Aug. 8, 1950 S. MOREL 2,518,047

SAND-BLAST GUN

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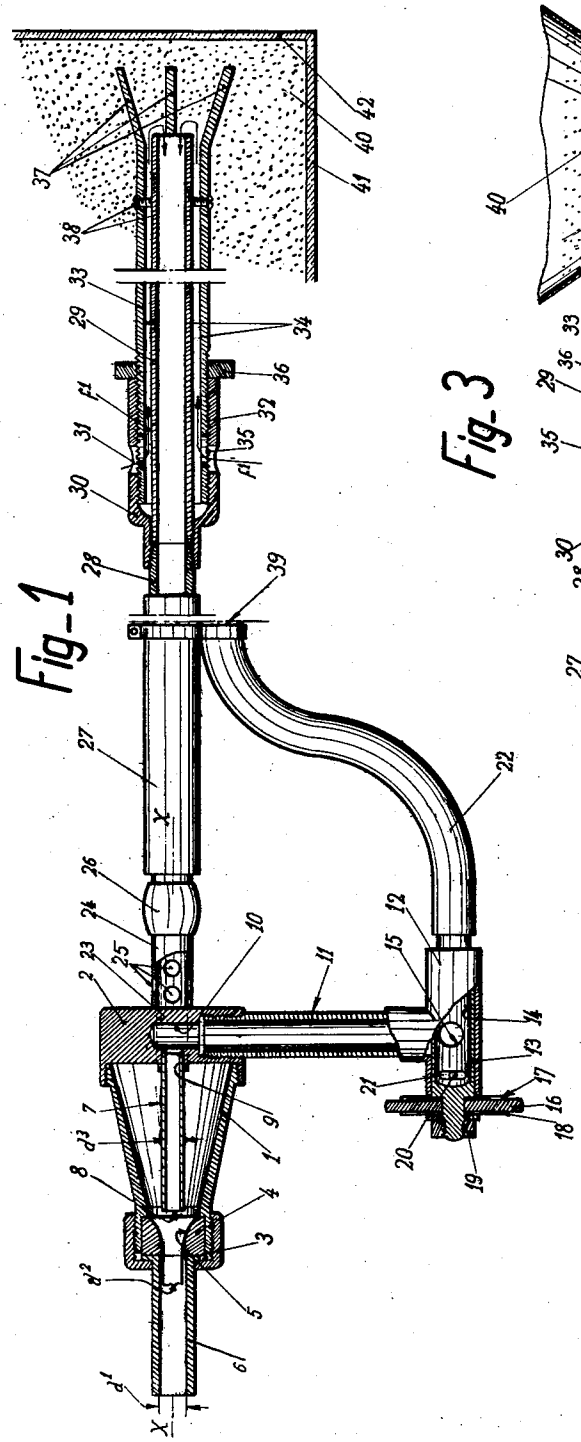


Fig. 1

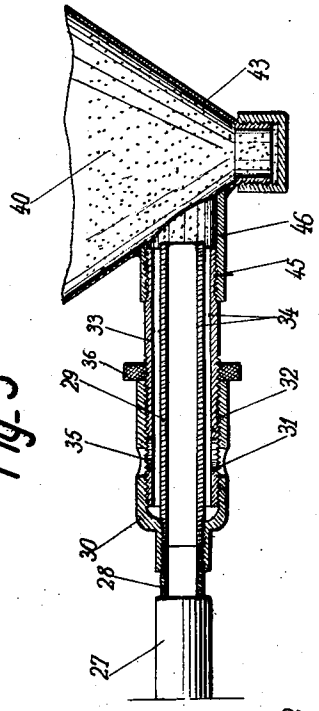


Fig. 3

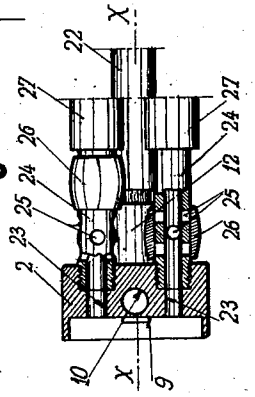


Fig. 2

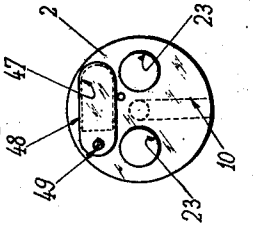


Fig. 4

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SANDBLAST GUN

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4 Claims. (Cl. 51—11)

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In small sand-blasting operations, both in the open air and in a booth or under a tarpaulin, use is often made of sand-blasting "by suction" owing to its simplicity.

