

[54] **CONTROL VALVE FOR PULSE JET TYPE
FILTER APPARATUS**

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137/613, 137/624.18, 251/61.1

[51] Int. Cl. **B01d 46/04**

[58] Field of Search 55/96, 302, 303,
55/341; 137/613, 60.8, 624.18; 251/61.1

[56] **References Cited**

UNITED STATES PATENTS

1,177,034	3/1916	Holt	137/613
2,989,282	6/1961	White	251/61.1
3,680,285	8/1972	Wellan et al.	55/302

OTHER PUBLICATIONS

Mikro Pulsaire dust collector Bulletin PC-2 Pulverizing
Machinery Corp. Ltd. 4/70 page 2

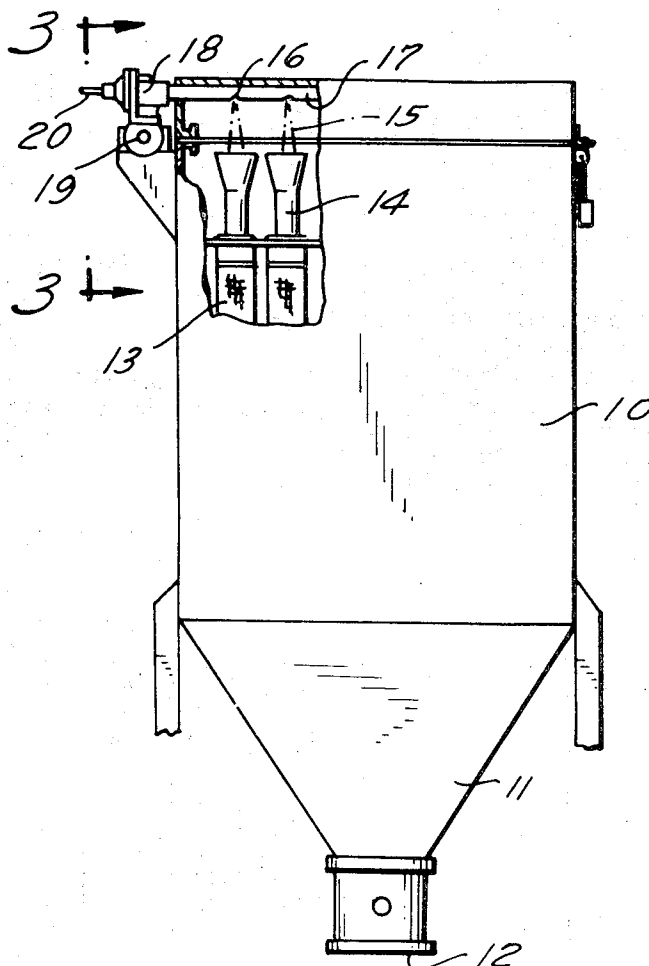
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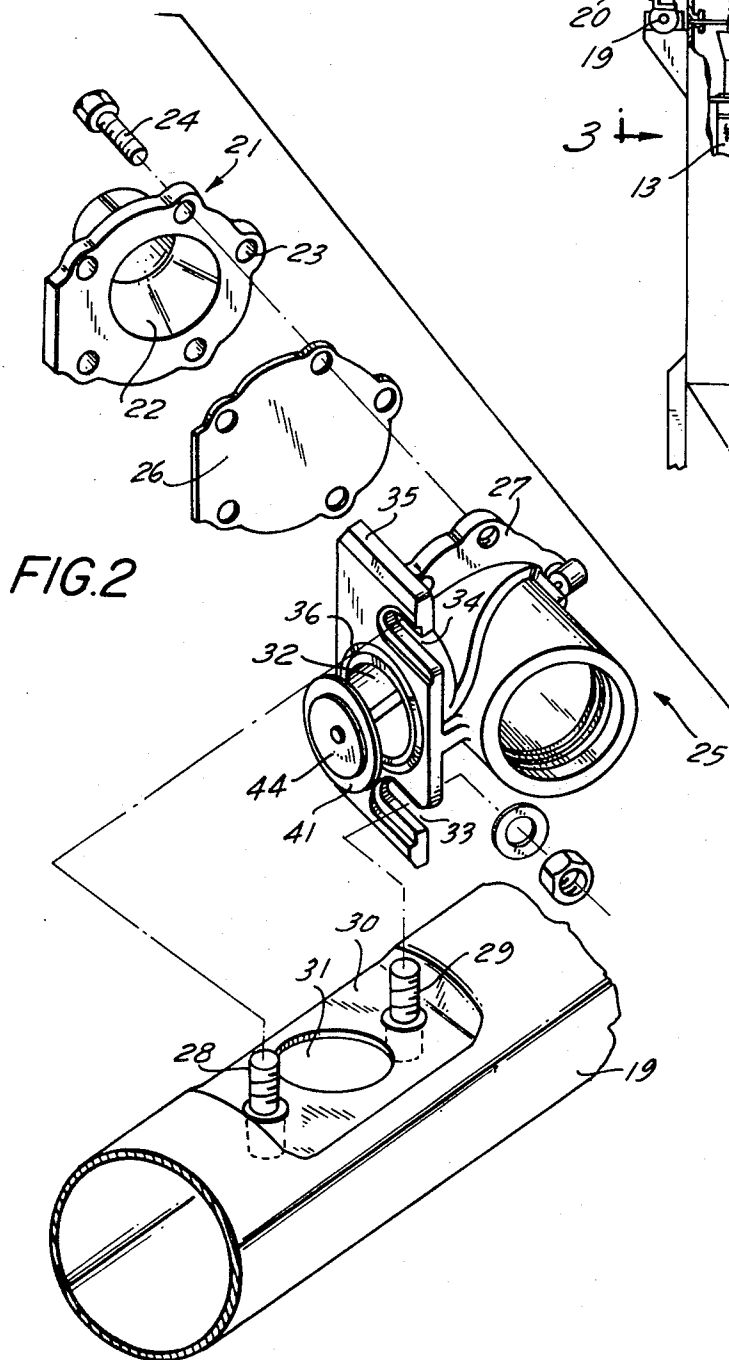
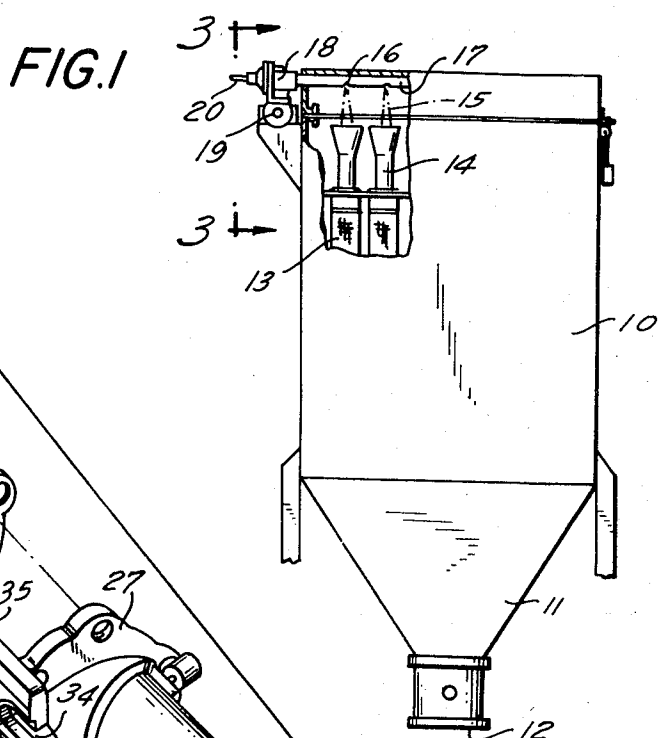
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ABSTRACT

A control valve for pulse jet type filter apparatus has a header supplying compressed air to the control valve through a port formed in the header. A blowpipe is disposed over filter bags of the filter apparatus and has aligned nozzles for periodically directing pulse air into the filter bags for removing accumulated dust. The control valve is positioned between the header and the blowpipe for periodically allowing a pulse of air to pass from the header into the blowpipe. The control valve has an internal header passage communicating with the header and an internal blowpipe passage communicating with the blowpipe. A diaphragm is disposed in a passage between the header and blowpipe passages allowing pulse air to flow periodically from the header to the blowpipe. A manually operated isolator valve is advantageously provided and has a disk movable into a position to stop the flow of air from the header into the internal header passage of the control valve. The disk is mounted on one end of a stem slidably mounted within the valve body and the other end of the stem extends from the valve body for manual operation of the isolator valve.

