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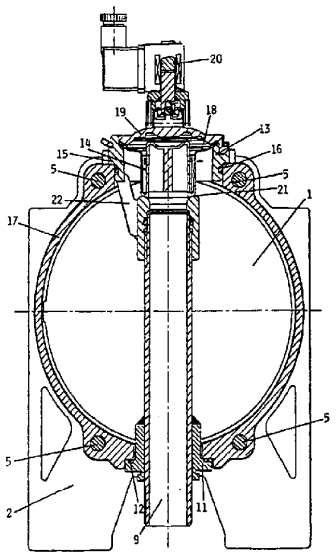
(54) Title: DEVICE AND METHOD FOR CLEANING A FILTER



(57) Abstract: A device for cleaning a filter, comprising a container (1) in which a gas pressure can be built up. The wall (17) of the container includes a first opening, through which a discharge pipe (a) extends into the container, which discharge pipe is provided with a circular valve seat (21) at its end, and a second opening, through which the housing (13) of a valve member (14) extends into the container. The valve member is cylindrical in shape, at least near said valve seat. The valve seat is connected to said housing.

WO 01/29465 A1

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DEVICE AND METHOD FOR CLEANING A FILTER

The invention relates to a device for cleaning a filter, comprising a container in which a gas pressure can be built up, wherein the wall of the container includes a first opening, through which a discharge pipe extends into the container, which discharge pipe is provided with a circular valve seat at its end, and a second opening, through which the housing of a valve member extends into the container, which valve member is cylindrical in shape, at least near said valve seat, and which can bear against the valve seat with a circular edge thereof.

A device of this kind is disclosed in WO-A-93/01433, and it functions to clean a filter used for filtrating dust from air, for example, by passing air through the filter for a short period in a direction opposed to the direction of flow of the air to be cleaned. During said short period the velocity of the air is so high that the term gas surge applies here, whereby the dust is blown off the filter.

The gas surge is effected by leading gas from the container to the filter via the discharge pipe, whereby a valve is present in the container, which valve opens the connection between the container and the discharge pipe. It is important thereby that the a maximum dimension is used for the passage between the container and the discharge pipe that is created by the valve, so that the gas will encounter little resistance, enabling it to flow to the filter as a relatively substantial gas surge.

In order to achieve this, the discharge pipe is provided with circular valve seat at the end that extends into the container, wherein the valve seat is closed by a valve member, which is substantially cylindrical near

the valve seat. As a result, a maximum inflow of gas to the discharge pipe is possible when the valve is opened. If a membrane would be used as the valve member, for example, less space would be available for the inflow of gas. Furthermore the housing of the valve member would have to extend to near the valve seat so as to make it possible to attach the membrane, which may likewise impede the inflow of gas.

In order to ensure a proper sealing action when using a cylindrical valve member, which is to mate with a circular valve seat, the position of the valve member with respect to the valve seat in the closed position of the valve must be precisely determined. With the device according to WO-A-93/01433 this is achieved by mounting the valve member, which is guided in the housing, with sufficient clearance in said housing, so that the valve member is capable of making a slight tilting movement so as to bear down sealingly on the valve seat.

It is therefore desirable to provide a device wherein the gas encounters little resistance upon its passage through the valve, and wherein a reliable sealing action of the valve is ensured.

It is the object of the present invention to substantially overcome or at least ameliorate one or more of the disadvantages of the prior art.

Accordingly, the present invention provides a device for cleaning a filter, comprising a container in which a gas pressure can be built up, wherein the wall of the container includes a first opening, through which a discharge pipe extends into the container, which discharge pipe is provided with a circular valve seat at its end, and a second opening, through which the housing of a valve member extends into the container, which valve member is cylindrical in shape, at least near said valve seat, wherein said valve seat is connected to said housing.

Preferably, the diameter of the cylindrical part of the valve member is smaller than the outside diameter of he valve seat, so that an advantageously shaped annular slit is formed upon opening of the valve, which is

freely accessible to inflowing gas from all directions.

In one preferred embodiment the valve seat is spaced from the second opening within the container by some distance, preferably a distance of more than 10 mm, more preferably more than 15 mm, and even more preferably more than 20 mm. When the valve seat is spaced sufficiently far from the second opening within the container, the gas can flow to the valve seat from all directions.

The term "within the container" is understood to mean within a surface that is closed all around, on which practically the entire inner wall of the container rests. In the case of a cylindrical container, said surface is the cylindrical surface that is made up of the larger part of the inner wall of the container.

