March 13, 1945. A. H. EPPLER 2,371,434

SAND BLAST MIXER VALVE

Filed May 3, 1943

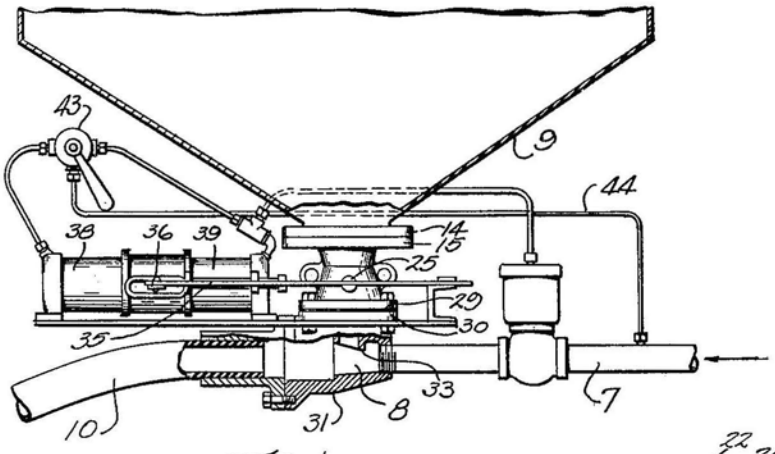

Fig. 1.

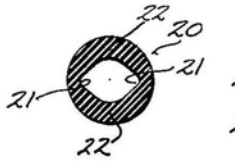

Fig. 4.

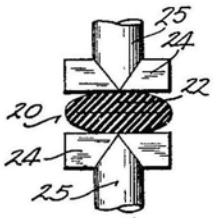

Fig. 5.

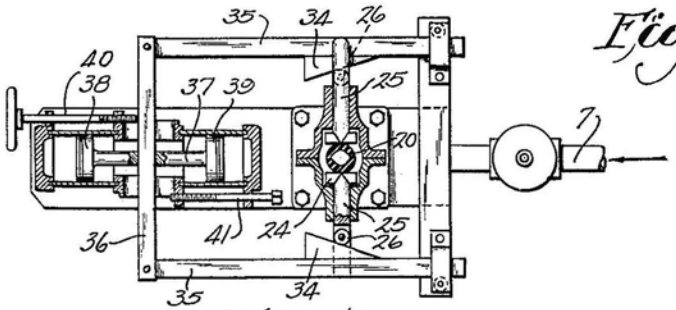

Fig. 2.

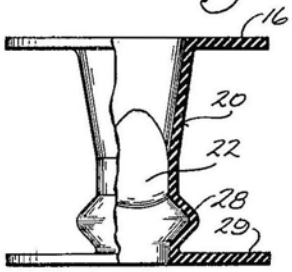

Fig. 6.

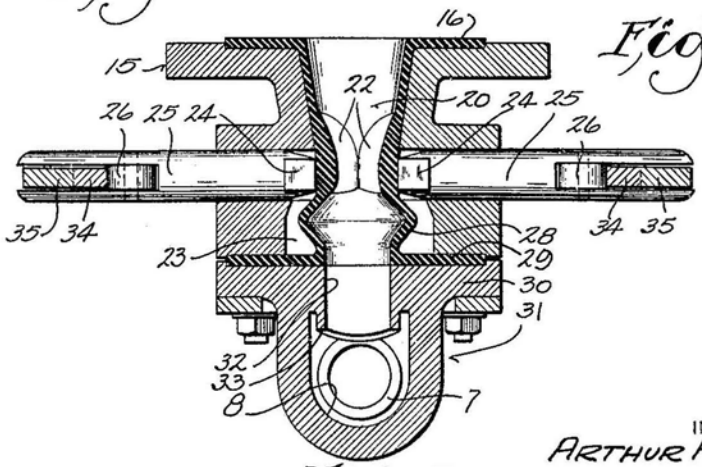

Fig. 3.

INVENTOR
ARTHUR H. EPPLER
BY
Wheeler, Wheeler & Wheeler
ATTORNEYS.

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SANDBLAST MIXER VALVE

Arthur H. Eppler, Milwaukee, Wis.

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8 Claims. (Cl. 51—12)

This invention relates to improvements in sand blast mixer valves.

It is the primary object of the invention to provide a novel and improved mixer and valve structure permitting of precision adjustment of the valve through which the sand is admitted to the mixer and enabling full control of the sand without objectionable wear on the controlling parts.

It is a further object of the invention to provide a novel and improved deformable flow tube anchored at both of its ends and having an intermediate portion specially shaped for the particular purposes of the invention.

