Aug. 5, 1952 W. C. UHRI 2,606,073

WASHING AND CLEANING GUN

Filed Oct. 24, 1949 2 SHEETS—SHEET 1

FIG. 1.

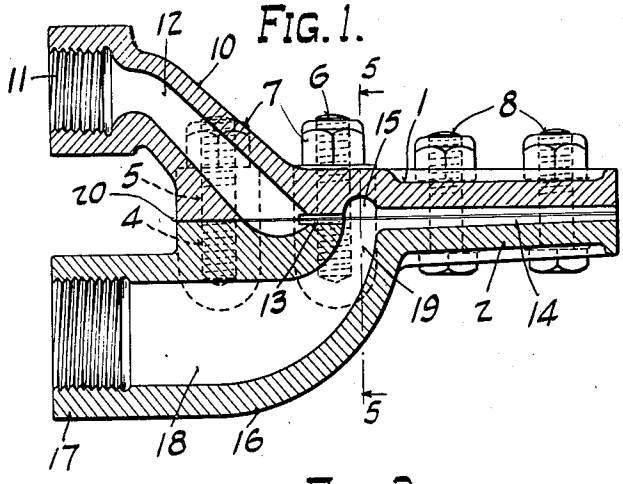


FIG. 4.

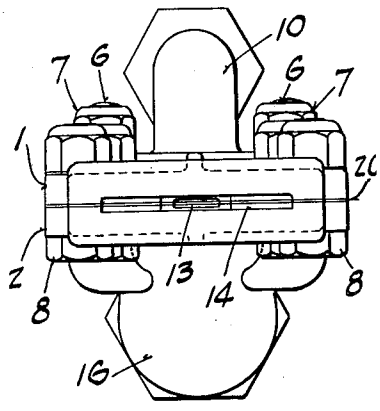


FIG. 2.

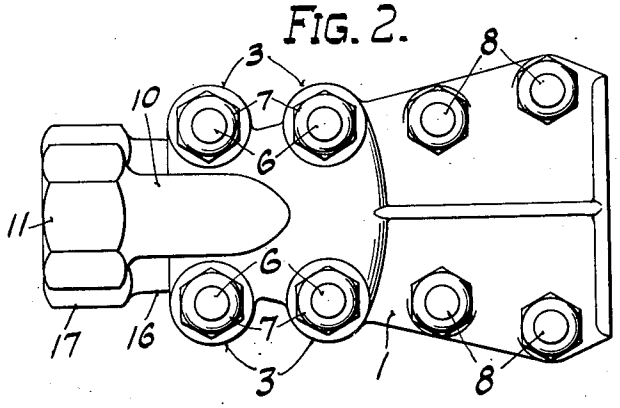


FIG. 5.

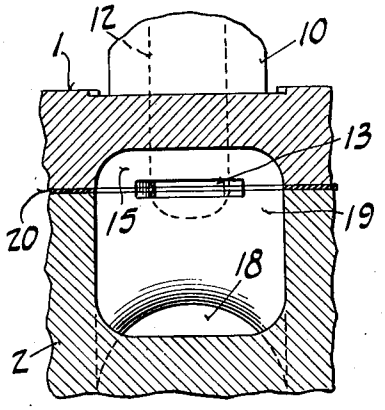
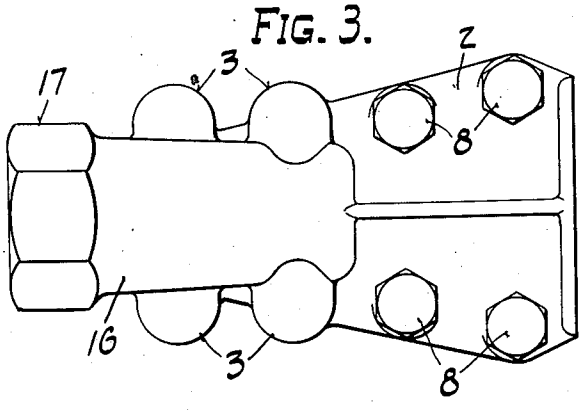


FIG. 3.



