

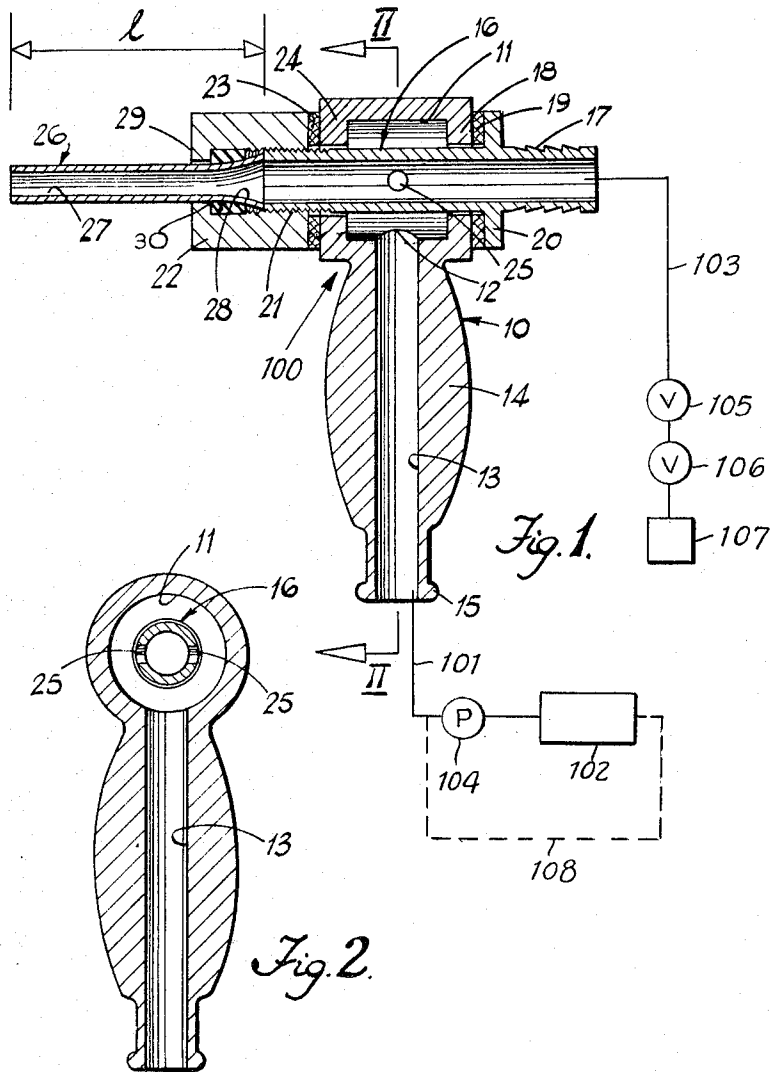
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ABRADING DEVICES

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ABRADING DEVICES

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4 Claims. (Cl. 51—11)

This invention relates to abrading devices comprising guns for producing blasting jets of abrasive grains in a mixture of liquid and gas usually, but not necessarily, water and air. The invention is particularly concerned with such a device including a gun comprising a mixing chamber with means for separately feeding thereto the gas and a slurry of the abrasive grains in the liquid and having an outlet comprising, or adapted to be connected to, a nozzle for directing the resulting mixture at a work piece.

A known form abrading device comprises a gun which includes, in the mixing chamber, a small nozzle for the introduction of air and a larger nozzle surrounding the smaller nozzle for the introduction of the slurry, the arrangement being such that the jet of air from the smaller nozzle generates, by venturi action, suction to draw the slurry from the larger nozzle. The nozzle arrangement sets up in the mixing chamber considerable turbulence which in turn results in a high rate of flow. While this arrangement is suitable for many purposes it does not produce the high velocity jet which we have found to be desirable to achieve a blast of sufficiently high intensity to treat deep recesses and/or the removal of stubborn scale.

It is an object of this invention to provide an abrading device which will produce a high velocity jet of a mixture of abrasive, liquid and gas.

According to the invention, I provide an abrading device comprising a gun for delivering a blast of a mixture of abrasive, liquid and gas, the gun including a feed chamber having an entry, a tube extending through the feed chamber, the interior of the tube constituting a mixing chamber, an inlet connection at one end of the tube outside the feed chamber and an outlet at the other end of the tube, an outlet nozzle communicating with the outlet, and at least one aperture in the tube opening into the feed chamber; a supply of the slurry of the abrasive and liquid; conduit means for delivering the slurry from the supply to the feed chamber; a supply of gas under pressure; and conduit means connected to the inlet connection for delivering the gas from the latter supply to the one end of the tube.

The invention will now be described by way of example with reference to the accompanying drawings, in which:

FIGURE 1 is a schematic diagram of a device embodying the invention with the gun being shown in longitudinal section; and

FIGURE 2 is a transverse section on the line II—II of the gun of FIGURE 1.

