Aug. 22, 1961 C. ALLANDER ET AL 2,997,061

VOLUME GOVERNOR FOR A FLOWING GASEOUS MEDIUM

Filed April 25, 1958 2 Sheets-Sheet 1

FIG. 1.

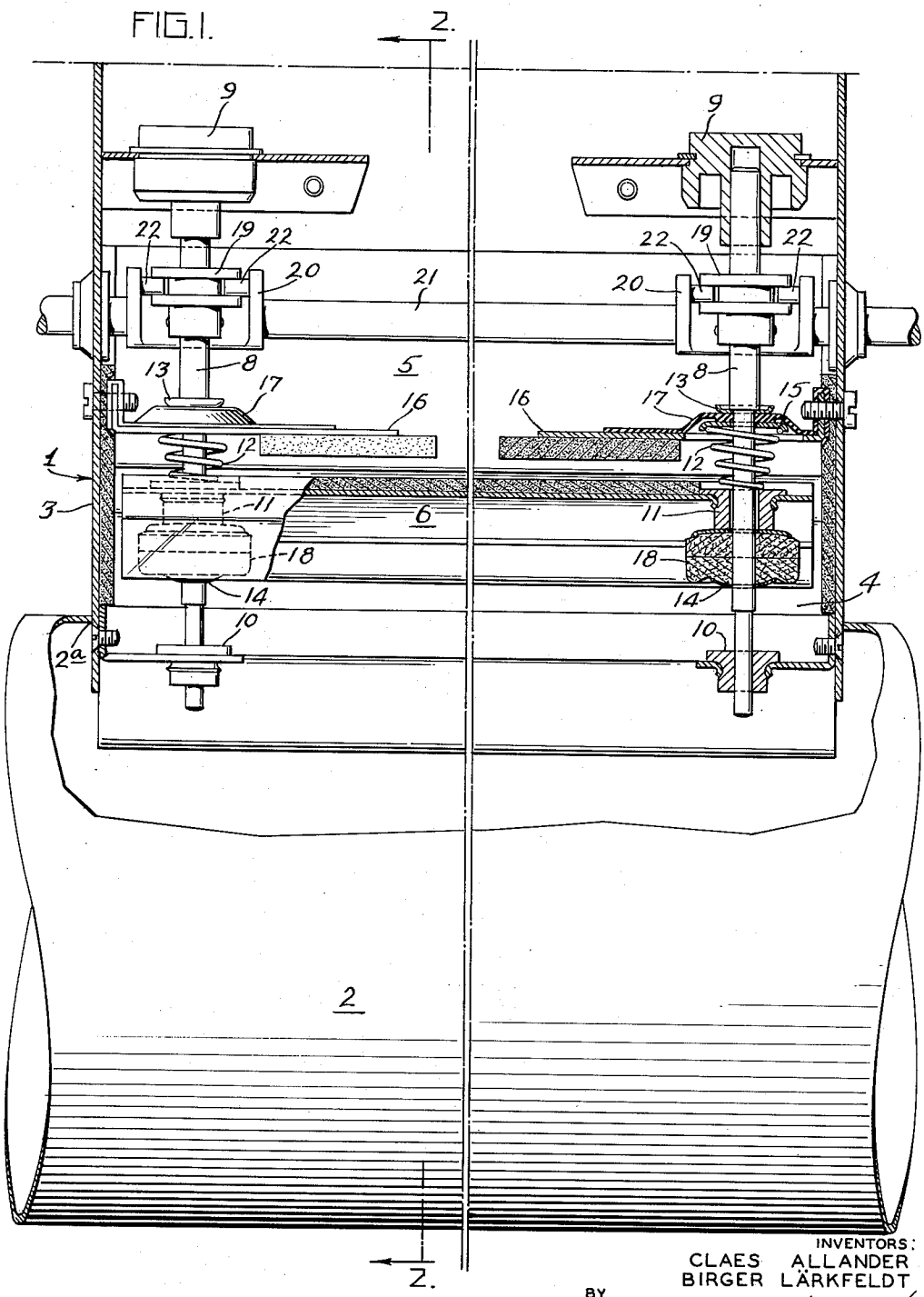

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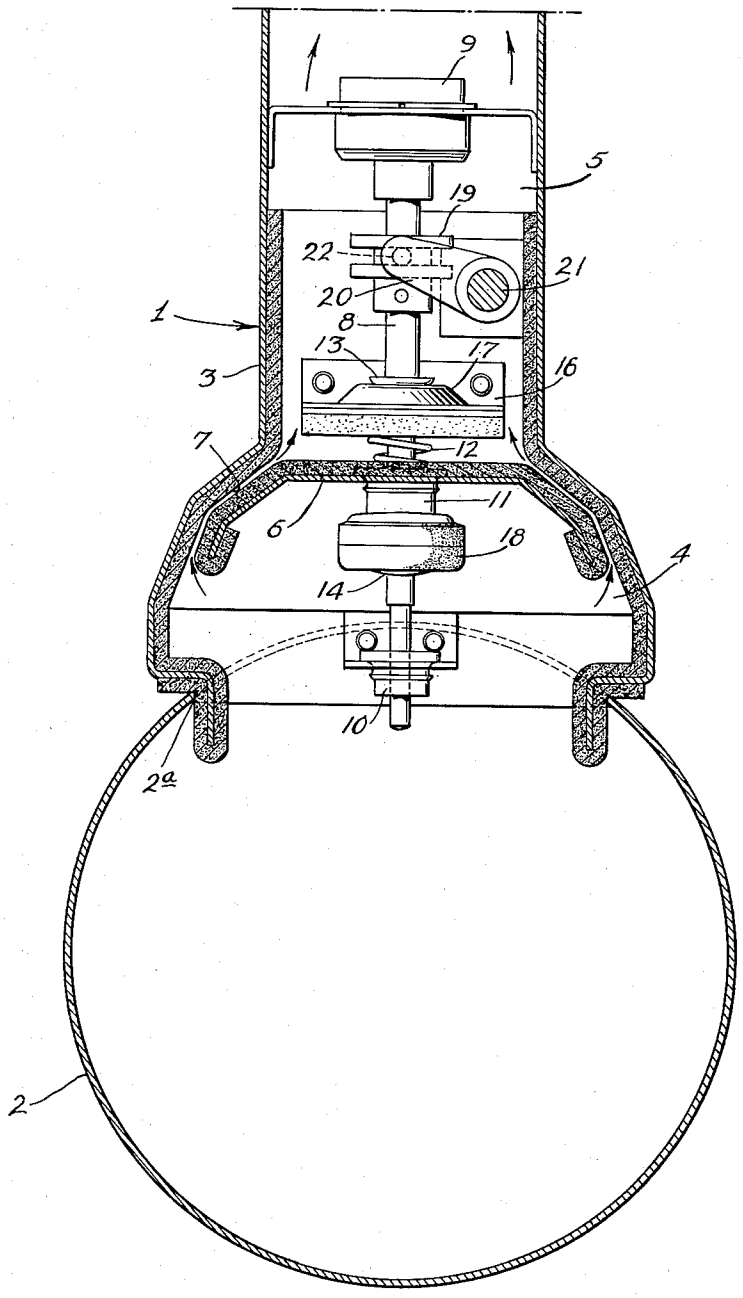
FIG. 2.



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VOLUME GOVERNOR FOR A FLOWING GASEOUS MEDIUM

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The present invention relates to a volume governor for a flowing gaseous medium, preferably to be used in ventilating plants, said governor being constructed as a flow passage for the medium and having one of its two opposite walls movable and arranged to be actuated by the static pressure of the medium at the inlet of the governor.

It is the practice in ventilating plants to use an automatically functioning volume governor in order to secure uniform air supply to different spaces in the ventilating system. Because of the use of high velocity systems with their relatively high working pressure and simultaneously increased requirements for noise-elimination, the problems regarding the noise occurring in regulators and air injecting means have been accentuated. The main object of the present invention is to produce a regulator satisfying high requirements for noise-elimination and simultaneously having good governing properties. The governor according to the invention may also be used as a shutting-off valve.

In earlier embodiments of governors the pressure reducing effect of the governor has without any exceptions been based on the principle of varying the throttling of a channel which is very short with respect to its flow area. In a regulator, functioning in accordance with said principle, the available pressure energy will be converted into an increased energy in the air in form of whirls, i.e. (hydrodynamically