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(54) IMPROVEMENTS IN FLAP VALVES

(71) We, GEBRUDER TROX GESELLSCHAFT MIT BESCHRANKTER HAFTUNG, a German Company of Heinrich-Trox-Platz 3, D-4133 Neukirchen-Vluyn, Federal Republic of Germany, 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:—

The invention relates to a valve device for controlling volumetric flow through a duct e.g. air flow in air-conditioning installations.

If a valve flap is pivotably disposed in an air duct with its rotary axis passing through the centre of the flap, the flap is subject to a consequent torque which moves the flap into the closed position. This torque acting in the closing direction is produced by the asymmetric position of the stagnation point on the outflow side of the flap and the asymmetric turbulence region on the discharge side of the flap.

In order to assist control of the flap position externally and thereby achieve the simplest construction it is, however, desirable for the flap to have a natural tendency to assume the open position.

In published German specification (Offenlegungsschrift) No. 24 17 745, a rotatably journaled plate is proposed whose pivotal axis is spaced from the central axis of the plate. Thus, the pressure of the air flow through the duct acts in such a manner upon the plate that it pivots in an opening direction. However, particularly with circular or oval duct cross-sections, it has proved impossible to pivot the flap out of the closed position about an eccentric axis of rotation in an opening direction. For this reason, a further possibility of achieving this opening movement of the flap is already indicated in the above-mentioned publication. There it is proposed to connect the plate by a linkage to a control element in such a manner that the weight of the linkage moves the plate into its open position. With such a construction, however, it has proved disadvantageous that

the opening moment is always independent of the volume of air.

The aim of the invention is therefore to provide a valve device for controlling a volume flow through a duct wherein a flap is disposed in the duct and pivots in an opening direction when acted upon by air, said flap being able to have in particular a circular or oval cross-section.

In accordance with the present invention there is provided a valve device for controlling volumetric flow through a duct comprising a flap pivotably disposed in a duct section the flap having a pivotal axis disposed substantially centrally of the duct section with one segment of the flap at one side of the pivotal axis shorter than the other segment at the other side of the pivotal axis so that the fluid to be controlled acts on the flap to bias it in an opening direction, the shorter flap segment in its closed position co-operating with a shelf which projects into the duct section to close the duct.

By suitably selecting and positioning the segments or wings of the flap in the through flow duct section, a torque is applied to the flap to cause the flap to open.

It is important particularly for ducts of circular cross-section that the flap is journaled substantially centrally in the duct section, since in this case rotation about an eccentrically journaled axis of rotation is not possible.

It is also proposed to dispose the flap in such a manner in the duct section that in a closed position it is at an acute angle to the longitudinal axis of the duct in particular this acute angle is preferably 40°.

The invention is further described, by way of example, with reference to the accompanying drawings, in which:—

Fig. 1 is a longitudinal section through a duct having a circular cross-section and having a flap disposed therein; and

Fig. 2 is a side view of the duct, seen in an approach flow direction.

Fig. 1 shows a section of the duct 1. The duct contains a pivotably journaled flap 2a, 2b whose rotary axle 3 extends

1. As illustrated, the flap 2a,2b has assumed the closed position. The flap segment 2b is shown with its lower edge lying against a shelf or, crosspiece 4 and the remaining flap edge adjoins the interior wall of the duct 1. The flap 2a,2b when closed as shown, is at an acute angle to the longitudinal axis of the duct 1, this angle being about 40° in the illustrated embodiment. The oncoming flow comes from the direction designated 5. Since the lower segment 2b of the flap is shorter than the upper segment 2a, because of the differing surfaces of pressure application a torque acts upon the axle 3 and pivotally biases the flap in its opening direction.

Fig. 2 shows the duct 1 of circular cross-section as seen in the oncoming flow direction 5. Extending through the centre of the duct 1 is the axle 3 to which the flap 2a,2b is rigidly connected. In a closed position, it lies with its lower edge against the segmental cross-piece 4. The flap axle 3 is led outwards through the duct so that it is possible to attach control devices externally of the duct.

WHAT WE CLAIM IS:—

1. A valve device for controlling volumetric flow through a duct, comprising a flap pivotally disposed in a duct section the flap having a pivotal axis disposed substantially centrally of the duct section

with one segment of the flap at one side of the pivotal axis shorter than the other segment at the other side of the pivotal axis so that the fluid to be controlled acts on the flap to bias it in an opening direction, the shorter flap segment in its closed position co-operating with a shelf which projects into the duct section to close the duct.

2. A device as claimed in claim 1, in which the flap in a closed position extends at an acute angle to the longitudinal axis of the duct section.

3. A device as claimed in claim 2, in which the flap in a closed position lies at an angle of approximately 40° to the duct axis.

4. A device as claimed in any preceding claim in which the duct section is circular in cross section.

5. A device as claimed in any preceding claim which is installed in an air conditioning or ventilating system.

6. A valve device for controlling volumetric flow constructed and adapted to operate substantially as herein described with reference to and as illustrated in the accompanying drawings.

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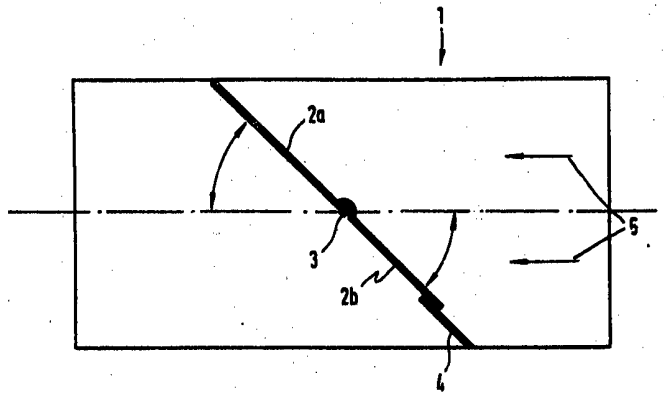


Fig.1

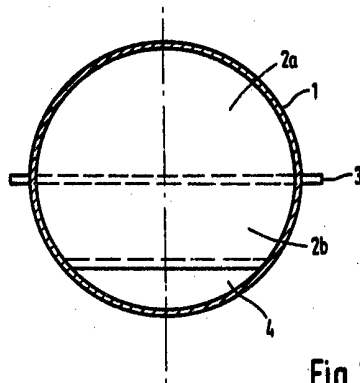


Fig.2