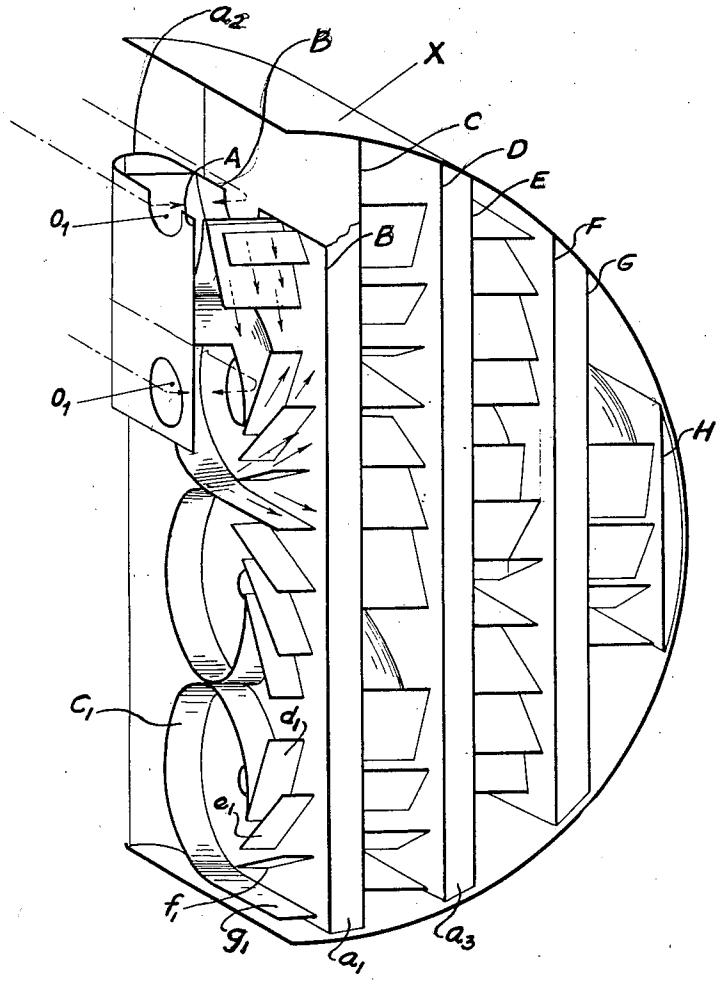
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AERODYNAMIC VALVE

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AERODYNAMIC VALVE

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3 Claims. (Cl. 138—42)

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In our U. S. patent application Serial No. 8,625 filed on this same day and entitled: "Aerodynamic Valve," we have described a device which amounts in effect to an aerodynamic check valve by reason of its imposing a much higher resistance to passage of gas therethrough in one direction than in the opposite direction. Such a device comprises a substantially drum-like chamber which has an axially arranged side inlet for gas and a plurality of tangential, outwardly diverging exit passages distributed around the periphery of the drum-like chamber; the exit passages open into a gas outlet pipe having a gradually increasing cross-section and arranged scroll-wise around the chamber. This device does not comprise any movable member and therefore its natural inertia is limited to that of the mass of gas it contains: owing to this fact, its use is particularly advantageous whenever the stream of gas to be controlled is of pulsatory character, with a periodic velocity, for example where gas is delivered from a source as a multiplicity of whiffs which follow one another at a high frequency, a typical example being the delivery of exhaust gas from an internal combustion engine.

The present invention has for its object to enable aerodynamic check valves of the aforesaid type to be used for controlling streams of gases of particularly high frequency.

With this object in view, our invention comprises an arrangement wherein a plurality of aerodynamic check valves of the aforesaid type are suitably grouped and each of which has a relatively small output capacity, to provide for control of a gaseous stream delivered at a predetermined rate.

The device according to the present invention may be constructed as illustrated diagrammatically and merely by way of example in the single figure of the accompanying drawing. The figure is a perspective view with parts broken away, of the right half of a tubular passage wherein a plurality of aerodynamic check valves are arranged in accordance with our invention.

Referring to the drawing, X denotes the wall of a tubular passage having a substantially circular cross-section. Arranged within said passage, are a plurality of partitions extending across the same in parallel relationship and of which only those partitions A, B, etc. H occupying half the inner space of the tubular passage are shown. The successive partitions are connected together alternately at their downstream ends and their upstream ends: thus partitions

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B and C as illustrated are connected by a cross-wall a_1 at their downstream end (front end on the showing), partitions D and E by a cross-wall a_3 and so on, while partitions A and B are connected by a round wall a_2 at their upstream or back end, partitions C and D being interconnected in like fashion and so on. The assembly of partitions and connecting walls is thus in corrugated or zig-zag formation across tubular passage X.

