

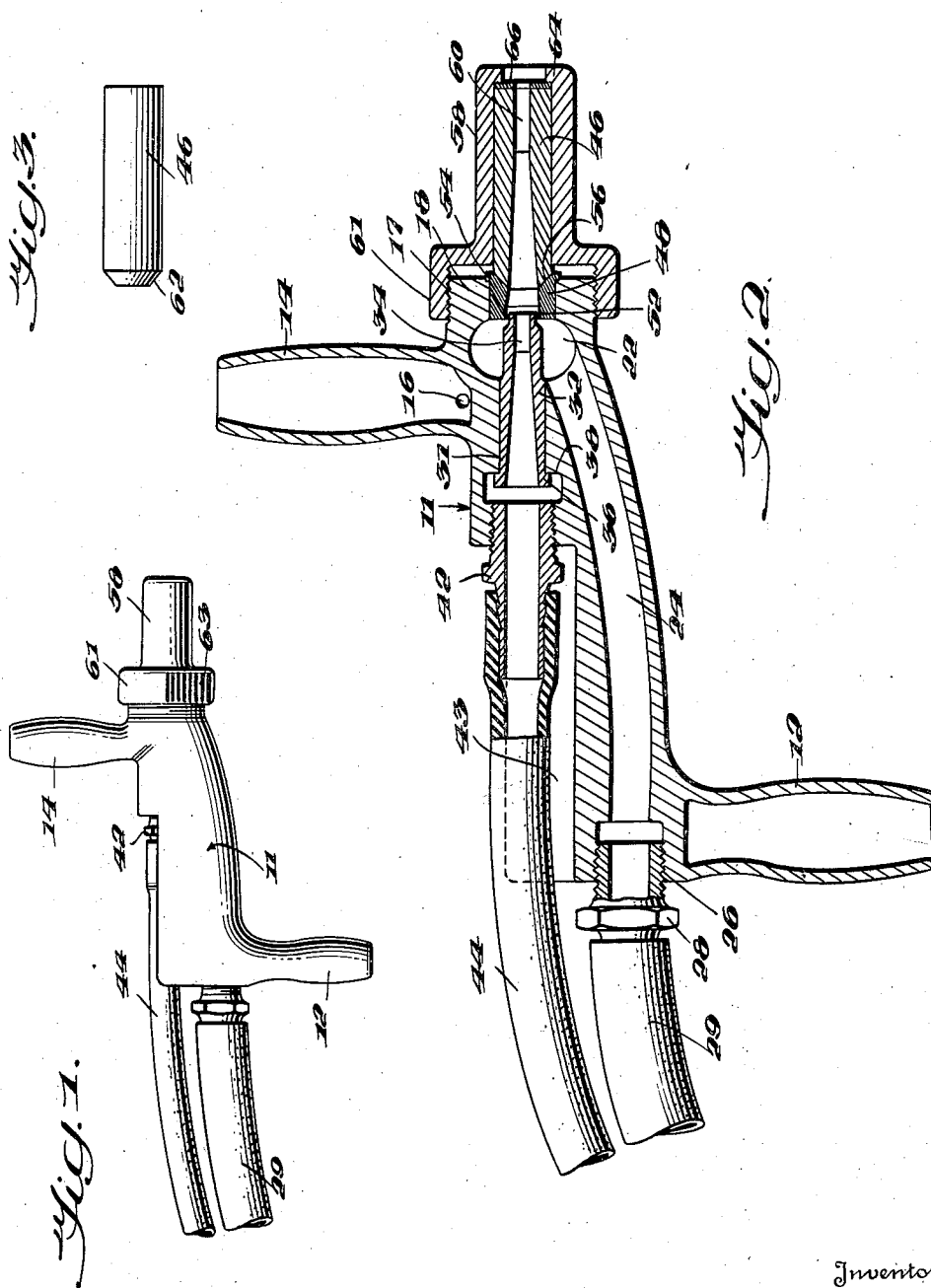
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BLAST GUN

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BLAST GUN

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The present invention relates to blast guns wherein abrading material is entrained by a propelling medium within the gun to be moved forwardly as a forcible blast stream. The invention more specifically pertains to that type of blast gun providing a partial vacuum therein for drawing abrading material from a supply source to a position within the gun whereby the propelling medium moves the abrasive forwardly to provide a high velocity blast stream.

A conventional type of blast gun employed in the past embodying the injector principle includes a nozzle at the forward end of the gun and a smaller jet positioned rearwardly of the forward nozzle and in axial alignment with the bore of the larger forward nozzle. A partial vacuum is generated by such a device between the two nozzles for drawing abrading material into the gun for engagement with the propelling medium whereby the abrading material is moved forwardly and projected onto the article or surface to be blasted. In such a type of gun the propelling medium passing through the rear nozzle and issuing therefrom as a jet expands within the larger nozzle for the creation of a partial vacuum and it appears that a material portion of the abrasive is pushed along the inner wall of the discharge nozzle. The engagement of the abrasive with the inner surface of the forward discharge nozzle causes wear therealong and the friction developed during such engagement provides a loss in the velocity of the blast stream passing through the forward discharge nozzle.

