Sept. 25, 1962 R. L. LUCE 3,055,149

SAND BLAST GUN

Filed March 23, 1959

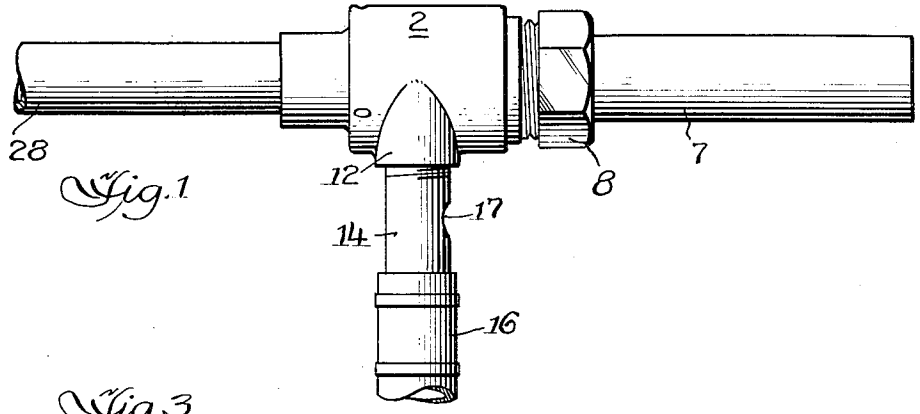
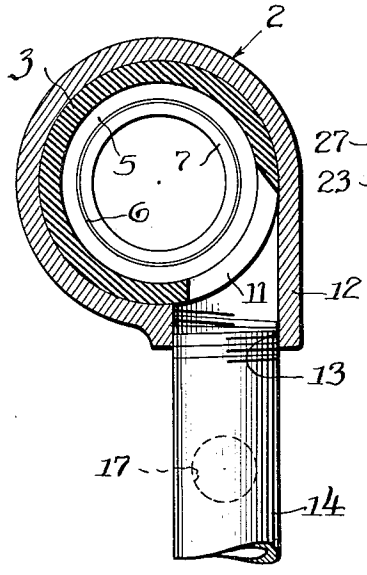


Fig. 1

Fig. 3



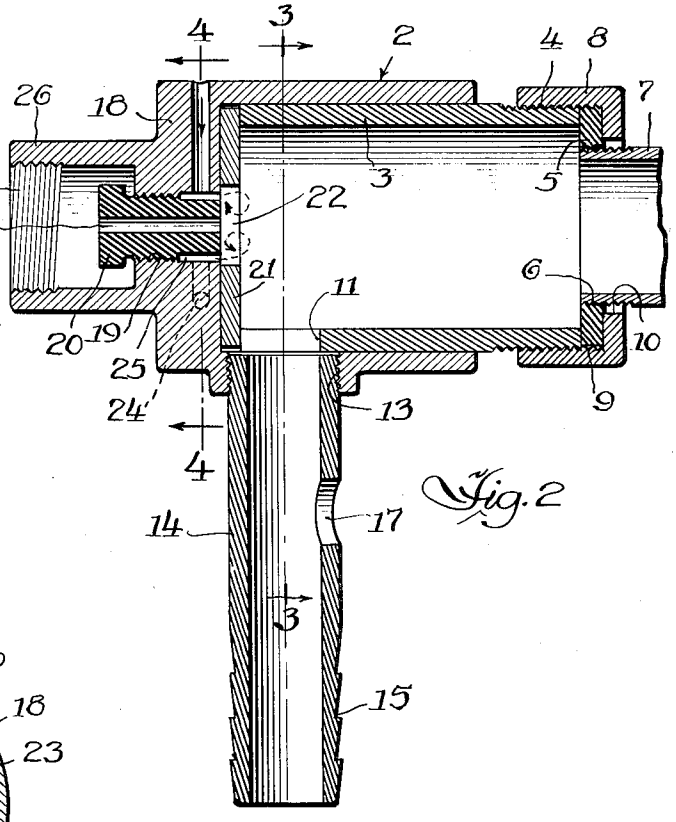


Fig. 2

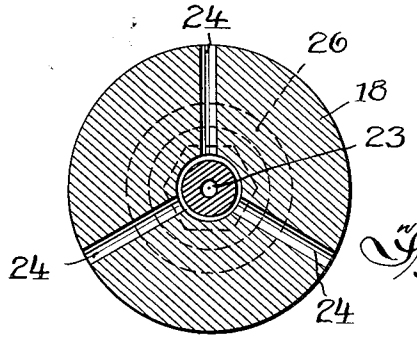


Fig. 4

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SAND BLAST GUN

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The present invention relates to a sand blash gun adapted to propel a jet of water having sand entrained therein against a surface to be cleaned, and is particularly concerned with means for improving the efficiency of such guns by controlling the admission of sand to the mixing chamber.

In guns of this type water is forced into a mixing chamber at high velocity. A sand slurry is pumped into the mixing chamber and mixed with the stream of water to entrain the sand from the slurry into the water. The water with the sand entrained therein is forced through the discharge nozzle in the form of a jet stream. If the amount of sand slurry pumped into the mixing chamber is greater than the amount that can be entrained in the water, the excess sand slurry will cause a decrease in the concentration of the blasting stream and thereby impair the efficiency of the sand blast gun.

