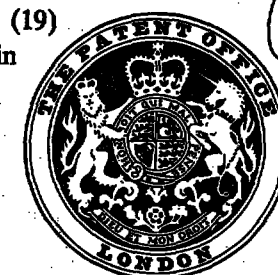


PATENT SPECIFICATION

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(54) DAMPER ARRANGEMENT

(71) We, AMERICAN AIR FILTER COMPANY INC., a corporation organized and existing under the laws of the State of Delaware, United States of America, of 215 Central Avenue, Louisville, Kentucky 40201, United States of America, 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 fluid damper assembly and in particular relates to a damper blade and means to control the fluid flow through an orifice to provide a selectively buffered transition in a fluid flow system when starting or stopping fluid flow.

It is desirable to provide for a buffered transition when removing a fluid system from or returning a fluid system to full fluid flow. For example, in the filtering of a gas stream using cloth fabric bags, it is desirable to avoid a sudden surge of fluid when a fluid controlling damper arrangement is activated since sudden surges of fluid may cause the fabric filter bag to snap and consequently weaken the fabric material and cause other undesirable results. This weakening of the fabric is particularly noticeable when the fabric material contains glass fibres or components therein. The prior art damper arrangements, such as bullseye dampers and butterfly dampers, can only be made to function satisfactorily in controlling sudden surges of fluid by using an expensive time actuating means which causes them to operate very slowly. Even then, butterfly dampers are particularly difficult to use because the fluid flow rate does not change linearly with respect to the change of position of the damper blade, but rather most of the fluid control occurs when the damper blade is merely parallel to the direction of fluid flow. Less objectionable is the bullseye damper since its flow rate changes linearly over the

entire damper blade stroke.

It is desirable to provide a damper arrangement which is straightforward, inexpensive, readily constructed, and which provides a buffered transition for removing a fluid system from, or returning a fluid system to full fluid flow.

Accordingly, the invention provides a fluid damper assembly comprising a plate forming a wall of a fluid system and having a main flow orifice therein, a blade comprising a first closure means cooperating with said orifice to control the fluid flow therethrough and venting means for venting said fluid system upon initially opening or finally closing said damper wherein said venting means comprises a cylindrical housing on said blade surrounding an aperture therethrough said housing having a plurality of parts in its cylindrical side wall, and a piston slidably fitting within the housing which is displaceable between a first position in which it seals an aperture communicating with the fluid system and a second position permitting ports in the side walls of the piston to uncover the ports in the housing side wall and permit venting therethrough of the fluid system.

Hereinafter the invention is further described by way of example and with reference to the accompanying drawings, wherein:-

Figure 1 is an exploded view, in perspective, with selected portions cut-away of one preferred embodiment of the damper assembly of the present invention;

Figure 2 is an elevational view, partially in cross section, of the damper assembly of Figure 1 with the damper being in a closed position; and

Figure 3 is an elevational view, partially in cross-section of the damper assembly of Figure 1 with the damper being in an open position.

The Figures of the drawing illustrate the

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structure of a damper assembly 2 operable in response to the operation of an actuating means for moving an orifice closing blade or damper blade 6, the actuating means being exemplified as a piston 20 connected to shaft 3 which extends through wall 7 and is attached to a fluid cylinder 4, the fluid being either hydraulic or pneumatic, the fluid pressures for operation of the fluid cylinder 4 being supplied from any known source. However, it is realized that the means for moving the piston 20 may be other means, such as a motorized drive with appropriate gearing. The fluid cylinder 4 is supported by frame 9 and is operable in response to a control means 5, control means 5 being generally a simple switch arrangement supplying power to actuate fluid cylinder 4 or other drive means for driving piston 20.

The damper assembly of the present invention includes the damper blade 6 which when actuated to a closed position forms a substantially fluid tight seal with an orifice 8 disposed within plate 10. The damper blade 6 is movably positioned between an open position, as shown in Figure 3 and a closed position, as shown in Figure 2 in relation to the orifice 8. The damper blade 6 is provided with an opening 12 substantially in the centre thereof with vent means in communication therewith, the vent means including a housing 14 circumferentially surrounding the opening 12, the housing 14 being mounted onto the blade 6 by bolts means 11. The housing 14 including walls 17 is provided with flow-through apertures 16 in the walls 17 thereof and engaging means, exemplified as an inwardly extending flange portion 18, the flange 18 being spaced a preselected distance from the blade 6.