It is a still further object of the invention to provide a mixer structure in which the valve parts for controlling flow accomplish their function in such a way as not to involve any undue enlargement of the mixing chamber such as might permit expansion of the air at the very point where its velocity should be maintained high.

Other objects of the invention will be apparent to those skilled in the art on the basis of the following disclosure.

In the drawing:

Fig. 1 shows partially in side elevation and partially in section a mixer and valve organization, the sand hopper and air and sand blast pipes being fragmentarily illustrated.

Fig. 2 is a view taken in horizontal section through the apparatus shown in Fig. 1.

Fig. 3 is an enlarged detail view in vertical section through the valve and mixer chamber of the apparatus shown in Fig. 1, said view being taken at right angles to Figure 1 and showing the right-hand half or inlet portion of said valve and mixing chamber.

Fig. 4 is a detail view in cross section on an enlarged scale through the throat of the control valve device of Fig. 3, showing such throat open.

Fig. 5 is a similar view showing the application of pressure members to the throat whereby the throat is closed.

Fig. 6 is a detail view partially in side elevation and partially in section showing the valve member on an enlarged scale, the section being at right angles to the section shown in Fig. 3.

Like parts are identified by the same reference characters throughout the several views.

Air under pressure is supplied through the pipe 7 to the mixing chamber 8 where sand from the hopper 9 is introduced into the air subject to the control of the valve hereinafter to be described. The air and entrained sand leave through the sand blast hose 10.

Intervening between hopper 9 and the mixing chamber 8 is a sand delivery valve fitting shown in enlarged detail in Fig. 3. The bottom of the hopper 9, as shown in Fig. 1, has an annular flange at 14 to which the flange 15 of the valve fitting is complementary. Between these two flanges is clamped the annular flange 16 of the tubular rubber valve member 20 to which the fitting is complementary.

While generally annular in form, the wall of the rubber valve member 20 is not truly circular in cross section. With the valve open, the wall at the point where flow is controlled preferably has the form indicated in Fig. 4, being somewhat elliptical in its interior section, but with rather pointed ends 21 rather than the rounded ends of a true ellipse. Between the apices of the elliptical opening, the side wall portions of the tube are thickened at 22 (in Figs. 3 and 6) to provide padlike valve elements. Above these elements, the casing is closely fitted exteriorly to the tube 20. At and below these elements, the casing is chambered at 23. Within the chamber of the casing are the heads 24 of plungers 25, each of which is reciprocably guided in the casing and provided with a cam roller 26 for its reciprocation.

The heads 24 of the respective plungers 25 are opposed to each other and engaged with the rubber valve tube 20 outside of the thickened areas or pads 22 so that when the plungers 25 are forced toward each other, the pads are forced into engagement, the tube becoming flattened and flow therethrough cut off, as indicated in Fig. 5.

To provide increased flexibility for the tube 20, the tube is expanded at 28 immediately below the valve pads 22 and immediately below the point of exterior engagement of the plunger heads 24 with the tube.

At its lower end, the tube has another annular flange at 29 which is clamped between the lower end of the valve casing and a complementary flange 30 at the top of the fitting 31 within which the mixing chamber 8 is provided. A duct 32 in fitting 31 is of the same cross section as the lower end of the rubber tube 20, preferably registering exactly therewith, as indicated in Fig. 3. A very short beveled nozzle 33 constitutes an extension of the duct 32 into the mixing chamber 8 in such a way as to assist the air traversing the mixing chamber 8 in aspirating sand from the nozzle. The bevel of the lower end of the nozzle is such that there is virtually no nozzle extension at the discharge side.

The cam follower rollers 26 on the respective

plungers 25 which close the valve are operated by cams 34 carried by the parallel arms 35 of a yoke 36 which may conveniently be actuated by the double end piston 37 whose respective ends operate in cylinders 38 and 39. Manually adjustable set screws 40 and 41 limit the movement of the yoke under pressure of the air in cylinders 38 and 39. A control valve 43 supplied by means of tube 44 with air from the air pressure line 7 is arranged to admit air to either of the cylinders 38 or 39 under control of the operator.

The setting of the adjustable stop members 40 and 41 accurately adapts the apparatus to its particular requirements. The stop member 41 will not require frequent change as it limits the closing of the valve and is intended to prevent damage to the deformable rubber valve element 20. The member 40 has a hand wheel for its adjustment. It defines the extreme opening of the valve and will ordinarily be varied according to the grade of sand with which the device is operated.

It will be understood that the apparatus may be operated by means other than air pressure.

The peculiar form of the tubular rubber valve member 20 has been found very desirable as a means of achieving precision control of the sand and avoiding injury to the member when the sand is completely cut off, as shown in Fig. 5. The shape of the throat when open, as shown in Fig. 4, and the provision of the pads at 22, make it possible to cut off the sand flow without subjecting the tube to such deformation as would cause the cracking of a tube of circular cross section and uniform wall thickness. The fact that the tube is anchored at both ends is another important factor, the flanges 16 and 29 facilitating such anchorage.