6 Claims, 5 Drawing Figures





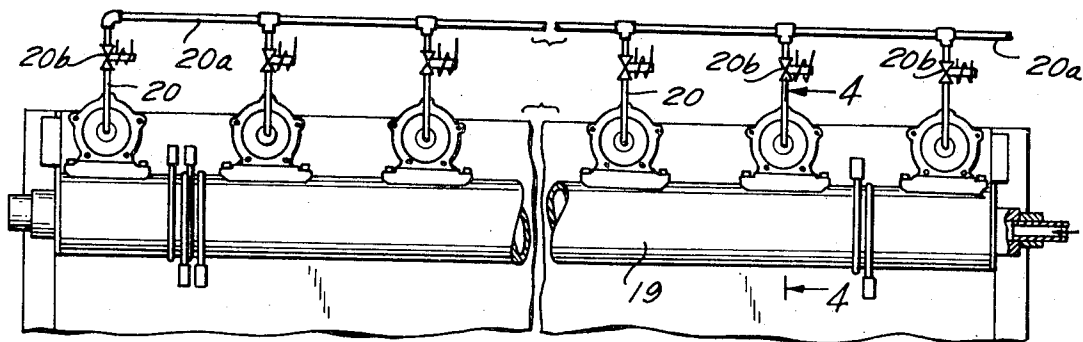


FIG. 3

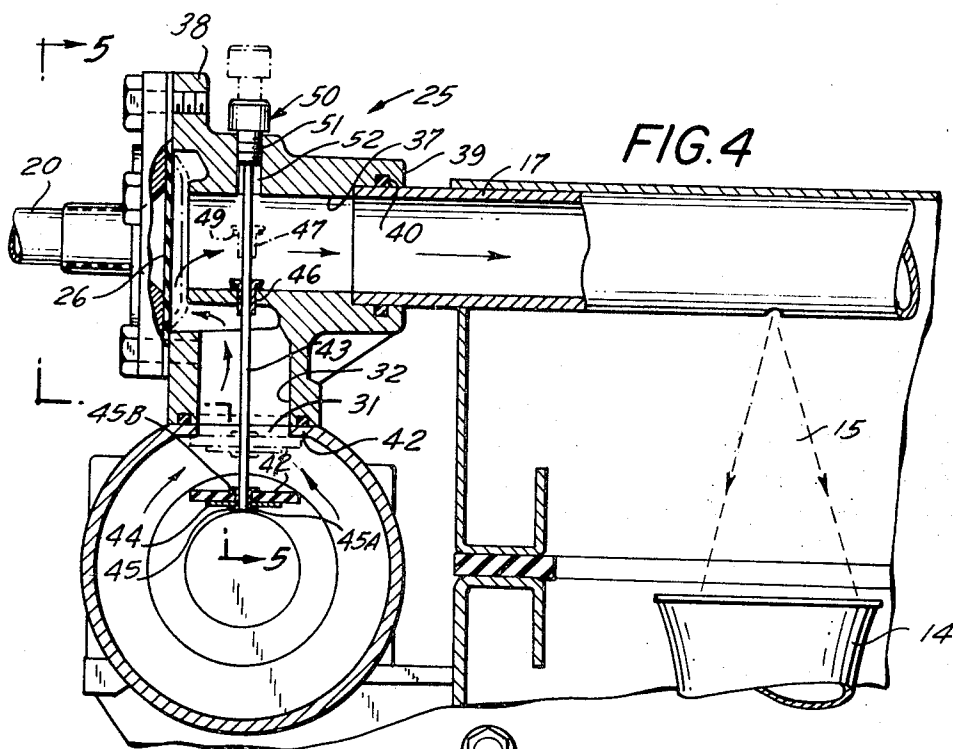


FIG. 4

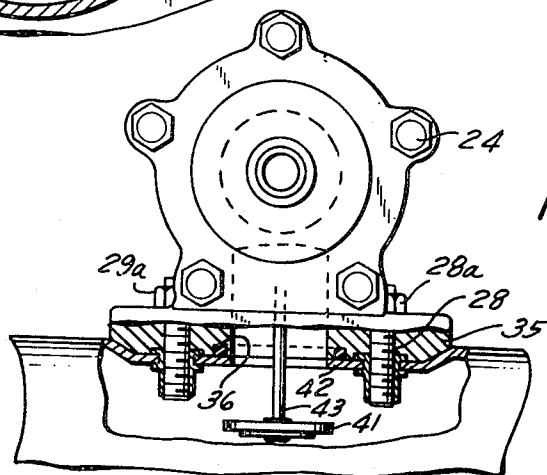


FIG. 5

CONTROL VALVE FOR PULSE JET TYPE FILTER APPARATUS

BACKGROUND OF THE INVENTION

One type of gas cleaning apparatus is called a pulse air system in which particle laden gas is introduced into a lower plenum (filter bag chamber) in which elongated cylindrical filter bags are supported by tubular bag retainers. The bag retainers are fixed within apertures in a stiff metal tube support sheet. The gas passes, due to a pressure difference, through the walls of the bags and the solid particles are trapped by the bags. At repeated timed intervals pulses of compressed high pressure gas are introduced at the top orifices of the retainers to remove the solid particles accumulated on the filter bags, with the particles being collected and removed at the bottom particle collection hopper of the apparatus. The pulses of air are directed from aligned orifices in a blowpipe.

The pulses of air are obtained from a compressed air header pipe which leads to a blowpipe having a number of exit orifices. A slave or control valve is positioned between the compressed air header and the blowpipe. The control valve is operated by controlled compressed air, for example, by means of a solenoid valve connected to a source of compressed air. The control valve is opened and closed upon control signals which are increased or reduced air control pressure. To repair one of the control valves it is presently necessary to shut down the entire cleaning apparatus during the repair operation. Alternatively it might be possible to mount a hand-operated valve in series with each slave valve, but such hand operated valves present spaced problems in their mounting and are relatively costly. At present the slave valves are mounted by means of conventional pipe fittings or compression couplings, the cost of which is relatively high.