It is known that sand-blasting by suction is effected by means of compressed air with a gun which is constructed on the principle of the blast pump. The compressed air is supplied to a tube called "injector," the jet of air passes through the body of the gun and issues through a tube called "nozzle," causing a rarefaction of the air in the said body of the gun. Owing to the vacuum thus created, a stream of atmospheric air is produced in another tube connected to a source of abrasive and conveys the abrasive into said body where it is projected by the compressed air through the nozzle against the surface to be treated.

In the known sand-blast guns, the injector has to be very remote from the nozzle in order not to be worn away by the abrasive which issues into the body of the gun almost at right angles to the axis of said injector.

The great distance which it is necessary to leave as a safety measure between the injector and the nozzle, makes it necessary to give to said nozzle a passage cross-section equal to at least four times that of the injector in order to enable the jet of compressed air, in spite of its divergence as it issues from the injector, to penetrate into the nozzle without creating eddies in the body of the gun, otherwise there would be no vacuum.

This great difference of cross-section between the injector and the nozzle causes a considerable loss of pressure and does not permit of a vacuum of more than about eighteen centimetres of mercury to be obtained; consequently the suction of atmospheric air, the force of which is proportional to the vacuum, is very small; this air therefore only conveys a small quantity of abrasive, the speed of which is moreover braked by the sudden change of direction which it has to effect in the body of the gun before penetrating into the nozzle.

For these various reasons, the known sand-blast guns are of low efficiency.

The present invention has for its object to provide an improved sand-blast gun of high efficiency, which is very practical to use, and, with this object in view, the gun according to the invention comprises a compressed air injector tube which terminates just short of the converging cone of the neck for the discharge nozzle for the mixture of compressed air and abrasive, thereby

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enabling said nozzle to be given a cross-sectional area which is hardly equal to three times that of the injector. Consequently the loss of pressure in the nozzle is not great and the efficiency is considerably increased, a fortiori since, owing to the fact that the injector tube terminates near the mouth of the discharge nozzle neck, the vacuum created is of the order of forty cm. of mercury. Due to this high vacuum there is a very powerful stream of atmospheric air which is capable of sucking up a very large quantity of abrasive, even more than is required.

According to another feature, the body of the gun is very short and of frusto-conical shape in order to lighten it, to reduce the length of the injector tube so as to decrease the loss of pressure, and facilitate the flow of the abrasive to the discharge nozzle.

Further features of the invention will be apparent from the following description, with reference to the accompanying drawing, which is given solely by way of example, and in which:

Fig. 1 is an elevational view, with parts in section, of a sand-blast gun according to the invention;

Fig. 2 is a partly sectional plan view thereof;

Fig. 3 is a longitudinal section of a variant of the abrasive sucking device or abrasive "pick-up," fitted at the bottom of an abrasive container;

Fig. 4 is a view of the rear face of a modification of the head of the gun.

According to the embodiment illustrated in Figs. 1 and 2, the gun comprises a frusto-conical metal injector body 1, the axis of which is at XX and which is closed at the rear by a head 2 fixed by screwing or otherwise.

At the front of the body 1 are fixed, for example by means of a nut 3, a nozzle neck 4 provided with a passage 5 flaring inwardly on its outlet end toward the body 1 and a tubular nozzle 6 of larger internal diameter d^1 than the diameter d^2 of the neck 4 on the outlet side.

The neck 4 and the nozzle 6 are made of any very hard metal or alloy, in particular of tungsten carbide, boron, etc. or are internally lined with a liner of one of these substances or of like substances.

In the body 1 and carried by the head 2 along the longitudinal axis XX is arranged a tubular element 7 forming the injector. This injector tube is fixed at the centre of the head in order to facilitate the centring thereof, which must be very accurate. Its front end 8 terminates very near the entrance to the neck 4, for example a

