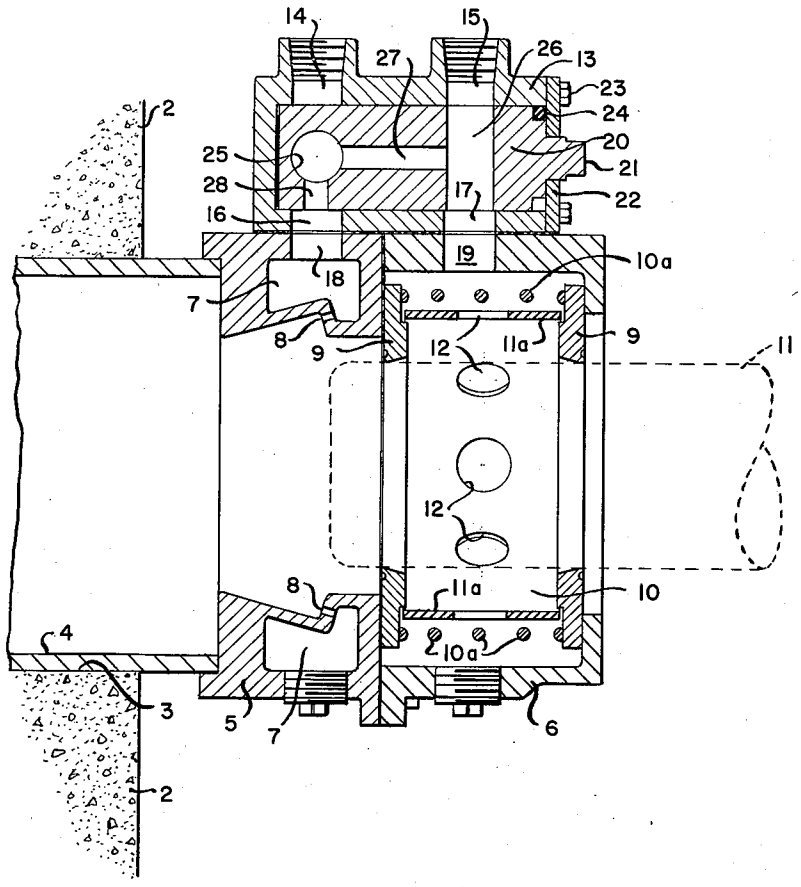
June 13, 1961 R. L. HARRIS 2,988,024

SOOT BLOWER AND VALVE THEREFOR

Filed Nov. 30, 1959



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United States Patent Office 2,988,024
Patented June 13, 1961

2,988,024

SOOT BLOWER AND VALVE THEREFOR

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Filed Nov. 30, 1959, Ser. No. 856,179
7 Claims. (Cl. 110—179)

This invention relates to a soot blower and a valve especially adapted for use in connection with soot blowers but which may well have other uses. The invention has to do with the control of the delivery of high pressure and low pressure fluid which in the case of a soot blower would normally be air.

Modern soot blowers comprise a lance which is projectable through an opening in the wall of the furnace or boiler in which the soot blower is used. The lance may be traversed axially back and forth and a sealing device comprising a gasket or gaskets may be disposed in the region of the furnace wall to effect a seal about the lance. However, the pressure within the furnace is usually substantially greater than the atmospheric pressure outside the furnace. Consequently it is customary to provide an air seal adjacent the sealing device and to supply air under pressure to the air seal chamber so that leakage past the sealing device as the lance moves back and forth is inward or from the outside atmosphere to the inside of the furnace rather than vice versa. To accomplish this result the pressure of the air supplied to the air seal chamber is somewhat above the internal furnace pressure.

At times the lance may be removed from the opening through which it operates, as for cleaning or repair, while the furnace is in operation, and at those times the outrush through the opening of gases within the furnace should be prevented. That is accomplished by the provision of what is known as an aspirating chamber in the region of the furnace wall including provision for aspirating or injecting air at relatively high pressure inwardly through the opening to prevent outflow of gases from within the furnace even though the lance has been completely withdrawn from the opening. Everything thus far described is old and well known to those skilled in the art.