SUMMARY OF THE INVENTION

The objects of the present invention are to provide a control valve for an pulse air type of filter apparatus which (1) permits the repair of its slave diaphragm or other parts without shutting down the entire filter apparatus; (2) is readily mounted in place and at relatively low cost; (3) is not substantially higher in cost than the cost of other slave valves; and (4) does not require complex or costly mounting or the mounting of two separate valves.

It has now been found that the foregoing objects and other advantages can be obtained in a control valve for pulse air type filter apparatus having a header supplying compressed air to the control valve through a port in the header. A blowpipe is disposed over filter bags of the filter apparatus and has aligned nozzles for periodically directing pulse air into the filter bags for removing accumulated dust. The control valve is disposed between the header and the blowpipe for periodically allowing a pulse of air to pass from the header into the blowpipe. The control valve has an internal header passage communicating with the header and an internal blowpipe passage communicating with the blowpipe. Diaphragm means is disposed in a passage between the header and blowpipe passages and control means operates the diaphragm to allow pulse air to flow periodically from the header to the blowpipe. Advantageously relatively simple and inexpensive manually operated isolator valve means is provided which has a disk

movable into a position to stop the flow of air from the header to the internal header passage of the control valve thereby isolating the remainder of the control valve from communication with the compressed air in the header so that the control valve can be inspected and repaired without shutting down the entire filtering apparatus. The disk is mounted on one end of a stem slidably mounted within the valve body, the other end of the stem extends from the valve body for manual operation of the isolator valve.

