

valve body having a separating wall inside thereof; a first chamber and a second chamber formed in the valve body 1 by the separating wall; a particle inlet opening and a particle outlet opening both provided in said first chamber; a control air inlet/outlet port provided in said second chamber; a valve rod which penetrates said partition wall to extend over the first chamber and the second chamber in a slidable manner so as to adjust to a valve seat formed at the particle inlet opening; a valve element provided at an end portion of the valve rod so as to open or close the valve seat by the sliding of said valve rod; a sliding disc provided at a part of the valve rod positioned in the first chamber so as to slide freely along to inside wall of said first chamber in a closely contact manner; a piston fixedly mounted to the valve rod positioned in the second chamber so as to press said valve rod against the valve seat by pressurized air applied from the control air inlet/outlet port; a ring shock absorber provided at the peripheral of the separating wall positioned in the second chamber; an adjust bolt screwed into a wall opposite to the ring shock absorber positioned in the second chamber so as to determine maximum valve clearance of the valve seat by connecting with the other end portion of the valve rod; and a regulating spring arranged around the valve rod positioned between the piston and the opposite wall in the second chamber 16.

Further, the particle supply valve for use in the blasting apparatus according to the present invention is characterized in that a slidable disc is fixed to the sliding rod in the first chamber.

Further, the particle supply valve for use in the blasting apparatus according to the present invention is characterized in that a bolt adjusting means is provided for restricting the movable range of the sliding rod within the second chamber.

Further, the particle supply valve for use in the blasting apparatus according to the present invention is characterized in that the valve body, diaphragm, sliding-rod, piston and sliding disc are all made of brass.

Further, the particle supply valve for use in the blasting apparatus according to the present invention is characterized in that the diaphragms are provided with an absorption material for absorbing abutting impact with said piston.

In summary, because the particle supply valve according to the present invention does not use diaphragms made of rubber, it is possible to avoid structurally the deterioration of elasticity characteristics associated with such construction. As a result the present invention provides a particle supply valve which prevents leakage of particles.

Furthermore, because the diaphragm, sliding disc and piston enable the sliding rod to maintain its sliding characteristics, it is possible to consistently carry out a proper sliding operation with the sliding rod. As a result, the valve element fixed to the sliding rod can consistently be brought into contact with the opening at a prescribed position thus making it possible to prevent particles from leaking through the valve seat.

Moreover, because the biasing means is constantly pushing the sliding rod to the left in the particle supply valve according to the present invention, even if the flow of control air which pressurizes the second chamber suddenly stops during the blasting operation, for example, when the power source of the blasting apparatus is accidentally shut off, the valve element is not retracted from the opening. Therefore, even in such a case, it is possible to prevent the particles from being ejected from the outlet opening.

Moreover, because the sliding disc of the particle supply valve according to the present invention is fixed to the sliding rod inside the first chamber, it is possible to prevent particles from entering into the sliding surface between the penetration hole and the sliding rod, thus making it possible to maintain an airtight seal between the first chamber and the second chamber over a long period of time.

Moreover, by operating the adjust bolt of the particle supply valve according to the present invention, it is possible to adjust the amount of particles and compressed air being supplied to the nozzle of the blasting apparatus.

Furthermore, because the valve body, diaphragm, sliding rod, piston and sliding disc of the particle supply valve according to the present invention are made of brass, it is possible to maintain the original characteristics of the valve over a long period of time.

Moreover, because the diaphragm of the particle supply valve according to the present invention is provided with a shock absorber to absorb the impact of the piston against the diaphragm, it is possible to prevent the valve element from being damaged when the second chamber experiences a sudden rise in pressure.

Brief Description of the Drawings

Fig. 1 is a cross-sectional view which shows the condition in which an opening of one embodiment of a particle supply valve according to the present invention is closed;

Fig. 2 is a cross-sectional view which shows the condition that the opening of the particle supply valve shown in Fig. 1 is opened; and

Fig. 3 is a cross-sectional view of a conventional particle supply valve.

Detailed Description of the Preferred Embodiment

With reference to the drawings, a detailed description of the preferred embodiment according to the present invention will now be given below.