To accomplish the results above pointed out two sources of air under pressure are provided, a source of air under relatively low pressure, i.e., a pressure only slightly above the internal furnace pressure, to prevent outflow of gases from within the furnace while the lance is in use, and a source of air under relatively high pressure, i.e., a pressure very much higher than the internal furnace pressure, to provide the aspirating effect to prevent outflow of gases from within the furnace when the lance has been completely withdrawn from the opening in the furnace wall through which it operates. The aspirating chamber has a plurality of relatively small openings or nozzles positioned to deliver jets of high pressure air in generally conical arrangement toward the interior of the furnace. When high pressure air is not being delivered through the nozzles there is danger that the nozzles may become clogged with particles entrained in the furnace gases. To prevent such clogging of the nozzles it has been customary to provide for the continuous passage of low pressure air through the nozzles when high pressure air is not being delivered therethrough.

Heretofore the valving utilized for control of the low pressure air and the high pressure air has been either relatively complex and expensive or not such as to control the flow of air in optimum manner. In one arrangement of valving three-way and two-way plug cocks 5 connected into a piping manifold were employed, the valving thus being undesirably complex and costly and almost presenting undesirable maintenance problems. In another arrangement the valving was simplified by delivering the low pressure air at all times to the air seal chamber without any control valve, which was unsatisfactory because when the high pressure air is being ejected through the nozzles the low pressure air has no effect and is wasted.

I provide improved and simplified control means for controlling the high pressure and low pressure air in a soot blower and I also provide an improved valve which has particular advantages when employed in a soot blower but which may also be otherwise employed to advantage.

I provide, in a soot blower, an air seal chamber, an aspirating chamber, a source of air under relatively low pressure, a source of air under relatively high pressure and control means comprising a shiftable valve which when in a first position admits relatively high pressure air from its source into the aspirating chamber while closing off the air seal chamber and which when in a second position admits relatively low pressure air from its source into both the air seal chamber and the aspirating chamber. The air seal chamber and the aspirating chamber are both preferably generally annular and substantially coaxial. The shiftable valve is preferably mounted laterally of the air seal chamber and the aspirating chamber so as to admit relatively high pressure air from its source laterally into the aspirating chamber and the air seal chamber. I preferably provide an auxiliary low pressure air passage through which when the valve is in the second position low pressure air is admitted from its source into the aspirating chamber.

I also provide a valve comprising, a casing having a first inlet, a second inlet, a first outlet and a second outlet and a shiftable valve element in the casing which when in a first position transmits fluid from the first inlet to the first outlet and closes off the second inlet and the second outlet and which when in a second position transmits fluid from the second inlet to both outlets and closes off the first inlet. The inlets are preferably spaced generally longitudinally of the casing and the first outlet and the second outlet are preferably generally opposed to the first inlet and the second inlet respectively. The shiftable valve element is preferably a turnable generally cylindrical valve element. The valve element preferably has a first passage which when the valve element is in the first position transmits fluid from the first inlet to the first outlet, a second passage which when the valve element is in the second position transmits fluid from the second inlet to the second outlet and an auxiliary passage which when the valve element is in the second position transmits fluid from the second inlet to the first outlet.

I further provide a valve comprising a generally cylindrical casing having a first inlet and a second inlet spaced apart generally longitudinally of the casing, a first outlet generally opposed to the first inlet and a second outlet generally opposed to the second inlet and a turnable generally cylindrical valve element in the casing, the valve element having a first passage which when the valve element is in a first position transmits fluid from the first inlet to the first outlet but which when the valve element is in a second position is in non-communicating relationship with the first inlet and the first outlet and having a second passage which when the valve element is in the first position is in non-communicating relationship with the second inlet and the second outlet but which when the valve element is in the second position transmits fluid from the second inlet to the second outlet, the valve element also having auxiliary passage means which when the valve element is in the second position transmits fluid from the second passage to the first passage and thence to

the first outlet. The inlets are preferably in longitudinal alignment at one side of the casing and the outlets are preferably respectively diametrically opposed to the inlets. In my preferred structure the valve element has an auxiliary passage extending between the first passage and the second passage and a delivery passage extending from the first passage to the first outlet when the valve element is in the second position so that when the valve element is in the second position fluid is transmitted from the second inlet to both outlets.

Other details, objects and advantages of the invention will become apparent as the following description of a present preferred embodiment thereof proceeds.

In the accompanying drawing I have shown a present preferred embodiment of the invention, the drawing comprising a fragmentary axial cross-sectional view through a soot blower embodying my invention.