The isolator valve disk is desirably made of bendable and compressible material and a metal support washer is mounted on the stem under the disk to stiffen the disk in the closed position. The stem extends through the control valve body and has one end with the disk mounted thereon and its other end has means engageable with the valve body for securing the isolator valve in the open position. The stem and disk extend into the interior of the header when in the open position and in the closed position the disk engages the annular shoulder portion of the header adjacent to header port to close the passage between the header and the control valve. The header advantageously has a flat seat formed thereon with the header port centered therein and the valve has a flange with sealing means adapted to mate with the header seat in sealing relationship. Fastening means extend from the header seat for securing the valve flange thereon.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects and advantages of the present invention will be apparent from the following detailed description, the claims and the drawings appended hereto wherein:

FIG. 1 is a side plan view, partly cut away, showing pulse air type filter apparatus embodying this invention;

FIG. 2 is an enlarged perspective exploded view of the pulse air control valve of the present invention and its air supply header pipe mounting;

FIG. 3 is an enlarged side plan view of the control valve arrangement as viewed along line 3—3 of FIG. 1, and looking in the direction of the arrows;

FIG. 4 is an enlarged cross-sectional view taken along line 4—4 of FIG. 3; and

FIG. 5 is a side plan view partially cut away and in section taken along line 5—5 of FIG. 4.

DETAILED DESCRIPTION

Referring now in detail to the drawings, as illustrated in FIG. 1, the pulse air type gas filtering apparatus in which the control valve of the present invention is used includes an external casing 10 having a bottom section 11 conically formed with an orifice 12 through which dust or pulverized material may be removed in the usual manner. Inside the casing 10 there are a plurality of elongated tubular filter bags 13 of a suitable filtering material, for example, of a woven wool fabric. The bags 13 are connected to the lower ends of venturi type tubular bag retainers 14 the upper ends of which have openings which are enlarged and upwardly directed. The bag retainers 14 are fixedly mounted on a stiff impermeable support sheet 14a supported by the casing 10.

In order to remove accumulated dust from the filter bags, a periodic pulse of compressed air 15 of one tenth of a second duration once every minute, for example,

is passed through the filter bags 13. The compressed air is directed downwardly from aligned orifices 16 in a plurality of spaced blowpipes 17 disposed over the openings in the retainers 14 communicating with the interior of the filter bags 13. A series of slave or control valves 18 of the type of the present invention are positioned between the blowpipe 17, a manifold pipe or header 19 which is in communication with a supply of compressed air in order to control the supply of pulse air for delivery to the filter bags 13 at periodic intervals. Each of the control valves 18 is connected to a control tube 20 which is a branch of a control air supply tube 20A. Each control tube 20 has a solenoid operated valve 20B periodically operated by a conventional cycle timing mechanism. Upon opening of the valve 20B, the control valve 18 is closed in a manner described hereinafter, and the supply of compressed air to the blowpipe 17 is stopped. The control valve 18 is normally kept closed and is opened only for a short period during each pulse cycle.

Each control valve 18 has a cover 21 with a bore 22 which is in communication with the control air tube 20. A plurality of fastener holes 23 in an outer flange of the cover 21 receive threaded bolts 24 which secure the cover to the valve body 25. A flexible diaphragm 26 is positioned between the flange of the cover 21 and a mating flange 27 of the valve body 25. The mating flange 27 has a plurality of aligned threaded holes to receive the fastening bolts 24 to secure the diaphragm therebetween.

The valve body 25 is advantageously mounted on a flat seat 30 formed in the header 19 by means of two bolts 28 and 29 which are fixed on the header and extend upwardly from the seat 30 as illustrated in FIG. 2. A port 31 in the header centered in the seat 30 communicates with an internal passage 32 of the valve body 25. The bolts 28 and 29 are adapted to be received within U-shaped slots 33 and 34 provided in a mounting flange 35 on the valve body 25 and to secure the flange 35 to the header seat 30 by means of fastening nuts 28a and 29a. The underside of the flange has a flat surface which mates with the header seat 30. An airtight seal is provided by an O-ring 36 mounted in an annular groove formed in the bottom of the flange 35. This advantageous construction provides for convenient removal and replacement of the control valve 18 and eliminates relatively costly conventional pipe fittings.

The passage 32 of the valve body 25 is substantially vertically directed and communicates through a generally U-shaped passage with a horizontally directed passage 37 in the valve body 25 as shown by the arrows in FIG. 4 which illustrate the air flow from the header 19 to the blowpipe 17. The horizontal passage 37 terminates at one end in a port 38 the outer edge of which acts as a valve seat for the diaphragm 26. When control air enters the tube 20, the diaphragm 26 flexes from the open position shown in solid line to the closed position shown in phantom line in FIG. 4 and thereby shuts off the flow of air through the U-shaped air passage between the passage 32 and 37. The other end of the passage 37 opposite to the orifice 38 receives the blowpipe 17 in sealed relationship by means of an O-ring seal 40.