Fig. 1 is a cross-sectional view of a particle supply valve for use in a blasting apparatus according to this embodiment, in which the valve is shown in a closed state. Fig. 2 is a cross-sectional view of the same valve shown in Fig. 1, in which the valve is shown in an opened state. The present invention relates to a valve which controls the amount of abrasive particles delivered to a blasting apparatus, in which the valve controls the amount of abrasive particles stored in a hopper and pushed out of the hopper by being applied pressurized air so as to be supplied thereto and ejects the abrasive particles flowed out of a delivery opening by mixing with compressed air so as to delivery the abrasive particles into a blasting chamber through a nozzle.

As shown in Figs. 1 and 2, the particle supply valve has a valve body 1 made of brass. The valve body 1 is provided with an inlet opening 2 which allows particles pushed out by means of pressurized air to pass into the valve, an outlet opening 3 which allows particles to pass out of the valve, and a control air inlet/outlet port 4 which allows control air to be supplied to and released from the valve.

Further, a brass partition wall 10 is provided inside the valve body 1 as an integral part thereof to partition the space inside the valve body 1 into a first chamber 15 and a second chamber 16. The inlet opening 2 and the outlet opening 3 both communicate with the first chamber 15, and the control air inlet/outlet port 4 communicates with the second chamber 16.

Further, a sliding rod 7 which is also made of brass is slidably inserted through a penetration hole 11 formed in the central portion of the partition wall 10. Provided on the tip end of the left side portion of the sliding rod 7 is a hard rubber valve element 6. The hard rubber valve element 6 is formed in the shape of a half sphere. The valve element 6 fixed to the sliding rod 7 can be brought into contact with a valve seat 5 of the inlet opening 2 in order to shut off the supply of particles flowing into the first chamber 15 of the valve. To accomplish this function, the valve element 6 is preferably formed to have a diameter that is larger than the diameter of the valve seat.

Also, provided in the first chamber 15 is a brass sliding disc 9 which is fixed to the sliding rod 7. The sliding disc 9 is formed such that the outer circumferential surface thereof is in sliding contact with the inner circumferential wall surface of the first chamber 15. As a result, the sliding disc 9 makes it possible to separate the first chamber 15 into a first space which receives particles and a second space which is kept free of particles.

Provided in the second chamber 16 is a brass piston 8 which is fixed to the sliding rod 7. The outer circumferential surface of the piston 8 is in sliding contact with the inner circumferential surface of the second chamber 16. The outer circumferential surface of the piston 8 is widened to stabilize the sliding movement of the sliding rod 7.

and to provide a highly effective airtight seal against the control air pressure in the second chamber 16. Further, a hard rubber shock absorber 17 is provided on the wall surface of the partition wall 10 in the second chamber 16.

Further, a regulating spring 12 comprised of a metal spring is provided in the second chamber 16 between a protruding portion formed at an end portion of the sliding rod 7 which lies in the second chamber 16 and the inner wall surface of the second chamber 16 which directly faces the protruding portion of the sliding rod 7. In particular, one end of the regulating spring 12 is secured around the protruding portion of the sliding rod 7 and the other end of the regulating spring 12 is secured inside a valve spring retainer 13 provided on the inner wall surface of the second chamber 16. Further, an adjust bolt 14 is inserted through the valve body 1 in a manner that allows an end portion thereof to be screwed into the second chamber 16. Moreover, the adjust bolt 14 has a head portion lying outside the valve body 1 which can be turned to adjust the length of the end portion thereof protruding within the second chamber 16, in other words, the stroke of the valve rod 7.

Now, when the supply of particles and compressed air to a nozzle (not shown) is to be shut off, as shown in Fig. 1, control air is passed into the second chamber 16 through the control air inlet/outlet port 4 to pressurize the second chamber 16, thereby causing the piston 8 to be pushed toward the first chamber 15, and this in turn causes the sliding rod 7 to slide to the left direction, whereby the valve element 6 is forced in to the valve seat 5 to seal off the inlet opening 2.

On the other hand, when particles and compressed air are to be supplied to the nozzle, the control air in the second chamber 16 is released through the inlet/outlet port 4 to depressurize the second chamber 16, thereby causing the piston 8 to retract in a direction toward the second chamber 16, and this in turn causes the sliding rod 7 to slide to the right direction, whereby the valve element 6 is pulled out of the valve seat 5 (i.e., the valve element 6 moves to the right direction in Fig. 2). As a result, particles first flow into the first chamber 15 from the inlet opening 2 through the space created between the valve seat 5 and the valve element 6, and then flow out through the outlet opening 3 to be supplied to the nozzle.