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FIG. 6.

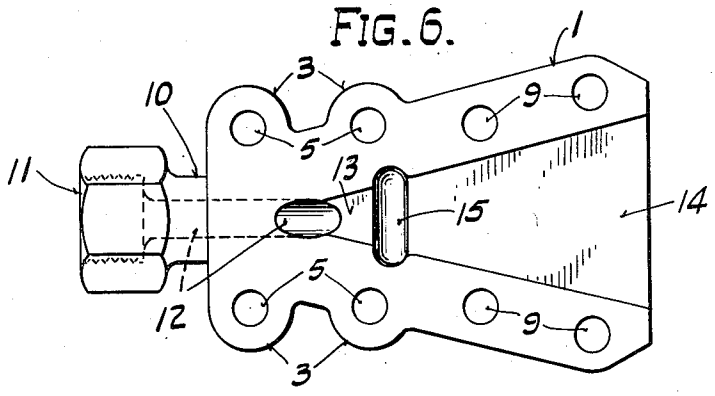


FIG. 7.

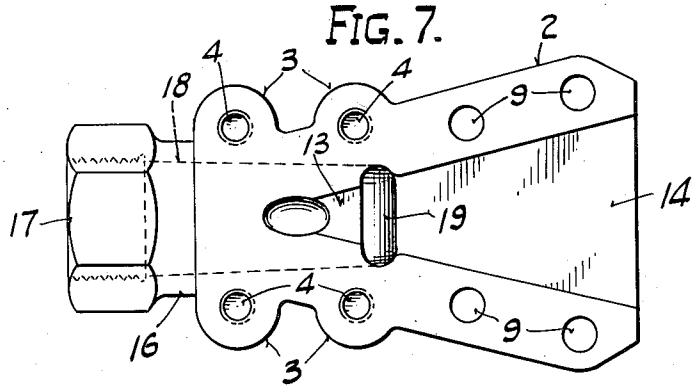
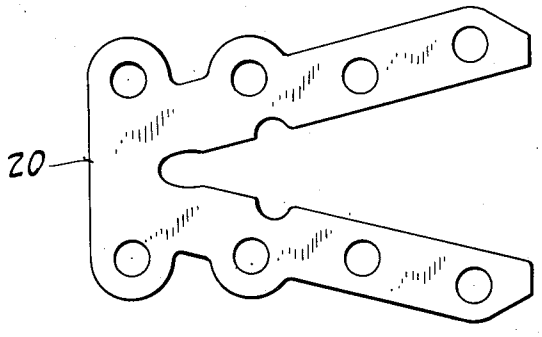


FIG. 8.



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UNITED STATES PATENT OFFICE

2,606,073

WASHING AND CLEANING GUN

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6 Claims. (Cl. 299—154)

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This invention relates in general to a novel construction of nozzle or gun, through which a cleaning fluid is propelled at high velocity, by utilizing air at high pressure as the propellant.

The principal object of the invention is to provide a nozzle which will produce a stream of atomized cleaning fluid, or slurry, having a wide, flat cross-section of uniform atomization throughout its width.

Another object of the invention is to provide a nozzle or gun which may be fabricated from essentially two parts and which may be adjusted to accommodate a cleaning fluid ranging from plain water, to a cleaning slurry composed of a combination of water, a detergent, and an abrasive.

Another object is to provide a nozzle or gun which will deliver a finely atomized mixture of water, a detergent, and an abrasive, for cleaning metal surfaces.

Another object is to provide a nozzle or gun to apply a finely atomized stream of slurry of wide, flat cross-section, at high velocity to remove grease, dirt, rust and scale from metal surfaces.