Referring now more particularly to the drawing, the furnace wall is designated by reference numeral **2** and has therein an opening **3** in which is disposed a sleeve **4** of the soot blower which extends only approximately to the inner face of the wall **2**. Connected with the sleeve **4** and constituting in effect an outward but restricted continuation thereof is an annular aspirating element **5**. Connected with the aspirating element **5** and constituting in effect an outward continuation thereof is an annular air seal element **6**. The element **5** has therein an annular aspirating chamber **7** provided with an annular series of nozzles **8** with their axes arranged substantially as the elements of a cone. The air seal element **6** has therein two sealing members or gaskets **9** forming between them an air seal chamber **10** urged apart by a spring **10***a* surrounding a spacing cylinder **11***a* having a circumferential series of ports **12** therethrough. The end of the lance of the soot blower is indicated by dotted lines at **11**, being in the position shown almost fully withdrawn but still passing through the gaskets **9**. The lance has near its extremity an annular series of openings or nozzles (not shown) through which steam or other soot blowing medium passes to accomplish the primary result of the soot blower when in operation.

Positioned laterally with respect to the aspirating element **5** and the air seal element **6** is an elongated cylindrical valve casing **13** having at its side remote from the elements **5** and **6** a high pressure air inlet **14** and a low pressure air inlet **15**. The high pressure air inlet **14** is connected with a source of relatively high pressure air (not shown) and the low pressure air inlet **15** is connected with a source of relatively low pressure air (not shown). The valve casing **13** has outlets **16** and **17**, the outlet **16** being diametrically opposed to the inlet **14** and the outlet **17** being diametrically opposed to the inlet **15**. The valve casing is carried by the soot blower in such manner that the outlet **16** communicates through a passage **18** with the aspirating chamber **7** and the outlet **17** communicates through a passage **19** with the air seal chamber **10**.

Within the valve casing **13** is an elongated rotatable plug valve element **20** adapted to be turned about its axis and having a non-circular outwardly projecting axial extremity **21** to enable turning of the valve member. The valve member may be turned manually or automatically as desired. The valve member is maintained in position in the casing by a closure plate **22** bolted to the valve casing **13** by bolts **23** and pressing a sealing gasket **24** against the end of the valve element and the end portion of the casing.

In the zone of the inlet **14** and the outlet **16** the valve element **20** has a straight-through passage **25** and in the zone of the inlet **15** and the outlet **17** the valve **20** has a straight-through passage **26**. The axes of the passages **25** and **26** are related to each other at 90 angles, i.e., when the passage **25** is horizontal the passage **26** is vertical and vice versa. An auxiliary longitudinal passage **27** connects the passages **25** and **26** as shown. A further auxiliary passage **28** extends from the passage **25** at the center thereof at right angles thereto to the peripheral face of the valve element **20**.

The valve element **20** has two operative positions. The first operative position is with the passage **25** connecting the inlet **14** and the outlet **16**, at which time the passage **26** is in non-communicating relationship with the inlet **15** and the outlet **17**. Thus when the valve element **20** is in the first position high pressure air passes from the inlet **14** through the passage **25**, the outlet **16** and the passage **18** into the aspirating chamber **7** whence it is ejected at high pressure and velocity through the nozzles **8** forming in effect a high pressure cone moving inwardly into the furnace and preventing outflow of gases from within the furnace when the lance has been removed and is not in use. At the time when the high pressure air is being thus injected into the furnace the lance will have been removed entirely and will not be in position as shown at **11** in dotted lines in the drawing.

When the valve element **20** is in the first position as just described the passage **28** is in non-communicating relationship with the outlet **16**. With the valve in that position the only flow of air is the flow of high pressure air to the aspirating chamber **7** and out through the nozzles **8**. At that time the low pressure air is not flowing.

When the valve member **20** is turned about its axis through an angle of 90° it assumes the position shown in the drawing with the passage **26** connecting the inlet **15** with the outlet **17** so that low pressure air enters through the inlet **15** and passes through the passage **26**, the outlet **17** and the passage **19** into the air seal chamber **10**. At that time the lance is in place and the low pressure air is under sufficient pressure to prevent gases from within the furnace from passing outwardly through the inner or left-hand gasket **9**. At the same time low pressure air passes through the passage **27** to the passage **25** and thence through the passage **28** to the outlet **16** and through the passage **18** to the aspirating chamber **7** and out through the nozzles **8** to prevent clogging of the nozzles when the high pressure air is shut off.

Thus, I provide an extremely simple, low cost, foolproof valve arrangement providing for admission of high pressure air to the aspirating chamber while completely shutting off low pressure air and also providing for admission of low pressure air to the air seal chamber and simultaneously to the aspirating chamber to prevent clogging of the aspirating nozzles when the lance is in use. The result is accomplished by a single valve element operating in a valve casing mounted laterally upon the soot blower.