While the valve functions very close to the mixing chamber 8, it will be noted that the valve control is effectuated without any enlargement of the mixing chamber, this being another important result of the arrangement whereby the lower as well as the upper end of the tube is anchored. The high air velocity is maintained through the mixing chamber 8 with no appreciable expansion. The peculiar form of the rubber valve member 20 is believed to be entirely new for the purposes of this invention and this member constitutes a separate article of manufacture used primarily, if not exclusively, in the valve structure herein disclosed, but replaceable when damaged.

I claim:

1. A device of the character described comprising the combination with a deformable valve tube, of headed pressure members reciprocable laterally of said tube in opposition to each other for tube deforming operation, and means for the reciprocation of said members, said means comprising a yoke movable transversely of the respective members and provided with cam means for acting conjointly upon the respective members for moving them in opposite directions.

2. A device of the character described comprising the combination of a valve tube annularly flanged at its ends and provided intermediate such ends with oppositely disposed thickened wall portions constituting an interior pad, the opening through said tube between said pads being generally elliptical, and said tube having an annularly enlarged portion adjacent said pads, a casing having a chamber within which the annularly enlarged portion of said tube is disposed, the flanges of the respective ends of the tube being engaged with said casing, a pair of plungers reciprocable in opposite directions laterally of the tube and headed for engagement therewith at said thickened wall portions for pressing said portions toward each other in flow constricting relation, said casing having bearings within which said plungers are reciprocable, cam followers at the outer ends of the respective plungers, a transversely reciprocable yoke having cam means operatively engaged with said followers for urging said plungers concurrently toward said tube, means for actuating said yoke, and means for adjustably limiting the stroke thereof whereby to define the extreme positions of said pads respecting each other.

3. A sand blast mechanism including the combination with a sand supply hopper, of a mixing chamber and a rubber tube connecting the hopper with the mixing chamber for sand delivery to the latter, said tube having a throat portion providing a constricted passage, elongated in cross section, and also having an adjacent portion enlarged relatively to the throat and end portions of the tube, a chambered fitting having upper and lower end portions clamped to the hopper and mixing chamber, respectively, with the ends of said tube interposed, and manually adjustable means carried by the fitting for applying pressure to opposite sides of the throat portion, whereby the flow of sand to the mixing chamber may be regulated, said mixing chamber having a sand blast outlet and an air blast inlet aligned therewith.

4. In a sand blast mechanism, the combination with a sand supply hopper, a mixing chamber in fixed relation thereto and provided with inlet and sand blast delivery connections, of a deformable tubular valve member having its ends fixedly secured to the hopper and mixing chamber, respectively, and providing a passage for feeding sand from the hopper into the path of air delivered to the mixing chamber through said air inlet, said member having a relatively restricted throat portion and an adjacent enlarged and relatively axially extensible portion as compared with the other portions of the tube, and manually controllable means for applying pressure to opposite sides of the throat portion to collapse and close the same.

5. The device of claim 4 in which said member has opposing wall portions thickened at the points of pressure application to provide internal pads cooperative to restrict flow through said member upon the deformation thereof, said member having an annularly enlarged portion between said pads and the end anchored to said fitting.

6. The device of claim 4 in which said member has opposing wall portions thickened at the points of pressure application to provide internal pads cooperative to restrict flow through said member upon the deformation thereof, said member having an annularly enlarged portion between said pads and the end anchored to said fitting, together with a casing having a chamber in which the annularly enlarged portion of said member is disposed, said casing conforming closely to the shape of said member at the other side of said pads and being in connection with said fitting.

7. A deformable tubular valve member for sand blast apparatus and the like, said member being of substantially uniform thickness in its end portions and at two opposite sides of its intermediate portion, the other two sides of its intermediate portion being progressively thickened to pro-

vide opposing pressure receiving pads and forming a transversely extending oblong throat, the end walls of which are of substantially the same thickness throughout the area between the pads and having rounded surfaces affording no lodgement for sand.

8. In a sand blast device, the combination of a fitting provided with a sand passage, a deformable tubular valve member lining said passage, the central portions of said valve member constituting a throat portion of a generally oval cross section with the throat, at the ends of the oval, cylindrically curved and of substantially uniform thickness those portions of the throat connecting the cylindrically curved portions being progressively thickened in the direction of the center of the side portions of the throat in the form of pad-like interior projections, and means carried by the fitting for manually applying exterior pressure to at least one of said thickened portions to vary the capacity of said throat.

ARTHUR H. EPPLER.