few millimetres from its inlet. The internal cross-section of the injector tube is of the order of one third to one half of the cross-sectional area of the nozzle. For a normal nozzle of diameter d^1=10 mm., the diameter d^3 of the injector tube is preferably between 6 and 7 mm. The rear end of the injector tube 7 is attached by forcing, screwing or otherwise fixing the same, in an axial passage 9 of the head 2. Said passage 9 opens into a radially extending chamber 10. In said chamber 10 is screwed, welded or otherwise fixed in a fluid-tight manner, a rigid tube 11 which is preferably perpendicular to the axis XX. Said tube 11 opens into the body 12 of a plug cock. The plug 13 of said cock is provided with a longitudinal chamber 14 which can be placed in communication with the tube 11 through a hole 15. In order to enable it to be rotated, the plug 13 which emerges from the body 12 carries an operating member, for example a wheel 16. Said wheel comprises for example a disc of rubber or like material clamped between two washers 17—18 by a nut 19. It should be noted that the washer 16 could be made of metal and, in that case, preferably serrated or knurled at its periphery. The rotation of the plug is limited for example by a projection 20 carried by the body 12 and housed in a circumferential slot 21 of limited length provided in the plug 13, in such a manner that by rotating said plug, it is possible at will to move the hole 15 into register with the tube 11 or to shut off the communication between said tube and the duct 14 of the plug 13.

Said duct 14 is permanently in communication, through a preferably flexible or pliable tube 22, with a source not shown of compressed air or other compressed gaseous fluid.

The head 2 is provided, on each side of the hole 9 and extending right through it parallel to the axis XX, with two holes 23 in which are fixed on the outer rear face of the head two tubes 24.

Each of said tubes 24 has one or more holes provided therein which, at will, can either be made to open into the atmosphere or, on the contrary, be closed by means of a sleeve 26 adapted to slide or rotate on said tube.

At its rear end, each tube 24 is connected by a preferably flexible or pliable pipe 27 made of rubber or other material, to a metal tube 28 which abuts against a tubular extension 29. The abutting ends of the tubes 28 and 29 are screw threaded and are connected together by the tapped end of a sleeve 30. Said sleeve 30 is provided with a number of air inlet holes 31. In said sleeve is screwed at 32, concentrically to the tube 29, another tube 33, the internal diameter of which is larger than the external diameter of the tube 29; so as to provide between these two tubes an annular space 34. This annular space 34 can communicate with the atmosphere through the holes 31 of the sleeve 30 by means of holes 35 which are provided in the tube 33 and with which, by adjusting the sleeve 30, the holes 31 can be brought more or less into register, the adjustment which has been made being retained by means of a nut 36 screwed on the tube 33. At the rear end, the space 34 is normally open.

The tube 33 terminates, at the rear in a number of divergent tongues 37. Furthermore, it is kept centered on the tube 29 by screws 38 bearing against said tube.

In Fig. 1, the flexible tube 22 has been shown bent back against the tubes 27; it can be fixed thereto by means of a collar 39 or any other appropriate means.

The apparatus operates as follows:

The rear end of the tubes 29 and 33 dips into a heap of abrasive 40 which may be open the atmosphere. Owing to the divergent parts 37 there is no danger of the rear end of the space 34 between the tubes 29 and 33 being obstructed, for example by the ground 41 or a wall such as 42.

The gun is held in one hand by the rigid tube 11, the tubes 27 and 22 resting on the forearm. As soon as the cock 13 is opened, the operation of said cock being very easily effected since it is only necessary to rub the wheel 16 against any surface, for example against the part to be sand-blasted or against the palm of the other hand (similarly for closing the cock), the compressed air issues from the injector tube 7 and flows into the nozzle 6. A vacuum is immediately created in the body 1 and consequently a stream of atmospheric air flows through the tubes 24, penetrates through the holes 31 and 35, flows into the annular space 34 in the direction of the arrows f_1, then into the heap of abrasive 40 and returns through the inside of the tube 29; this air therefore carries abrasive with it. The mixture of air and abrasive flows at a certain speed through the pipes 24 into the body 1 of the gun, parallel to and round the injector tube 7 and, without being subjected to any braking and still by the action of the stream of atmospheric air sucked in, flows through the neck 4 towards the nozzle 6. It penetrates into said nozzle and mixes with the compressed air which is issuing from the injector tube 7 and which carries it along with it, enormously increasing its speed, and projects it against the surface to be treated.

For certain work, a large quantity of compressed air and a small quantity of abrasive are required; for other work it is the opposite and sometimes a small quantity of each is necessary. In all cases, it is only necessary to adjust the supply of compressed air by means of the cock 13 and the supply of abrasive by adjusting the air sucked in by means of the sleeves 26 which enable the holes 25 to be closed more or less and consequently the suction in the tubes 24 to be "braked" more or less.

Without the stream of atmospheric air or if its volume is insufficient, the abrasive pick-ups and the pipes 24 would become clogged with abrasive and the gun would only discharge compressed air. On the other hand, if the stream of atmospheric air sucked in and of abrasive are not correctly dosed, the discharge of abrasive is not regular. A correct operation of each abrasive pick-up is ensured by the sleeve 30 which serves to open or close the holes 31 more or less according to the fineness and the density of the abrasive used.