expressed) the pressure energy is bound to the air in form of turbulent whirl energy. Because such an energy conversion always causes a considerable quality of free sound energy, such regulators must always be used in combination with a separate sound deadening means in ventilating plants for human habitations. As known, the conversion of pressure energy into heat takes place without the occurrence of whirls. This is the case in laminar currents, where the dependence of the viscosity will guarantee the energy absorption.

The deciding factor for the degree of the occurrence of whirls in a flow passage for a medium is the actual Reynold's number for the flow. This number is defined as the product of the flow velocity of the medium and the hydraulic diameter of said flow passage divided by the kinetic viscosity of the flowing medium. The hydraulic diameter of a duct is determined by dividing its perimeter into its cross-sectional area and multiplying by four. In a long channel a shifting from laminar to turbulent flow occurs at a value of the Reynold's number of about 2000.

As the length of the flow passage decreases said value will decrease depending upon disturbances in the inlet of said passage. When the flow is laminar hardly any noise will occur and thus the most silent pressure reduction can be obtained in this kind of flow. The rule may thus be so formulated that for a constant pressure reduction, the noise will increase with increasing Reynold's number and thus a method to satisfy the demand of noise elimination is to work with small Reynold's numbers. In order to obtain the necessary throttling or pressure reduction there is a need for a length of the passage increasing with decreasing Reynold's number and thus the length of said flow passage in accordance with

the invention should considerably increase the hydraulic diameter of same.