The housing 14 receives the piston 20 therein and the flange portion 18 is adapted for engagement with the piston 20 when the piston 20 is in movement away from the opening 12. Further retracting movement of the piston 20 causes abutment against engaging means 18 to lift the housing 14 and in turn the blade 6 away from the orifice 8 thereby providing a flow through opening in the plate 10.

The piston 20 may be a soft resilient material and is provided with a downwardly depending cylindrical wall portion 21, the wall portion 21 defining a recess in the piston 20.

Disposed within the housing 14 is a guide member or collar 22 circumferentially surrounding the opening 12, collar 22 being attached to the blade 6. The collar 22 has an outer diameter substantially the same as the inner diameter of the wall portion 21 of piston 20 and receives and guides the piston 20 in a fluid tight relation when the piston is in a closed or first position. Disposed within the collar 22 is a resilient spring means 24,

the spring means 24 being disposed to rest on an inwardly extending ledge 26 of plate 6 surrounding orifice 12 adjacent collar 22. The spring means 24 under compression from piston 20 forces damper blade 6 into closed position.

The piston 20 is movably mounted to slide along the inner face of wall 17 of the housing 14 and is further provided with radially extending apertures 28 in the walls 21 thereof, the apertures 28 being in fluid communication with the recess and in alignment with apertures 16 in housing 14 when the piston 20 moves a preselected distance from its first position to its second position whereby fluid flows from the opening 12 in the blade 6 through the apertures 28 and out through apertures 16.

In the operation of the damper assembly described previously, when the damper blade 6 is in a closed position, piston 20 rests upon the shoulders of the collar 22 compressing spring means 24 against the damper blade 6 thereby providing a fluid tight seal or closing of the orifice 8. Upon actuation of the fluid cylinder 4 by means of the control means 5, piston 20 retracts and engages with the flange portion 18 of the housing 14. Just prior to engagement with the flange portion 18, apertures 28 are in alignment with apertures 16 thereby allowing for the flow of gases through the orifice 8 and subsequently out through apertures 28 and 16. Upon engagement with flange portion 18 and further retraction of the piston 20, the damper blade 6 is lifted away from the closed position with the plate 10 since the housing 14 including flange 18 is attached to the damper blade 6. Flow of the gases through the orifice 8 and out through the apertures 28 and 16 provides a buffer for a smooth transition from no flow to full flow through orifice 8.

It is realized that cleaning means (not shown) may also be provided for cleaning apertures 16 and 28 as well as the spring means 24 when dust build up occurs.

WHAT WE CLAIM IS:-

1. A fluid damper assembly comprising a plate forming a wall of a fluid system and having a main flow orifice therein, a blade comprising a first closure means cooperating with said orifice to control the fluid flow therethrough and venting means for venting said fluid system upon initially opening or finally closing said damper wherein said venting means comprises a cylindrical housing on said blade surrounding an aperture therethrough, said housing having a plurality of ports in its cylindrical side wall, and a piston slidably fitting within the housing which is displaceable between a first position in which it seals an aperture communicating with the fluid system and a second position permitting ports in the side walls of the pis-

structure of a damper assembly 2 operable in response to the operation of an actuating means for moving an orifice closing blade or damper blade 6, the actuating means being exemplified as a piston 20 connected to shaft 3 which extends through wall 7 and is attached to a fluid cylinder 4, the fluid being either hydraulic or pneumatic, the fluid pressures for operation of the fluid cylinder 4 being supplied from any known source. However, it is realized that the means for moving the piston 20 may be other means, such as a motorized drive with appropriate gearing. The fluid cylinder 4 is supported by frame 9 and is operable in response to a control means 5, control means 5 being generally a simple switch arrangement supplying power to actuate fluid cylinder 4 or other drive means for driving piston 20.