While I have shown and described a present preferred embodiment of the invention it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied within the scope of the following claims.

I claim:

1. In a soot blower, an air seal chamber, an aspirating chamber, a source of air under relatively low pressure, a source of air under relatively high pressure and control means comprising a shiftable valve which when in a first position admits relatively high pressure air from its source into the aspirating chamber while closing off the air seal chamber and which when in a second position admits relatively low pressure air from its source into both the air seal chamber and the aspirating chamber.

2. In a soot blower, a generally annular air seal chamber, a generally annular aspirating chamber substantially coaxial with the air seal chamber, a source of air under relatively low pressure, a source of air under relatively high pressure and control means comprising a shiftable valve mounted laterally of said chambers which when in a first position admits relatively high pressure air from its source laterally into the aspirating chamber while closing off the air seal chamber and which when in a second position admits relatively low pressure air from its source

laterally into both the air seal chamber and the aspirating chamber.

3. In a soot blower, an air seal chamber, an aspirating chamber, a source of air under relatively low pressure, a source of air under relatively high pressure and control means comprising a shiftable valve which when in a first position admits relatively high pressure air from its source into the aspirating chamber while closing off the air seal chamber and which when in a second position admits relatively low pressure air from its source into the air seal chamber, the valve having an auxiliary low pressure air passage through which when the valve is in the second position low pressure air is admitted from its source into the aspirating chamber.

4. In a soot blower, the combination of elements defined by claim 1 in which the control means comprises a casing having a first inlet, a second inlet, a first outlet and a second outlet, the shiftable valve being disposed in the casing and being constructed and arranged to transmit fluid from the first inlet to the first outlet and close off the second inlet and the second outlet when the valve is in said first position and to transmit fluid from the second inlet to both outlets and close off the first inlet when the valve is in said second position.

5. In a soot blower, the combination of elements defined by claim 1 in which the control means comprises a generally cylindrical casing having a first inlet and a second inlet spaced apart generally longitudinally of the casing, a first outlet generally opposed to the first inlet and a second outlet generally opposed to the second inlet, the shiftable valve consisting of a turnable generally cylindrical valve element and being disposed in the casing, the valve element having a first passage which when the valve element is in said first position transmits fluid from the first inlet to the first outlet, a second passage which when the valve element is in said second position transmits fluid from the second inlet to the second outlet and an auxiliary passage which when the valve element is in the second position transmits fluid from the second inlet to the first outlet.

6. In a soot blower, the combination of elements defined by claim 1 in which the control means comprises a generally cylindrical casing having a first inlet and a second inlet spaced apart generally longitudinally of the casing, a first outlet generally opposed to the first inlet and a second outlet generally opposed to the second inlet, the shiftable valve consisting of a turnable generally cylindrical valve element and being disposed in the casing, the valve element having a first passage

which when the valve element is in said first position transmits fluid from the first inlet to the first outlet but which when the valve element is in said second position is in non-communicating relationship with the first inlet and the first outlet and having a second passage which when the valve element is in the first position is in non-communicating relationship with the second inlet and the second outlet but which when the valve element is in the second position transmits fluid from the second inlet to the second outlet, the valve element also having auxiliary passage means which when the valve element is in the second position transmits fluid from the second passage to the first passage and thence to the first outlet.

7. In a soot blower, the combination of elements defined by claim 1 in which the control means comprises a generally cylindrical casing having a first inlet and a second inlet in longitudinal alignment at one side of the casing, a first outlet diametrically opposed to the first inlet and a second outlet diametrically opposed to the second inlet, the shiftable valve consisting of a turntable generally cylindrical valve element and being disposed in the casing, the valve element having a first passage which when the valve element is in said first position transmits fluid from the first inlet to the first outlet but which when the valve element is in said second position is in non-communicating relationship with the first inlet and the first outlet and having a second passage which when the valve element is in the first position is in non-communicating relationship with the second inlet and the second outlet but which when the valve element is in the second position transmits fluid from the second inlet to the second outlet, the valve element also having an auxiliary passage extending between the first passage and the second passage and a delivery passage extending from the first passage to the first outlet when the valve element is in the second position so that when the valve element is in the second position fluid is transmitted from the second inlet to both outlets.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,988,024 June 13, 1961

Robert L. Harris

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 72, for "almost" read -- also --; column 3, line 73, for "90" read -- 90° --; column 6, line 22, for "turntable" read -- turnable --.

Signed and sealed this 14th day of November 1961.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents

USCOMM-DC