Preferably, the valve member extends into the container in the fully open position of the valve, so that also the entire annular slit between the valve member and the valve seat is positioned within the container. As a result of this arrangement, the gas can flow into the discharge pipe via the valve seat in an advantageous manner in the open position of the valve.

In one preferred embodiment connecting means are present between the housing and the valve seat, which connecting means leave more than 50%, preferably more than 75%, of the space in a radial plane surrounding the valve seat clear for the flow of gas to the discharge pipe. Preferably, said connecting means consist of a number of connecting elements, preferably three connecting elements, which are spaced out evenly around the valve seat.

In one preferred embodiment the valve member is

connected to a membrane, which is attached to the housing all around. The valve member is thereby guided in its correct path by the membrane, and the movement of the valve member can be obtained from differences in the gas pressure on different sides of the membrane. Preferably, the valve member and the membrane are integrally formed of one material. The valve member is preferably substantially cylindrical thereby.

In one preferred embodiment the cylindrical part of the valve member is bevelled at the location where it abuts against the valve seat, so that the contact surface at the location of the circular line of contact between the valve member and the valve seat is a conical surface. This helps to ensure a good inflow of the gas into the discharge pipe, and also a proper sealing action between the valve member and the valve seat.

Preferably, the diameter of the circular line of contact between the valve seat and the valve member is equal to or larger than the inside diameter of the discharge pipe, preferably by more than 10%.

Preferably, the valve seat is attached to the discharge pipe by means of a screwed connection. The discharge pipe and the housing may each include a flange that abuts against the outer wall of the container, which flanges are larger than the first and the second opening, respectively, which flanges are pulled towards each other as a result of the discharge pipe on the one hand and the valve seat that is attached to the housing on the other hand being screwed together. In practice this has appeared to be an adequate and simple way of mounting the valve in the container.

The invention also relates to a method for assembling a device for cleaning a filter, comprising a container in

which a gas pressure can be built up, wherein the wall of the container includes a first opening, through which a discharge pipe is passed into the container, which discharge pipe is provided with circular valve seat at its end, and a second opening, through which the housing of a valve member is passed into the container, which valve member is cylindrical in shape, at least near said valve seat, and is capable of abutment against the valve seat with a circular edge thereof, wherein the valve seat attached to the housing is connected to one end of the discharge pipe.

A preferred form of the present invention will now be described by way of example with reference to the accompanying drawings, wherein:

Figure 1 is a side view of the device;

Figure 2 is a top plan view of the device;

Figure 3 is a bottom plan view of the device;

Figure 4 is a sectional view along line IV-IV in Figure 1;

Figure 5 is a side view of the device;

Figure 6 is a perspective view of a part of the device; and

Figures 7 to 9 show the mating relationship between the valve member and the valve seat.

The figures are schematic representations of the embodiment.

Figure 1 shows in side elevation a cylindrical or tubular container 1, which is closed at either end by an end plate 2, which is provided with holes 3 for mounting the device. End plates 2 are furthermore provided with a passage 4, which can be connected to a gas supply pipe

for supplying a gas to container 1, so that a gas pressure can be built up in the container.

The two end plates 2 are connected together by means of four tie rods 5, which tie rods 5 extend through axially extending holes in the wall (17) of cylindrical container 1. It is also possible to attach the end plates 2 to the cylindrical part of the container 1 by means of bolts.

As is shown in Figures 1 and 3, four discharge pipes 6, 7, 8, 9 are present at the bottom side of the container, which discharge pipes extend into the container 1 through respective openings. Discharge pipe 6 is fitted with a clamp 10 for being connected to another pipe (not shown). Discharge pipe 7 is of the same type, but it does not include clamp 10. Discharge pipe 8 has a cylindrical external surface, so that a flexible hose (not shown) can be fixed to discharge pipe 8 by means of a hose clamp. Discharge pipe 9 is provided with external screw thread, to which a pipe (not shown) can be connected by means of a screwed connection.

Each discharge pipe 6, 7, 8, 9 has a flange 11 welded thereon, which flange 11 abuts against the wall 17 of container 11 with the interposition of a sealing ring 12, as is also shown in Figure 4.

As is shown in Figure 4, an opening is present in the wall 17 of the container 1 directly opposite each opening for passing a discharge pipe 6, 7, 8, 9 therethrough, through which opening a housing 13 of a valve member 14 extends. Housing 13 has a flange 15, which bears against the wall 17 of container 1, and a sealing ring 16 provides a proper gastight seal between the housing 13 and the wall 17 of container 1.