Referring now to the drawings, a gun 100 comprises a body component 10 in which is formed a slurry feed chamber 11 which is internally of right cylindrical shape. A slurry entry 12 is formed in and mid-way along the cylindrical wall of the chamber 11 and is continued externally as a longitudinal bore 13 in a handle 14 which forms part of the component 10 and is adapted to be coupled at its outer end 15 to a supply pipe or conduit means 101 leading from a source of supply 102 of slurry under pressure. A case-hardened tube 16 extends axially through the end walls of the feed chamber 11 and is provided at one end with an inlet connection 17 to be

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coupled to an air supply pipe or conduit means 103. The interior of the tube forms a mixing chamber and the tube is longitudinally displaceable from the slurry feed chamber 11. A fluid-tight seal between the tube 16 and the end wall 18 of the chamber 11 at the entry end is provided by an annular gasket 19 clamped between the end wall and an external flange 20 formed on and integrally with the tube. The outlet end of the tube 16 extending beyond the chamber 11 is externally screw-threaded at 21 and engaged by a clamping nut 22 which provides, at least in part, a seal at its end by clamping another annular gasket 23 against the adjacent end wall 24 of the chamber 11 while simultaneously effecting the clamping of the first mentioned gasket 19.

Midway along the length of the part of the tube 16 located within the chamber 11, the tube is pierced by two apertures 25, which serve as the slurry feed openings and, which are aligned on a diameter of the tube 16 which extends normal to the axis of the slurry entry 13. It will be seen that the apertures 25 are out of alignment with the entry 13.

The outlet end of the mixing tube 16 is extended by a replaceable nozzle 26 in the form of a tube which has a major cylindrical portion 27 of less cross-sectional area than the tube 16 and which is flared at its inner end 28 to the dimension of the mixing tube. An inwardly directed flange 29 at the outer end of the clamping nut 22 provides an annular abutment for engaging a rubber or similar elastic sealing bush 30 which is pressed, by the action of screwing the nut 22 on to the mixing tube 16, into tight engagement with the exterior of the flared inner end 28 of the nozzle so as to press this into tight engagement with the outlet end of the mixing tube and also to complete the seal at this end of the slurry feed chamber 11.

The nozzle 26 may be of mild steel or other relatively low wear-resisting metal, intended to be periodically replaced, or it may be of relatively high wear-resisting metal for replacement at less frequent intervals.

The gun is intended to be operated under the following conditions.

The slurry is fed from the supply 102 by a pump 104 to the entry 13 at a pressure of 70–75 p.s.i. The air pressure in the supply pipe 103 will be at a pressure somewhat higher than the slurry pressure but not normally more than about 25% above that pressure. The air supply in the pipe 103 is controlled by a sharp cut-off/cut-in valve 105 in association with a variable orifice valve 106 to control the rate of flow of air at any given pressure from a supply 107 of air under pressure. The velocity of the blast from the nozzle 26 is controlled by means of the variable orifice valve 106. The rate of flow of slurry increases as the rate of flow of air is reduced. In practice with a gun of typical dimensions set out below the minimum velocity at the nozzle is in the order of 100 f.p.s. when the slurry is supplied to the slurry feed chamber at 75 p.s.i.

Before initiating the slurry feed to the slurry feed chamber it is preferable to bleed air to the gun at a slow rate to prevent the abrasive entering the air line. The abrasive does not give rise to uneconomical wear of the material of the gun, that is to the slurry feed chamber and mixing tube, provided that the gun is not used without air.

It is also found that if the nozzle is too short the velocity in the nozzle tends to fall, particularly with the larger sizes of abrasive grains. Moreover, short nozzles tend to increase air consumption.

Nevertheless an equally effective device can be obtained by appropriately scaling, up or down, the physical dimensions of the gun and the provisions for the supply of air.

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In a typical range of guns, the length of the nozzle 26 (1 in FIGURE 1) may be 5½" and two holes 25 may be provided. The remaining dimensions may vary as below:

Internal Dia. of nozzle part 27	Diameter of holes 25	Internal Dia. of connections 17	Internal Dia. of Entry 13
<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>
5/16	3/16	5/8	5/8
3/8	1/4	5/8	5/8
7/16	9/32	5/8	5/8
1/2	5/16	3/4	5/8

Owing to the small slurry demand at the higher velocities of the jet delivered by the gun, a by-pass arrangement may be desirable in the system for supplying the slurry from a pump to the slurry feed chamber 11; thus the main delivery passage, indicated by the dotted line 108 in FIGURE 1, on the outlet side of the pump 104 may feed back to the slurry supply 102 and the supply pipe 101 may form a by-pass outlet leading to the slurry feed chamber. Thereby there will be fed to that chamber the slurry at the comparatively small rate demanded by the gun, the remainder of the pump output will be circulated back to the inlet side of the pump via the supply 102 and the pump will be enabled to run at its optimum efficiency.

What I claim is:

1. An abrading device comprising a gun for delivering a blast of a mixture of abrasive, liquid and gas, the gun including a feed chamber having an entry, a tube extending through the feed chamber, the interior of the tube constituting a mixing chamber, an inlet connection

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at one end of the tube outside the feed chamber and an outlet at the other end of the tube, an outlet nozzle communicating with the outlet, and at least one aperture in the tube opening into the feed chamber; a supply of the slurry of the abrasive and liquid; conduit means for delivery of the slurry from the supply to the feed chamber; a supply of gas under pressure; and conduit means connected to the inlet connection for delivering the gas from the latter supply to the one end of the tube.

2. An abrading device gun according to claim 1 wherein the entry to the feed chamber is out of alignment with said aperture in the tube wall.

3. An abrading device according to claim 2 wherein the mixing chamber is cylindrical and wherein there are two apertures in the tube wall opening into the feed chamber, said apertures being at the ends of a diameter of the mixing chamber, said feed chamber entry lying on a radius of the mixing chamber normal to said diameter.

4. An abrading device according to claim 3 wherein the gun includes a body component in which the feed chamber is formed, said component including a handle for the gun and the entry to the feed chamber extending within the handle.

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