Another object is to provide a washing and cleaning gun which is relatively simple to construct, is less costly, to make, and which may be quickly and easily adjusted in size for use in delivering a finely atomized stream of cleaning mixtures of varying consistencies.

Other objects and advantages of the invention will appear hereinafter.

The invention is illustrated in the accompanying drawing in which:

Figure 1 is a vertical longitudinal sectional view of the gun;

Fig. 2 is a top plan view;

Fig. 3 is a bottom plan view;

Fig. 4 is an end view from the nozzle end of the gun;

Fig. 5 is an enlarged transverse sectional view of the gun, taken on line 5—5 of Fig. 1;

Fig. 6 is a bottom plan view of the top portion of the gun;

Fig. 7 is a top plan view of the bottom portion of the gun; and

Fig. 8 is a plan view of a gasket interposed between the top and bottom portions of the gun.

Briefly the washing and cleaning gun of the invention embodies an inner elongated orifice for discharging a stream of air or other propellant fluid, which orifice is bounded by substantially parallel sides, and a similarly shaped outer nozzle for discharging a finely atomized stream

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of slurry comprising a mixture of water, detergent, and abrasive. The outer nozzle extends forwardly of the inner orifice for a substantial distance, and confines the combined fluid stream within a restricted but gradually increasing cross-sectional area for a sufficient distance or time, to effect a high degree of atomization. The gun has a chamber between the inner orifice and outer nozzles to insure substantially complete envelopment of a stream of air or other motive fluid, by the slurry mixture.

The gun body shown in the drawing in general comprises upper and lower sections 1 and 2 respectively formed with complementary lugs 3 on the edges of the rear portions thereof with the lugs on the lower section 2 having threaded openings 4 and the lugs of the upper section 1 having holes 5 there-through complementary to openings 4 for the insertion of studs 6 threaded in the openings 4. Nuts 7 threaded onto studs 6 secure the sections together at the rear. The forward portions of the sections are secured together by bolts 8 which extend through aligned holes 9 along the side edges thereof.

The rear portion of upper section 1 is formed with a rearwardly extending upwardly inclined member 10, having its outer end 11 internally threaded for the reception of a conduit for carrying air or other motive fluid to the gun. The member 10 has a passageway 12 extending lengthwise therethrough, which serves to conduct air to the inner orifice hereinafter described. The upper section 1 is of general fan-shape, as best seen in Figs. 2 and 6, its narrow portion being at the rear end and its wide portion being at the forward or delivery end of the gun.

The lower or inner surface of section 1 is machined out, as shown in Fig. 5, to form the upper halves of the inner orifice 13 and outer nozzle 14. The side walls of both orifice 13 and nozzle 14 diverge toward the delivery end of the gun, and the side walls of the nozzle 14 are, in general, a straight line continuation of the side walls of the orifice 13. The upper and lower walls of nozzle 14, converge slightly toward the outer end of the nozzle.

An elongated cavity 15 is disposed transversely in section 1 between the orifice 13 and nozzle 14, the purpose of which will be later explained. The top of the chamber 15 is of generally circular shape and the side walls are machined out as best seen in Figs. 1, 5 and 6.

The lower section 2 of the body includes a generally downwardly and rearwardly extend-

ing member 16, having its outer end 17 provided with screw threads for the reception of a conduit for carrying to the gun, a slurry comprising a mixture of water, detergent, and an abrasive. The member 16 has a passageway 18, extending lengthwise therethrough the inner end of which is curved upwardly into registry with the cavity 15, and which serves as a passageway for the slurry.

The passageway 18 is of generally circular shape for a substantial portion of its length, but near the inner end thereof, it gradually assumes a rectangular shape so that the stream of slurry enters the chamber 15 in a form substantially of the same shape as the chamber 15. This provides for more equal distribution of the slurry mixture entering chamber 15, and cuts down frictional losses which may be quite substantial.