Cylindrical valve member 14 is integrally connected to membrane 18, and valve member 14 can be moved in vertical direction by means of an electromagnetic actuator 20, by means of which the gas pressure above membrane 18 can be changed. This actuator is mounted above the cover 19 of the valve, which cover forms part of housing 13. Membrane 18 is clamped down between cover 19 and the other part of housing 13. It is also possible to use a remote actuator and connect it to the valve via a gas pipe, so that the valve is opened and closed by means of a pressure change in said gas pipe.

In the closed position of the valve, valve member 14 bears on the circular valve seat 21, which is connected to discharge pipe 9 by means of screw thread. Valve seat 21 is attached to housing 13 by means of three connecting elements 22, one of which is shown in Figure 5.

The valve is mounted in container 1 in that flanges 11 and 15 are pulled towards each other when discharge pipe 9 and valve seat 21 are being screwed together, causing them to abut firmly against the wall 17 of container 1.

Figure 5 shows the device is side view, wherein the device is disposed on a floor 24, against a wall 23, to which the device is secured by means of bolts (not shown), which extend through holes 3. The end plates 2 are constructed in such a manner that they can be fixed to a floor and/or to a wall.

Figure 6 shows the end plate 2 in perspective view, wherein the tie rods 5 are partially shown.

Figures 7 and 9 show the manner in which valve member 14 mates with valve seat 21.

Figure 7 is a detail view wherein the valve is shown in its closed position. Numeral 31 indicates the diameter of the circular line of contact between valve member 14 and valve seat 21. The outside diameter of the cylindrical valve member 14 is indicated at 32. valve seat 21 has an outside diameter 33, and discharge pipe 9 has an inside diameter 34. The valve seat is screwed onto the end of the discharge pipe 9 with the interposition of a sealing ring 35.

Figure 9 shows the detail that is indicated at IX in Figure 7, wherein the shape of the valve seat is illustrated. From Figure 9 it is apparent that the cylindrical part of the valve member 14 is bevelled at the location where it abuts against valve seat 21, so that the contact surface of the circular line of contact between the valve member 14 and the valve seat 21 is a conical surface, which extends at an angle, indicated at 36, with respect to the radial plane.

Figure 9 furthermore shows that the valve seat 21 is rounded both on the outside, with radius 37, and on the inside, with radius 38. This boosts the inflow of gas from container 1 to the discharge pipe 9 in the open position of the valve as shown in Figure 8. Said inflow is indicated by arrows 39.

Figure 8 furthermore shows that the valve member 14 extends some distance, which distance is indicated at 40, into container 1 in the open position of the valve.

The illustrated embodiment is merely an exemplary embodiment, many other embodiments are possible.

The claims defining the invention are as follows:

1. A device for cleaning a filter, comprising a container in which a gas pressure can be built up, wherein the wall of the container includes a first opening, through which a discharge pipe extends into the container, which discharge pipe is provided with a circular valve seat at its end, and a second opening, through which the housing of a valve member extends into the container, which valve member is cylindrical in shape, at least near said valve seat, wherein said valve seat is connected to said housing.

2. A device according to claim 1, wherein the diameter of the cylindrical part of the valve member is smaller than the outside diameter of the valve seat.

3. A device according to any one of the preceding claims, wherein the valve seat is spaced from the second opening in the container by some distance.

4. A device according to claim 3, wherein said distance is more than 10 mm.

5. A device according to claim 3, wherein said distance is more than 15 mm.

6. A device according to claim 3, wherein said distance is more than 20 mm.

7. A device according to any one of the preceding claims, wherein the valve member extends into the container in the fully open position of the valve.

8. A device according to any one of the preceding claims, wherein connecting means are present between the housing and the valve seat, which connecting means leave more than 50% of the space in a radial plane surrounding the valve seat clear for the flow of gas to the discharge pipe.

9. A device according to claim 8, wherein connecting means leaves more than 75% of the space in a radial plane surrounding the valve seat clear for the flow of gas to the discharge pipe.

10. A device according to any of the preceding claims, wherein connecting means are present between the housing and the valve seat, which connecting means consist of a number of connecting elements, which are spaced out evenly around the valve seat.

11. A device according to claim 10, wherein said connecting means consists of three connecting elements.

12. A device according to any one of the preceding claims, wherein the valve member is connected to a membrane, which is attached to the housing all around.

13. A device according to claim 12, wherein the valve member and the membrane are integrally formed of one material.

14. A device according to any one of the preceding claims, wherein the cylindrical part of the valve member is bevelled at the location where it abuts against the valve seat, so that the contact surface at the location of the cylindrical line of contact between the valve member and the valve seat is a conical surface.