The damper assembly of the present invention includes the damper blade 6 which when actuated to a closed position forms a substantially fluid tight seal with an orifice 8 disposed within plate 10. The damper blade 6 is movably positioned between an open position, as shown in Figure 3 and a closed position, as shown in Figure 2 in relation to the orifice 8. The damper blade 6 is provided with an opening 12 substantially in the centre thereof with vent means in communication therewith, the vent means including a housing 14 circumferentially surrounding the opening 12, the housing 14 being mounted onto the blade 6 by bolts means 11. The housing 14 including walls 17 is provided with flow-through apertures 16 in the walls 17 thereof and engaging means, exemplified as an inwardly extending flange portion 18, the flange 18 being spaced a preselected distance from the blade 6.

The housing 14 receives the piston 20 therein and the flange portion 18 is adapted for engagement with the piston 20 when the piston 20 is in movement away from the opening 12. Further retracting movement of the piston 20 causes abutment against engaging means 18 to lift the housing 14 and in turn the blade 6 away from the orifice 8 thereby providing a flow through opening in the plate 10.

The piston 20 may be a soft resilient material and is provided with a downwardly depending cylindrical wall portion 21, the wall portion 21 defining a recess in the piston 20.

Disposed within the housing 14 is a guide member or collar 22 circumferentially surrounding the opening 12, collar 22 being attached to the blade 6. The collar 22 has an outer diameter substantially the same as the inner diameter of the wall portion 21 of piston 20 and receives and guides the piston 20 in a fluid tight relation when the piston is in a closed or first position. Disposed within the collar 22 is a resilient spring means 24,

the spring means 24 being disposed to rest on an inwardly extending ledge 26 of plate 6 surrounding orifice 12 adjacent collar 22. The spring means 24 under compression from piston 20 forces damper blade 6 into closed position.

The piston 20 is movably mounted to slide along the inner face of wall 17 of the housing 14 and is further provided with radially extending apertures 28 in the walls 21 thereof, the apertures 28 being in fluid communication with the recess and in alignment with apertures 16 in housing 14 when the piston 20 moves a preselected distance from its first position to its second position whereby fluid flows from the opening 12 in the blade 6 through the apertures 28 and out through apertures 16.

In the operation of the damper assembly described previously, when the damper blade 6 is in a closed position, piston 20 rests upon the shoulders of the collar 22 compressing spring means 24 against the damper blade 6 thereby providing a fluid tight seal or closing of the orifice 8. Upon actuation of the fluid cylinder 4 by means of the control means 5, piston 20 retracts and engages with the flange portion 18 of the housing 14. Just prior to engagement with the flange portion 18, apertures 28 are in alignment with apertures 16 thereby allowing for the flow of gases through the orifice 8 and subsequently out through apertures 28 and 16. Upon engagement with flange portion 18 and further retraction of the piston 20, the damper blade 6 is lifted away from the closed position with the plate 10 since the housing 14 including flange 18 is attached to the damper blade 6. Flow of the gases through the orifice 8 and out through the apertures 28 and 16 provides a buffer for a smooth transition from no flow to full flow through orifice 8.

It is realized that cleaning means (not shown) may also be provided for cleaning apertures 16 and 28 as well as the spring means 24 when dust build up occurs.

WHAT WE CLAIM IS:-

1. A fluid damper assembly comprising a plate forming a wall of a fluid system and having a main flow orifice therein, a blade comprising a first closure means cooperating with said orifice to control the fluid flow therethrough and venting means for venting said fluid system upon initially opening or finally closing said damper wherein said venting means comprises a cylindrical housing on said blade surrounding an aperture there-through, said housing having a plurality of ports in its cylindrical side wall, and a piston slidably fitting within the housing which is displaceable between a first position in which it seals an aperture communicating with the fluid system and a second position permitting ports in the side walls of the pis-





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ton to uncover the ports in the housing side wall and permit venting therethrough of the fluid system.

2. A fluid damper assembly according to claim 1 wherein the piston is attached to damper actuating means by means of a rod passing through an apertured end wall of the said housing and in its second position the piston abuts the said housing end wall.

3. A fluid damper assembly according to claim 1 or claim 2, wherein said blade has an upwardly extending cylindrical guide member surrounding said aperture therein, on which said piston is a sliding fit.

4. A fluid damper assembly according to

claim 3, wherein said cylindrical guide member has an inwardly extending ledge surrounding said aperture, said ledge receiving resilient means thereon, said resilient means cooperating with said piston to provide a fluid tight seal for seal aperture in the blade.

5. A fluid damper assembly substantially as described herein with reference to the accompanying drawing.

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