The present invention is based on this very fact and the governor according to the invention is thus constructed with a small hydraulic diameter and further made with such a large length of the flow passage so that there is time enough for a laminar flow to arise. In this way a flow substantially free from whirls will be obtained and as the necessary absorption of the pressure energy takes place without any substantial occurrence of whirls, the arising noise in the ventilating system will be of no intensity to speak about. As the hydraulic diameter is of decided importance and said diameter is to be made small, the flow passage of the governor at the usual air quantities must be given a rather elongated cross section area. It has proved effective to dimension the volume governor to correspond to the width of the ventilating apparatus, in which the governor is to be used.

The volume governor according to the invention is mainly characterized in that the flow passage is formed in such a manner that in any position of the movable wall, the length of the flow passage as reckoned in the flow direction of the medium is considerably larger than its hydraulic diameter, and its flow area is so dimensioned that the medium flows through the channel without the occurrence of any whirls. The volume governor is preferably so constructed that the length of the flow passage exceeds five times the hydraulic diameter. The flow passage should further suitably be given such a hydraulic diameter that the Reynold's number does not exceed 2000 at the maximum flow velocity of the gaseous medium. For the purpose of eliminating as much as possible the occurrence of disturbing noise, the walls of the flow passage are covered with a sound deadening material. In order to eliminate the need for a separate valve for the gaseous medium the movable wall may be arranged to entirely shut off the flow passage area for the gaseous medium by a manual adjustment.

The invention will now be described more in detail with reference to the accompanying drawings, wherein:

FIG. 1 shows a longitudinal cross section through an exemplifying embodiment of a volume governor according to the invention.

FIG. 2 shows a cross section through a volume governor along the line 2—2 in FIG. 1.

In the embodiment illustrated in the drawing a volume governor 1 is connected to a duct 2 for a gaseous medium, in which duct an opening 2*a* is arranged for the application of the invented volume governor. The casing 3 of the governor 1 encloses a space 4 directly communicating with said duct, said space terminating into an outlet chamber 5 of smaller width. The walls of the casing are covered with a sound-deadening material 3*a*, and adjacent said chamber 5 are formed to function as a seat for a valve means 6 movably arranged in said casing. The flow passage formed between said valve means and the walls of the casing is designated 7. The valve means 6 is shaped as an elongated plate having an inverted generally U-shaped cross-section, and has a covering 6*a* of sound-deadening material. The valve element 6 is guided at both ends by an axially movable rod 8, mounted in two bushings 9 and 10. A bushing 11 is fastened to said valve means and slidably engages said rod 8. The valve means 6 is actuated by the static pressure prevailing in the space 4 to move against said seat, and is counteracted by a helical spring 12 surrounding said rod 8. The spring 12, one end of which rests against the valve means, supports at its opopsite end a washer 15, which, in turn, rests on a stop washer 13, fixed to the rod 8. A membrane 17

is arranged between the washers 13 and 15 and is fastened to supporting plates 16 fixed to the end walls of said outlet chamber 5.

In order to adjust the valve means 6 in different working positions and—if needed—entirely shut off the flow passages of the volume governor, the rod 8 is arranged to be axially movable. This movement is effected by means of a lever 20, arranged on a shaft 21, said shaft being arranged to be turned by means of an adjusting maneuvering knob or arm (not shown in the drawing). The free end of the lever 20 is equipped with a stud 22, engaging a groove in a sleeve 19 fixed to the rod 8. The movements of the rod 8 are transmitted to the valve means by a washer 14 fixed to the rod 8. Between said washer 14 and the bushing 11 there is arranged a damping packing 18.

What we claim is:

1. A volume governor for a flowing gaseous medium, comprising a channel-like open-ended casing, a valve seat in said casing, an axially displaceable valve disk cooperating with said seat, guiding means for said valve disk and biasing means tending to hold said valve disk at a normal position a predetermined distance from said valve seat against the pressure of the flowing gaseous medium and operable upon increase of pressure of the medium to afford displacement of said valve disk toward said seat and to maintain said flow substantially constant, characterized in that the casing is formed with a rectangular, very elongated cross section area and with the valve seat constituted by an inwardly projecting part of each of two opposite longitudinal walls of the casing, the longitudinal edges of said valve disk conforming with said inwardly projecting parts of said side walls to form two narrow flow passages of uniform width dimensioned so that the length of said flow passages in the flow direction exceeds five times the hydraulic diameter of same in said normal position of the valve disk.

2. A volume governor according to claim 1 including a sound-deadening material covering the walls of the flow passages.

3. A volume governor according to claim 1 characterized in that the biasing means comprises springs attached to the guiding means for the valve disk, said guiding means being axially displaceable rods at each end of the valve disk and arranged to be manually adjustable to set the volume governor for different, predetermined values of the medium flow and to entirely shut off the flow passage area for the gaseous medium.

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