15. A device according to any one of the preceding claims, wherein the diameter of the circular line of contact between the valve seat and the valve member is equal to or larger than the inside diameter of the discharge pipe.

16. A device according to claim 15, wherein the diameter of the circular line of contact between the valve seat and the valve member is equal to or larger than the inside diameter of the discharge pipe by more than 10%.

17. A device according to any one of the preceding claims, wherein the valve seat is attached to the discharge pipe by means of a screwed connection.

18. A device according to any one of the preceding claims, wherein the discharge pipe and the housing each include a flange that abuts against the wall of the container, which flanges are larger than the first and the second opening, respectively, and which flanges are pulled together each other as a result of the discharge pipe on the one hand and the valve seat attached to the housing on the other hand being screwed together.

19. A method for assembling a device for cleaning a filter, comprising a container in which a gas pressure can be built up, wherein the wall of the container includes a first opening, through which a discharge pipe is passed into the container, which discharge pipe is provided with circular valve seat at its end, and a second opening, through which the housing of a valve member is passed into the container, which valve member is cylindrical in shape, at least near said valve seat, and is capable of abutment against the valve seat with a circular edge thereof, wherein the valve seat attached to the housing is connected to one end of the discharge pipe.

20. A device for cleaning a filter, substantially as herein described with reference to any one of the embodiments of the invention shown in the accompanying drawings.

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21. A method for assembling a device for cleaning a filter, said method substantially as herein described with reference to any one of the embodiments of the invention shown in the accompanying drawings.

Dated 13 August 2002
Asco Controls B.V.
Patent Attorneys for the Applicant/Nominated Person
SPRUSON & FERGUSON

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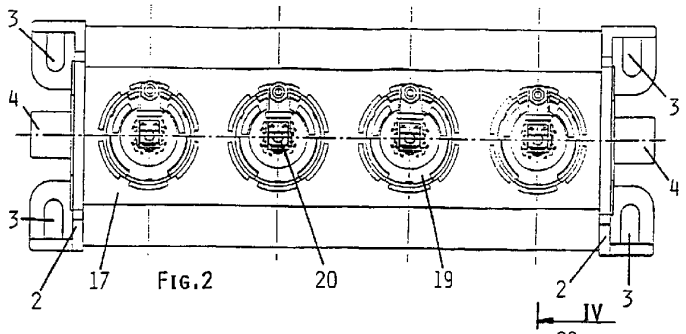