In accordance with the present invention, the sand slurry inlet is arranged tangentially to the mixing chamber so as to facilitate the entrance of the sand slurry into the stream of water without slowing the travel of the water. The feed line for the sand slurry is provided with an opening in the side below the mixing chamber which serves as a bleed-off. The excess sand slurry that cannot be entrained in the stream of water by-passes the mixing chamber by flowing out of the feed line through the bleed-off opening, and back to the tank or receptacle from which the sand slurry is pumped.

A structure by means of which the above mentioned and other advantages of the invention are attained will be described in the following specification, taken in conjunction with the accompanying drawings, showing a preferred illustrative embodiment of the invention, in which:

FIGURE 1 is a side elevational view of a sand blast gun embodying the invention;

FIG. 2 is a fragmentary cross sectional view of the sand blast gun;

FIG. 3 is a cross sectional view taken along the line 3—3 of FIG. 2; and

FIG. 4 is a cross sectional view taken along the line 4—4 of FIG. 2.

The sand blast gun comprises a gun body 2 and a cylindrical pipe liner 3 which serves as a mixing chamber. One end of the pipe liner is threaded, as indicated at 4, and an annular washer 5 is positioned against the open end of the pipe liner. The washer is threaded on its inner edge, as indicated at 6, to receive one end of a discharge nozzle 7. A coupling 8, having an interior thread 9 on its cylindrical wall and provided with an aperture 10 slightly larger than the outside diameter of the discharge nozzle is screwed onto the threaded end of pipe liner 3 and tightened against washer 5 to hold the washer and discharge nozzle 7 tightly against the open end of the mixing chamber.

The pipe liner is provided with an opening 11 in its cylindrical wall adjacent one end thereof, and the wall of gun body 2 is bulked outwardly to form an extension 12 (FIGS. 1 and 3) having a threaded opening 13 in tangential registration with opening 11 to receive one end of a feed line 14 through which a sand and water slurry is pumped into the mixing chamber. The outer end of slurry feed line 14 is serrated as indicated at 15, to receive one end of a hose 16 connected at its other end to a pump (not shown).

The tangential relationship between slurry feed line 14 and opening 11 causes the sand slurry to enter the mixing chamber along a tangential path adjacent the inner wall surface of pipe liner 3. The sand slurry travels around the outer circumferential portion of the stream of water forced through the mixing chamber, rather than directly through the center of said stream, so that it does not slow down the velocity of the stream to any substantial extent. The tangential entry of the slurry causes the sand to be distributed uniformly throughout the cross sectional area of the stream of water. The water passing through the mixing chamber entrains as much of the sand from the slurry as it can hold, and carries it out of the mixing chamber at high velocity. Accordingly, the amount of sand forced through feed line 14 is greater than the amount that can be entrained in the stream of water, thereby providing an excess of sand in the feed line.

It is desirable to entrain a maximum amount of sand in the water being forced through the mixing chamber. When the water has the maximum amount of sand that it can hold entrained, pumping any additional slurry into the mixing chamber results in decreased concentration of the blasting stream. The tangential feed of sand slurry into the mixing chamber causes the slurry to rotate around the inner circumference of the mixing chamber, and when no more sand can be entrained in the water, the sand slurry rotating around the inner circumference of the mixing chamber forms an effective barrier to prevent entrance of additional slurry into the mixing chamber.

Slurry feed line 14 is provided with an opening 17 which serves as a bleed-off to cause the excess sand slurry to by-pass the mixing chamber by flowing through opening 17 back into the tank or other receptacle (not shown) from which it is pumped. Accordingly, the amount of sand slurry pumped into the mixing chamber is never in excess of the amount required to carry the sand that can be entrained in the stream of water being forced through the mixing chamber.

Gun body 2 comprises a casting which is closed at one end by a comparatively thick wall 18 provided with a threaded aperture 19 into which a jet 20 is threaded. A plate 21 is positioned within gun body 2 between wall 18 and the adjacent end of pipe liner 3. Plate 21 is provided with a central opening 22 slightly larger than the end of jet 20 with which it registers. Jet 20 is provided with a longitudinal bore 23 through which a jet stream of water is forced into the mixing chamber at high velocity.

Wall 18 is provided with a plurality of radial bores 24 to permit air from the atmosphere to be sucked into the jet stream. The end of jet 20 adjacent opening 22 is recessed, as indicated at 25, to form a passageway for air sucked in from the atmosphere to pass into the mixing chamber. A short pipe section 26, extending outwardly at right angles from wall 18, is threaded, as indicated at 27, for connection to a high pressure water line 28. Water forced through line 28 under high pressure is discharged from bore 23 into the mixing chamber at high velocity and sucks in air from the atmosphere through openings 24 and 25 as it passes into the mixing chamber.