The lower section 2 is of the same shape as the upper section 1, and its inner surface is machined out to form the lower halves of orifice 13 and nozzle 14. The side walls of the lower halves of orifice 13 and nozzle 14 diverge in a like manner, and to the same degree, as their counterparts in the upper body section. The lower wall of nozzle 14 is formed to incline upwardly toward the outer end of the nozzle.

The upper end 19 of passageway 18 is flattened in the longitudinal plane of the member 2 and registers with cavity 15 disposed between the outer end of the orifice 13 and the inner end of the nozzle 14.

When the upper and lower sections, 1 and 2, of the body are assembled, the upper and lower halves of both the orifice 13 and nozzle 14 complement each other to form the orifice and nozzle in their entirety.

A gasket 20 of any suitable material, and of a configuration shown in Fig. 8, corresponding to the mating surfaces of upper and lower sections 1 and 2, is interposed between the upper and lower sections of the body member.

In the device of this invention, it is of particular importance that the slurry mixture completely surround the air or other motive fluid. Means for accomplishing this has been provided by the cavity 15 in the upper body section, and the flattened portion 19 of passageway 18 in the lower body portion.

The orifice 13 and nozzle 14 are so arranged that the slurry stream will be in dynamic flow or motion equally on all sides of the air orifice. In the operation of the device air is introduced through passageway 12 at a velocity of 6000 feet or more per second. At the same time a slurry comprising water, a suitable detergent and an abrasive is forced through passageway 18 at a velocity of substantially 900 feet or more per second. As the slurry is forced through passageway 18, it is directed upwardly into cavity 15 in a flattened stream. As this stream is wider and higher than the flattened jet of air from orifice 13, the stream of air is completely enveloped as it leaves orifice 13 and causes the slurry to be carried along into the nozzle 14 at a high velocity by the stream of air.

As the mixture of air and slurry progresses toward the discharge end of the gun, it spreads out into a substantially wide flat stream due to the configuration of nozzle 14. As has been explained, the upper and lower walls of the nozzle gradually converge toward the discharge end of the gun. This convergence serves to offset any tendency of the thoroughly mixed air and slurry to expand perpendicularly of the wider dimension of the nozzle when released. At the same time the converging upper and lower walls of the nozzle progressively restrict vertical movement of the air and slurry mix and permit a thorough mixing of the two. It has been found that best results are obtained if the length of the orifice 13 ranges between ⅛ inch to $\frac{3}{16}$ of an inch. It also has been found that it is desirable that the area of the orifice 13 at the entrance thereto of passage 12 be approximately sixty-five percent of the area of the orifice at the discharge end. Similarly, the area of the nozzle 14 at the entrance is approximately sixty-five percent of the area of the nozzle at the discharge end.

Because of the greatly simplified construction of this device, it is possible to adapt the same to slurries of different consistencies simply by employing a gasket 20 of different appropriate thickness. Both the orifice 13 and nozzle 14 are adjusted simultaneously in size by changing gaskets. The relative amounts of motive fluid and slurry change proportionately with the particular gasket employed.

Suitable valves may be employed in the air and slurry conduits leading to the gun, so that air may be used to clean nozzle 14 of slurry mix to prevent clogging of the same. Air may also be utilized along in the nozzle to dry the freshly abraded surface of any moisture remaining thereon from the water or detergent employed in the slurry. It is also feasible to use fresh water from a by-pass to clean the slurry from the entire unit upon completion of any operation.

Silicosis hazards are reduced to a minimum by the invention in that it makes it possible to use a wet slurry which eliminates dust as compared to ordinary dry sand blasting.

Various embodiments of the invention may be employed within the scope of the accompanying claims.

I claim:

1. A washing and cleaning gun for discharging a relatively thin flat fan-shaped stream of water and abrasive mixture comprising upper and lower housing members, a coaxial orifice and nozzle formed by said housing members and being disposed therebetween, the upper and lower walls of said nozzle being flat and gradually converging toward each other from one end of the nozzle to the opposite end thereof, a concave chamber disposed between said orifice and nozzle and formed in said upper housing member, means to supply fluid under pressure to said orifice, and means to supply abrasive mixture under pressure to said chamber to cause substantially complete envelopment of said first named fluid by said abrasive mixture within said chamber prior to passage of said water and abrasive mixture into said nozzle.