In certain cases, the part treated has to have the dust removed and for this purpose it is only necessary for the holes 25 to be completely uncovered, so that no abrasive is sucked up and the nozzle of the gun operates as a dust removing blower.

As already stated, the cock 13 can be actuated quickly by rubbing the wheel 16 in the required direction against the work table, against the part to be treated or against the hand which is free. Owing to the speed of the operation, this method of proceeding prevents wasting an appreciable quantity of compressed air and abrasive; it also saves time.

Since the compressed air pipe and the abrasive

pipes are preferably fastened together, as shown, over a certain length from the gun, this is very convenient for the user. The two movable abrasive pick-ups may also be fastened together in order to facilitate the manipulation thereof.

Fig. 3 shows a modification of an abrasive pick-up intended to be fixed to the base of a hopper **43**. In this case, the tube **33** is screw-threaded at its rear end at **45** and screwed in a tapped connection **46** provided for this purpose on the hopper **43**.

Finally, Fig. 4 shows a rear view of a modification of the head **2**, in which an opening **47** is provided which opens into the atmosphere and can be partly or completely opened or closed at will by means of a shutter **48** which is adapted to swing about a pivot **49** (or to slide). This device can replace the holes **25** of the tubes **24** and the sleeves **26**.

Naturally, the invention is in no way limited to the embodiments illustrated and described which have only been chosen by way of example.

In the example of Figs. 1, 2 and 4, two abrasive supplies have been provided, but of course, the device could be provided with a single supply or more than two.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A suction operated sandblast gun comprising a hollow injector body having an outlet orifice, said injector body tapering toward said orifice a discharge nozzle neck in said orifice along the longitudinal axis thereof and having its internal wall flaring outwardly in the direction of said body, an injector tube supported by said body and extending along the horizontal axis thereof for substantially its whole length, but terminating just short of said neck, means for supplying fluid under pressure to said injector tube, and means operated by the suction effect of said injector tube for supplying abrasive to said body, in a direction substantially parallel with the axis of the injector tube, said means comprising at least an abrasive supply conduit extending into said body, said conduit having at least one opening in the wall thereof leading to the atmosphere, and a sleeve movable on said conduit for controlling the effective area of said opening during the operation of said gun.

2. A suction operated sand-blast gun as claimed in claim 1, wherein said injector body is formed with at least one opening leading to the atmosphere and further comprising a movable shutter for controlling the effective area of said opening.

3. A portable, suction operated sandblast gun comprising an injector body having an outlet orifice, the internal wall of the body tapering toward said orifice, a discharge nozzle neck fitted in said orifice along the longitudinal axis thereof, the wall of the discharge passage of said neck flaring outwardly towards the wall of the injector body and substantially merging with said wall

of the injector body; an injector tube extending forwardly from the rear wall of said injector body substantially along the horizontal axis thereof for substantially the whole length of said body, but terminating short of the inlet end of said discharge nozzle neck, the cross sectional area of said nozzle neck being at least equal to three times the cross sectional area of said injector tube, means for supplying compressed air to said injector tube and means including a conduit for delivering abrasive to said body under the suction effect of said injector tube in a direction substantially parallel to said injector tube, said conduit being laterally offset from said injector tube, said means for supplying compressed air including an air control cock radially spaced from the injector body, and a nipple connected to said body, said nipple extending from said body at substantially right angles to the longitudinal axis of said body and connecting said body and cock, said nipple forming a hand hold for manipulating said gun.

4. A suction operated sandblast gun comprising an injector body having an outlet orifice, the internal wall of the body tapering toward said orifice, said orifice being internally counterbored to provide a shoulder, a discharge nozzle neck fitted in said counterbore and seated against said shoulder, the wall of the discharge passage of said neck flaring outwardly towards the wall of the injector body and substantially merging with said wall, a supplementary nozzle seated against said discharge nozzle and having an internal diameter greater than that of the discharge nozzle and means for supporting said supplemental nozzle on the injector body; an injector tube extending forwardly from the rear wall of said injector body substantially along the horizontal axis thereof for substantially the whole length of said body, but terminating short of the inlet end of said discharge nozzle neck, the cross sectional area of said nozzle being at least equal to three times the cross sectional area of said injector tube, means for supplying compressed air to said injector tube and means including a conduit for delivering abrasive to said body under the suction effect of said injector tube in a direction substantially parallel to said injector tube, said conduit being laterally offset from said injector tube.

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