The air sucked into the mixing chamber by the stream of water passing through opening 22 at high velocity forms a cushion of air around the end of jet 20 adjacent opening 22 to protect the jet from the abrasive action of the sand contained in the sand and water slurry pumped into the mixing chamber through feed line 14. The velocity of the stream of water with sand entrained therein tends to keep the stream axially aligned with the mixing chamber and discharge nozzle at the end of the mixing chamber. The air tends to keep the stream of water and entrained sand concentrated against expansion, and thereby protects the inner surface of discharge nozzle 7 from the

abrasive action of the sand as the stream of water and sand is discharged therethrough at high velocity.

In the operation of the sand blast gun in accordance with the present invention, water is forced through feed line **28** and jet bore **23** into the mixing chamber at a high velocity. The sand slurry pumped through feed line **14** enters the mixing chamber tangentially and the sand is entrained with the water. The water, with sand entrained therein, is forced through discharge nozzle **7**. The jet stream of water passing through opening **22** into mixing chamber **3** creates a suction adjacent the end of the mixing chamber which sucks air from the atmosphere through openings **24** and **25**. This air circulates in the vicinity of the end of jet **20**, and forms a cushion of air which protects adjacent end of jet **20** from the abrasive action of the sand. The velocity of the sand and water slurry is sufficient to prevent the sand from settling out, but is not great enough to force it into the stream of water after the water has as much sand as it can hold entrained therein.

The velocity of the stream of water and sand through mixing chamber **3** causes it to be propelled forwardly into discharge nozzle **7** along a straight line extending through the center of the mixing chamber in axial alignment with the discharge nozzle **7**. As the sand and water slurry moves around the water in the mixing chamber, sand from the slurry is entrained in said water and carried forwardly through the discharge nozzle by the jet stream at a high velocity. The air circulates around the inner wall surface of the mixing chamber and forms a cushion of air around the outside of the jet stream of water and entrained sand to help protect the nozzle from the abrasive action of the sand. Although the sand slurry passing into the stream of water in the mixing chamber to entrain the sand in the water of the stream creates a turbulence, the amount of turbulence is kept to a minimum by the tangential entry of the slurry into the mixing chamber. The turbulence is local, and is confined to the proximity of inlet **22**.

The gun may be used for various blasting patterns by the use of special jets. For example, discharge nozzle **7** may be eliminated by use of a fan type jet.

Although I have described a preferred embodiment of the invention in considerable detail, it will be understood that the description thereof is intended to be illustrative, rather than restrictive, as many details may be modified or changed without departing from the spirit or scope of the invention. Accordingly, I do not desire to be restricted to the exact details of construction described.

I claim:

1. A sand blast gun comprising a mixing chamber, a jet at one end of said chamber for feeding a stream of water into said chamber under pressure, said chamber having a tangentially disposed inlet at one side thereof adjacent said one end, a feed line fitted in said tangential inlet for feeding a sand slurry into said chamber to entrain sand from said slurry in the stream of water in said chamber, an air inlet terminating adjacent the inner end of said jet, whereby air flowing through said inlet provides a cushion of air around the inner end of said jet to protect it against the abrasive action of the sand, and a nozzle at the opposite end of said chamber for discharge of said water and entrained sand from said chamber at high velocity.

2. A sand blast gun comprising a mixing chamber, a jet having its inner end communicating with one end of said chamber for feeding a stream of water into said chamber under pressure, means for feeding a sand slurry tangentially into said chamber to entrain sand from said slurry in the water in said chamber, a nozzle at the opposite end of said chamber for discharge of said water and entrained sand from said chamber at high velocity, an atmospheric air inlet terminating adjacent the inner end of said jet whereby air sucked into said chamber by the stream of water passing from said jet into said chamber circulates in proximity to the inner end of said jet and forms a cushion of air that protects the inner end of said jet and the discharge nozzle from the abrasive action of the sand.

3. A sand blast gun comprising a mixing chamber, a jet having its inner end communicating with one end of said chamber for feeding a stream of water into said chamber under pressure, said chamber having a tangentially disposed inlet at one side thereof adjacent said one end, a feed line fitted in said tangential inlet for feeding a sand slurry into said chamber to entrain sand from said slurry in the stream of water in said chamber, the sand slurry rotating around the inner surface of the mixing chamber and forming an effective barrier to prevent entrance of additional sand slurry into said chamber when the water in said chamber has entrained therein as much sand as it can hold, an opening extending through one wall of said feed line intermediate its length, said opening serving as a by-pass for excess sand slurry being moved toward said mixing chamber, whereby said excess sand slurry flows out of said feed line before it reaches the mixing chamber when the water in the mixing chamber has entrained therein as much sand as it can hold, an air inlet adjacent the inner end of said jet, whereby air sucked through said air inlet by the stream of water passing through said jet provides a cushion of air around the inner end of said jet to protect it against the abrasive action of the sand, and a nozzle at the opposite end of said chamber for discharge of said water and entrained sand from said chamber at high velocity.

References Cited in the file of this patent

UNITED STATES PATENTS

828,361	Winckler	Aug. 14, 1906
2,176,577	Tirrell	Oct. 17, 1939
2,440,643	Pettinos	Apr. 27, 1948
2,489,097	Luce	Nov. 22, 1949
2,503,743	Keefer	Apr. 11, 1950