2. A washing and cleaning gun for discharging a relatively thin flat fan-shaped stream of water and abrasive mixture comprising a housing having upper and lower walls, a coaxial inner orifice and outer nozzle with corresponding walls spaced apart and formed by said housing, the upper and lower walls of said nozzle being flat and gradually converging toward each other from one end of the nozzle to the opposite end thereof, a concave chamber disposed between said orifice and nozzle and formed in said upper housing, means to supply fluid under pressure to said orifice, and means to supply abrasive mixture under pressure to said chamber to cause sub-

stantially complete envelopment of said first named fluid by the abrasive mixture within said chamber prior to the passage of said water and abrasive mixture into said nozzle.

3. A washing and cleaning gun for discharging a relatively thin flat fan-shaped stream of water and abrasive mixture comprising a coaxial inner orifice and outer nozzle, said nozzle having upper and lower flat walls and diverging edges, means to supply fluid under pressure separately to said orifice and nozzle, a concave chamber formed in said upper flat wall and disposed between said orifice and nozzle to provide substantially complete envelopment within said chamber, of the fluid from said orifice by an abrasive prior to the passage of said water and abrasive into said nozzle, and said chamber being laterally elongated to extend beyond the outer end of the orifice and the inner end of the outer nozzle.

4. A washing and cleaning gun for discharging a relatively thin flat fan-shaped stream of water and abrasive comprising a housing having flat upper and flat lower walls defining a coaxial inner orifice and an outer nozzle by peripheral complementary meeting edges with the area of the orifice at the entrance thereto approximately sixty-five percent of the area of the orifice at the discharge therefrom and the area of the nozzle at the entrance thereto approximately sixty-five percent of the area of the nozzle at the discharge therefrom, a concave chamber formed in said upper wall and disposed between said orifice and nozzle and formed by said housing, means to supply fluid under pressure to said orifice, and means to supply abrasive under pressure to said chamber to cause substantially complete envelopment of said first named fluid by the abrasive within said chamber prior to the passage of the water and the abrasive into said nozzle.

5. A washing and cleaning gun for discharging a relatively thin flat fan-shaped stream of water and abrasive mixture comprising a coaxial inner orifice and outer nozzle, said nozzle having upper and lower flat walls and substantially coplanar diverging edges, a concave chamber formed in said upper flat wall and disposed between the orifice and the nozzle, said orifice having parallel upper and lower walls, the upper and lower walls of said nozzle being flat and gradually converging toward one another from the chamber to the opposite end of the nozzle, the outlet of said orifice being laterally elongated and being positioned immediately adjacent said chamber to discharge a flat diverging stream through said chamber and into said nozzle.

6. A washing and cleaning gun for discharging a relatively thin flat fan-shaped stream of water and abrasive mixture comprising a coaxial inner orifice and outer nozzle, said nozzle having upper and lower flat walls and substantially coplanar diverging edges, a concave chamber formed in said upper flat wall and disposed between the orifice and the nozzle, said orifice having parallel upper and lower walls and said nozzle having substantially flat upper and lower walls which gradually converge from said chamber to the discharge end of the nozzle, the outlet of said orifice being laterally elongated and being positioned immediately adjacent said chamber to discharge a flat diverging stream through said chamber and into said nozzle.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
561,483	Bryce	June 2, 1896
1,425,196	Grossenbacher	Aug. 8, 1922
1,511,118	Fiduccia	Oct. 7, 1924
1,548,317	Hilgerink	Aug. 4, 1925
2,007,029	Uhri	July 2, 1935
2,213,522	Holmboe et al.	Sept. 3, 1940