In this connection, because the sliding disc 9 separates the first chamber 15 into a first space which receives particles and a second space which is kept free of particles, it is possible to prevent particles from entering into the sliding surface between the penetration hole 11 and the sliding rod 7. As a result, it is possible to prevent the sliding surface from being abraded by the particles. Further, by turning the adjust bolt 14 in the clockwise direction to increase the protruding length of the end portion thereof inside the second chamber 16, it is possible to reduce the distance between the left end of

the adjust bolt 14 and the right end of the sliding rod 7, and this distance defines the retraction distance of the valve element 6. Namely, as shown in Fig. 2, when particles are being supplied to the nozzle, the left end of the adjust bolt 14 is in contact with the right end of the sliding rod 7 to restrict further the movement of the sliding rod 7. Consequently, it is possible to control the amount of particles and compressed air being supplied to the nozzle by turning the adjust bolt 14 to adjust the protruding length of the end portion thereof inside the second chamber 16.

Furthermore, because the valve body 1, diaphragm 10, sliding rod 7, piston 8 and sliding disc 9 are made of brass, they have a higher hardness than the particles. As a result, the valve is imparted with excellent antiabrasion characteristics.

Moreover, because the wall surface of the partition wall 10 that lies inside the second chamber 16 is provided with the hard rubber shock absorber 17, it is possible to absorb the impact of the piston 8 against the partition wall 10, and this makes it possible to prevent the valve element 6 from being damaged when the second chamber 16 experiences a sudden rise in pressure.

What is Claimed is:

1. A particle supply valve for use in a blasting apparatus, wherein said valve supplies abrasive particles to the blasting apparatus by means of applying pressurized air, comprising:

a valve body having a separating wall inside thereof;

a first chamber and a second chamber formed in the valve body 1 by the separating wall;

a particle inlet opening and a particle outlet opening both provided in said first chamber;

a control air inlet/outlet port provided in said second chamber;

a valve rod which penetrates said partition wall to extend over the first chamber and the second chamber in a slidable manner so as to adjust to a valve seat formed at the particle inlet opening;

a valve element provided at an end portion of the valve rod so as to open or close the valve seat by the sliding of said valve rod;

a sliding disc provided at a part of the valve rod positioned in the first chamber so as to slide freely along to inside wall of said first chamber in a closely contact manner;

a piston fixedly mounted to the valve rod positioned in the second chamber so as to press said valve rod against the valve seat by pressurized air applied from the control air inlet/outlet port;

a ring shock absorber provided at the peripheral of the separating wall positioned in the second chamber;

an adjust bolt screwed into a wall opposite to the ring shock absorber positioned in the second chamber so as to determine maximum valve clearance of the valve seat by connecting with the other end portion of the valve rod; and

a regulating spring arranged around the valve rod positioned between the piston and the opposite wall in the second chamber.

PARTICLE SUPPLY VALVE FOR USE IN BLASTING APPARATUS

Abstract

A leakproof particle supply valve for use in a blasting apparatus is provided, which uses a piston and a biasing means instead of rubber partition walls in order to avoid structurally the deterioration of elasticity characteristics, thereby preventing leakage of compressed air and particles.

The particle supply valve is characterized in that the valve is comprised of a valve body (1) having an inside space; a diaphragm (29) for separating the inside space of the valve body (1) into a first chamber (15) and a second chamber (16); a particle inlet port and a particle outlet port both provided in the first chamber (15); a control air inlet/outlet port (4) provided in the second chamber (16); a sliding rod (7) which passes through the diaphragm (29) in a slidable manner, the slidable rod (7) having a first end portion positioned in the first chamber (15) and a second end portion positioned in the second chamber (16); a valve element (6) fixed to the first end portion of the sliding rod (7) in the first chamber (15); a piston (8) fixed to the sliding rod (7) in the second chamber (16); and a biasing means for pushing the second end portion of the sliding rod (7) in the second chamber (16).

Fig. 1