The control valve 18 has the desirable feature of having incorporated therein an isolator valve which shuts off the air supply from the header 19 so that the other

portion of the valve 18 may be inspected or repaired without shutting down the entire filtering operation. For instance, with the air supply shut off a worn out diaphragm can readily be replaced. The isolator valve has a valve disk 41 which is formed of relatively stiff but compressible and bendable material such as synthetic plastic or rubber and which is mounted so that it may be manually closed against the shoulder portion 42 of the header 19 forming the port 31.

The valve disk 41 is mounted on the lower end of a movable valve stem 43 by means of a metal washer 44 on the underside of the valve disk and a bushing 45 which is rigidly fixed to the lower end of the stem 43 and has upper and lower annular shoulder portions 45A and 45B which retain the valve disk 41 and the washer 44 therebetween. The valve stem 43 is slidably mounted within the valve body 25 so that the valve disk 41 may be moved from an open position illustrated in solid line to a closed position illustrated in phantom line against the annular shoulder 42 of the header 19 to close the header port 31 as shown in FIG. 4. The metal washer 44 is relatively stiff and prevents the disk 41 from bending when the isolator valve is in the closed position.

The stem 43 passes through a bore 46 in the valve body 25 and extends through the passage 37. A shouldered bushing 47 is fixed to the stem 43 in the passage 37 in order to seal the bore 46 when the stem is in the closed position by means of an O ring seal 49 mounted on the bushing 47. The valve stem 43 extends through the remaining portion of the valve body 25 with its upper end protruding therefrom for manual operation.

A bushing 50 is fixed to the outer end of the stem 43 and has an externally threaded portion which is adapted to be received in an internally threaded bore 52 of the valve body 25 for securing the valve disk 41 in the open position. When the bushing 53 is manually unfastened and pulled upwardly, the air pressure in the header 19 secures the valve disk 41 in the closed position sealing the port 31 and isolating the other portions of the control valve 18 for convenient inspection and repair.

It will be understood that the foregoing description with the details of exemplary structure is not to be construed in any way to limit the invention, but that modifications may be made thereto without departing from the scope of the invention as set forth in the following claims.

I claim:

1. A control valve for pulse air type filter apparatus comprising a header supplying compressed air to said control valve through a port formed in said header, a blowpipe disposed over filter bags of the filter apparatus having aligned nozzles for periodically directing pulse air into the filter bags for removing accumulated dust, said control valve being disposed between said header and said blowpipe for periodically allowing a pulse of air to pass from said header into said blowpipe, said control valve having an internal header passage communicating with said header and an internal blowpipe passage communicating with said blowpipe, diaphragm means disposed in a passage between said header and blowpipe passages, and control means for operating said diaphragm to allow pulse air to flow periodically from said header to said blowpipe, manually operated isolator valve means having a disk movable into a position to stop the flow of air from said header

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to said internal header passage of said control valve, said disk being mounted on one end of a valve stem slidably mounted within the valve body.

2. The control valve of claim 1 wherein said stem extends through the body portion of said valve with one end of said stem having said disk mounted thereon and wherein the other end of said stem has means engagable with said valve body for securing said isolator valve in the open position.

3. The control valve of claim 2 wherein said stem and disk extend into the interior of said header when in the open position and wherein when in the closed position said disk engages the annular shoulder portion of said header adjacent said header port to close the passage between said header and said control valve.

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4. The control valve of claim 3 wherein said header has a flat seat formed thereon with said header port centered therein and wherein said valve has a flange with sealing means adapted to mate with said header seat in sealing relationship and wherein fastening means extending from said seat portion secure said valve flange thereon.

5. The control valve of claim 4 wherein said isolator valve disk is made of bendable and compressible material.

6. The control valve of claim 5 wherein a metal support washer is mounted on said stem under said disk to rigidly support said disk in the closed position.

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