein a weight is carried by the lower end of the vertical stem, a shoulder on said stem above said weight, said disc bearing against said shoulder and urged thereagainst by a coil spring fitted between the shoulder and said weight.

3. A vacuum compensating relief valve for milking machines comprising a head casing having a chamber with an outlet for connection to a vacuum system, a wall of said chamber having an air admission passage surrounded by a seat, a preloaded valve urged against said seat to normally close said air admission passage, a stem supporting said valve in said chamber, a reaction member on the upper end of the stem acted on by the inrushing air when the valve is opened to constitute a secondary valve lifting means, a member arranged to be influenced by the drop in air pressure beneath the valve when the valve is opened and to be acted on by atmospheric air pressure to constitute a tertiary valve lifting means, said

head casing being provided with a port on the vacuum side of the valve, and testing means serving in one position to close said port while being disposed out of the path of valve movement during the normal operation of the valve, and in a second position to provide a predetermined flow of atmospheric air through said port while maintaining said valve closed.

4. A valve as claimed in claim 3 wherein said testing means comprises a member to seat over said port and having two studs projecting from opposite sides, one stud being of such size as to seal said port in said one position and the other stud being of such size as to provide flow clearance with respect to said port and being dimensioned to maintain said valve closed in said second position.

5. A vacuum compensating relief valve for milking machines comprising a head casing having a chamber with an outlet for connection to a vacuum system, a wall of said chamber having an air admission passage surrounded by a seat, a preloaded valve urged against said seat to normally close said air admission passage, a stem supporting said valve in said chamber, said head casing being provided with a port on the vacuum side of the valve member, and testing means serving in one position to close said port while being disposed out of the path of valve movement during the normal operation of the valve, and in a second position to provide a predetermined flow of atmospheric air through said port while maintaining said valve closed.

6. A vacuum compensator valve for milking machines comprising a head casing having a chamber with an outlet for connection to a vacuum system, one wall of said chamber having an air admission passage, a preloaded valve in said chamber urged to normally close said passage, a stem supporting said valve in said chamber, a tubular extension on said one wall surrounding said passage and extending away from said chamber, a surrounding skirt supported on said extension, both the extension and the skirt having coregistering slots for air admission to the interior of said extension, and a piston slidably engaging the inner surface of said extension and connected to said valve, said piston and extension defining a second chamber whose interior is vented by said slots, said piston having its outer side exposed to atmosphere and said skirt being rotatable on said extension for adjustment of the registration of said slots whereby the admission of air to said second chamber may be regulated.

7. A valve according to claim 6 wherein said skirt extends beyond said tubular extension and said stem passes axially through said air admission passage, piston, extension and skirt, an additional air port in said skirt at a point beyond said piston for admitting air to the outer side of the piston, and a disc slidable in said skirt, connected to said stem and movably closing the outer end of said skirt.

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