Assuming that the gaseous stream to be controlled moves through tubular passage X from the back to the front of the figure (i. e. from left to right on the perspective view), it will readily be appreciated as far as the specification has proceeded that the stream enters dead ends distributed in glove finger fashion, between partitions BC, DE, etc.

Formed in the successive partitions A, B, etc. H are a plurality of apertures o_1 wherethrough gas finds an exit to enter the dead ends provided between partitions AB, CD, etc., interconnected at their back ends by round walls, such as a_2.

Two adjacent partitions such as AB, CD, etc., provide side walls for a plurality of drum-like chambers as described in our patent application Serial No. 8,625 above mentioned; each chamber has a peripheral wall in open ring formation disposed around two registering apertures o_1 to bridge the side walls or partitions, but unlike the chambers described in said application, the tangential, outwardly diverging gas exit passages are distributed only over that part of the peripheral wall which faces downstream. More specifically, referring to the drawing, the peripheral wall c_1 for the lowermost chamber formed between partitions A and B extends over less than 360°, leaving a front arcuate gap from which four vanes d_1, e_1, f_1, g_1 diverge frontwardly, bridging partitions A, B, to provide tangential gas exit passages as described in our patent application Serial No. 8,625, vane g_1 being shown as an extension of peripheral wall c_1. The other chambers are constructed likewise, it being simply remarked that the groups of exit passages from vertically succeeding chambers are located alternately in the lower portion and the upper portion of said chambers, as illustrated.

The operation of the whole device will readily be understood in considering the arrows showing the direction of flow of gaseous stream.

If R is the radius of the peripheral wall of each chamber and r the radius of each opening

o_1, the ratio R/r is, according to our invention, given the same value as would be selected for one big aerodynamic check valve if according to our patent application Serial No. 8,625, one such valve were employed to control the flow of the gaseous stream.

Each elemental check valve or chamber employed according to this invention has a smaller output than if one big valve were employed, but the total output of the various elemental check valves is the same.

However, it has been found that the device according to this invention is capable of performing its function correctly with pulsatory gas streams in which pulsations follow one another at very much higher frequencies than could be controlled by the corresponding single valve, since the mass of air contained in the cylindrical chamber of a valve is proportional to the cube of the linear dimension of the device, and therefore rapidly decreases with said linear dimension. Now, the speeds of said mass completely change their direction and their intensity at each alternation; the greater said mass, the longer will be the time required for effecting each fresh distribution, and the less capable will be the valve of operating at high frequencies. Its "response time" will be too long. It will thus be realized how important it is only to use small valves.

The "response times" of the elemental valves are not added together since they are mounted in parallel. If they are all identical, the response time of the combination of element valves formed by the grid is equal to any one, if not to the longest of them.

It is obvious that the invention is not limited to the construction diagrammatically illustrated in the figure but that any device constructed in accordance with the same principles falls within the scope of the present invention.

What we claim is:

1. In a check-valve device for controlling the flow of a gaseous fluid through a pipe section, the combination of partition means extending across said pipe section and having a U cross-section with the legs of said U extending lengthwise, said partition means having at least one pair of apertures facing each other, through the U legs thereof, for causing said gaseous fluid to pass through said apertures from the space in said piping means without said partition means to the space within, spacing means between said legs of the U section of said partition means arranged in open ring formation around said apertures, to provide an intermediate chamber having an exit for the discharge into said space within said partition means, of the gaseous fluid passed via said apertures into said chamber, and means providing an outwardly diverging nozzle at the exit of said chamber.

2. The combination of claim 1, the nozzle means, consisting of several separate spacers between said U legs, arranged to define outwardly diverging discharge passages.

3. In a check-valve device for controlling the flow of a gaseous fluid through a pipe section, the combination of partition means extending across said pipe section and having a U cross-section with the legs of said U extending lengthwise, said partition means having at least one aperture through one of the U legs thereof, for causing said gaseous fluid to pass through said aperture from the space in said piping means without said partition means to the space within, spacing means between said legs of the U section of said partition means arranged in open ring formation around said aperture, to provide an intermediate chamber having an exit for the discharge into said space within said partition means, of the gaseous fluid passed via said aperture into said chamber, and means providing an outwardly diverging nozzle at the exit of said chamber.

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