FIG.2

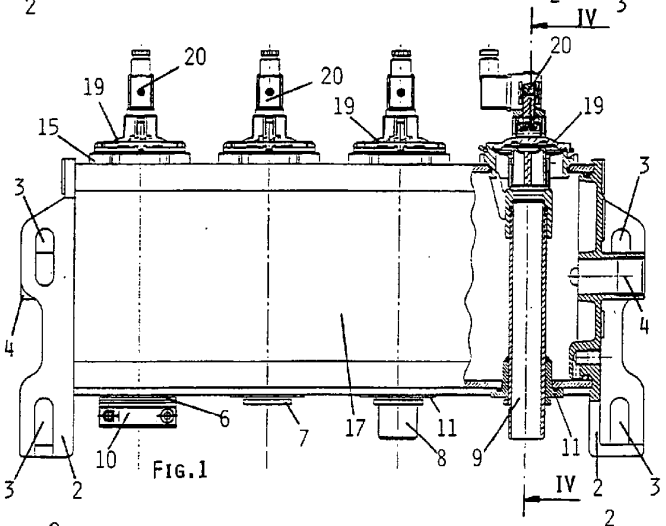

FIG.1

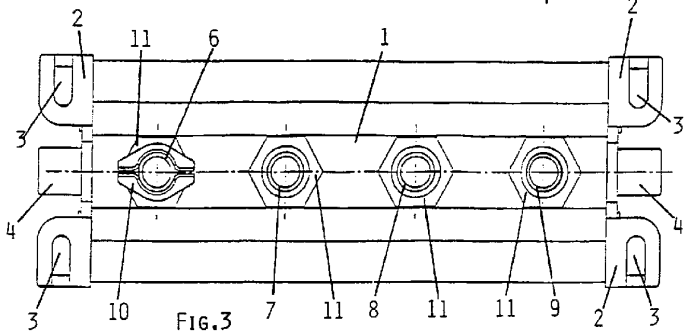

FIG.3

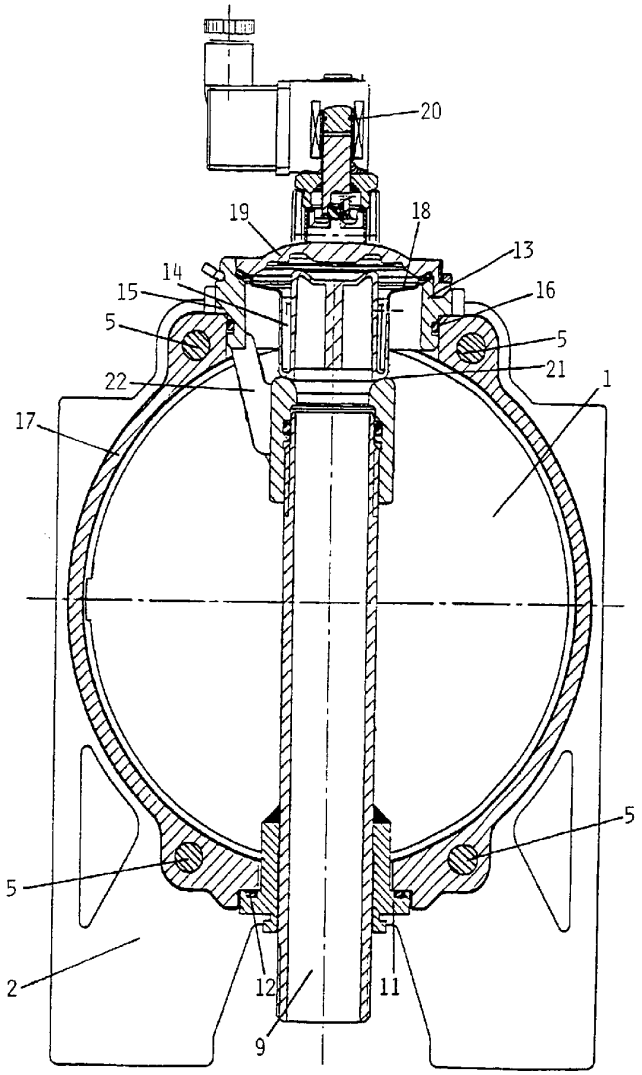

FIG.4

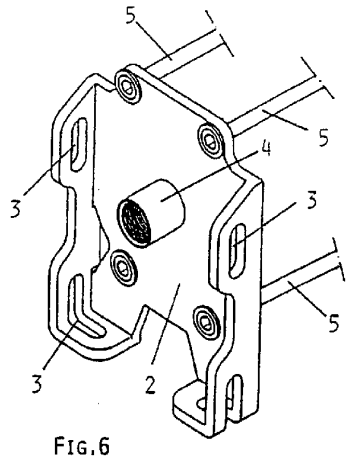

FIG.6

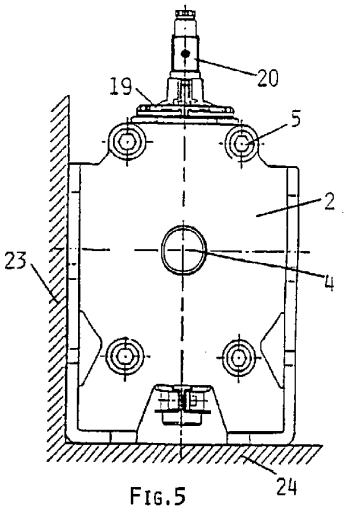

FIG.5

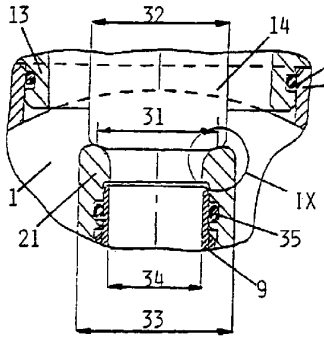

FIG.7

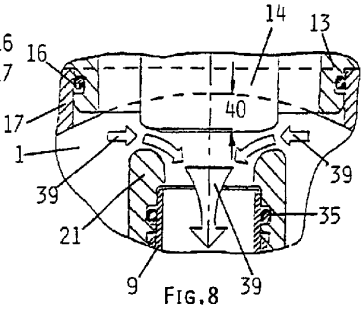

FIG.8

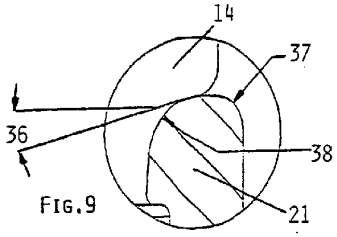

FIG.9