It is accordingly an object of the present invention to remove the disadvantages of such prior type of blasting device and to provide a blast gun wherein the abradant is drawn into and inside an annular jet formed by the propelling medium moving forwardly at a high velocity so that the propelling medium is thus arranged on the outside of the abrasive as it is accelerated within the discharge nozzle to thereby provide a sheath of the propelling medium around the abrasive to reduce the wear on the discharge nozzle and to provide a concentration of the abrasive within the blast stream.

Another object of the invention resides in providing a rugged blast gun wherein the propelling medium is supplied around the abrasive material through an annular opening into a discharge nozzle of the gun including a replaceable forward discharge nozzle which may be mounted on the gun without disturbing the an-

nular opening through which the propelling medium is supplied.

A further object of the invention pertains to the provision of a blast gun that may be economically manufactured and readily assembled with the parts thereof replaceable and particularly the discharge nozzle by an operator who lacks skill and acquaintance with the art of ejectors or the science dealing with the creation of a partial vacuum by changes in velocity and pressure so that the gun will function efficiently in the field even though the discharge nozzle parts are replaced by a layman.

Other objects and features of the invention will be more apparent to those skilled in the art upon a consideration of the accompanying drawing and the following detailed description wherein an exemplary embodiment of the invention is disclosed.

In the drawing:

Fig. 1 is a side elevational view of a blast gun embodying the invention.

Fig. 2 is an axial sectional view of the blast gun shown in Fig. 1.

Fig. 3 is a side elevational view of the discharge nozzle member.

In carrying out the invention the blast gun is designed for the purpose of entraining abrasive material of any granular type so that such abrasive will be moved forwardly at high velocity for impingement upon an article to be abraded or a surface to be blasted or for knocking out sand cores of castings. A gun embodying the invention is adapted to generate or create a partial vacuum within the gun barrel so as to draw or suck the abrasive material from a supply into the gun where the abrasive is entrained by the propelling medium which creates the partial vacuum so that the abrasive is moved forward at a high velocity from the forward end of the gun in the form of a forcible blast stream.

Referring to the drawing there is shown at 11 a gun body preferably formed or cast in one piece and provided with passages therein for the propelling medium and the abrasive material. The body 11 may be provided with handles 12 and 14 for the purpose of manually manipulating the gun particularly when the propelling medium is a liquid such as water under pressure of four hundred pounds per square inch and greater. The handles 12 and 14 may be formed integral with the gun body 11, and they are preferably hollow for the purpose of reducing the weight of the gun assembly. In normal operation the handles 12 and 14 are usually arranged in a sub-

stantially vertical plane so that the handle 14 extends upwardly. In carrying out an abrading or blasting operation wherein liquid forms the propelling medium some of the splattered fluid may fill the handle 14 and a drain opening 16 may therefore be provided in the handle adjacent the gun body for the purpose of permitting the escape of the liquid from within the handle 14.

The gun body 11 terminates at the forward end thereof in an annular portion 18 having threads 17 on the outer surface for receiving a retaining jacket for the discharge nozzle as hereinafter described. The annular end portion 18 thus provides an opening in the forward end of the gun body substantially concentric of a passage in the gun through which the abrasive is supplied. The gun body immediately rearwardly of the annular end portion 18 is provided with a cavity or chamber 22 of any suitable cross sectional shape and in the embodiment illustrated is formed with arcuate walls for the purpose of reducing the size of the chamber and at the same time providing a chamber of adequate dimensions for receiving a quantity of the propelling medium. The normally lower portion of the gun body 11 is provided with a passage or conduit 24 through which the propelling medium is supplied to the chamber 22. The rear end portion of the passage 24 may be threaded as indicated at 26 for receiving a pipe connection 28. The outer end portion of the pipe connection 28 is adapted to receive a flexible tube such as a rubber hose 29 supplying the propelling medium under pressure to the gun and into the passage 24 which communicates with the chamber 22.

The gun body 11 is also provided with an axial opening or passage 31 rearwardly of the chamber 22. A replaceable nozzle member 32 may be securely mounted within the gun body in any suitable manner and in the structural arrangement illustrated the nozzle member 32 is of such external dimensions as to fit tightly within the opening 31 and with sufficient friction to prevent displacement thereof during operation of the gun. The forward end of the nozzle member 32 is reduced such as by a grinding operation so as to provide a substantially cylindrical outer end surface for the purpose of providing an annular opening therearound of precise dimensions when the parts of the gun are properly assembled as hereinafter described. The nozzle member 32 is provided with an axially extending bore, and in the forward portion thereof as indicated at 34 the inner wall is substantially cylindrical shaped. The bore of the nozzle member 32 flares conically outwardly in proceeding towards the rear end thereof. The nozzle member 32 terminates at the rear end thereof in an annular flange 36 for engaging a shoulder 38 formed on the gun body 11 to thereby limit the forward movement of the nozzle member 32 when this nozzle is mounted in the opening 31 in the gun body.

The granular abrasive material is supplied to the nozzle member 32 and in the structure shown on the drawing the gun body 11 adjacent the rear portion of the nozzle member 32 is provided with a pipe fitting 42 suitably threaded in the gun body 11 so as to provide open communication with the bore of the nozzle member 32. In this connection it is to be noted that the opening in the gun body for the pipe fitting 42 is sufficiently large to introduce the nozzle member 32 therethrough and to remove this nozzle member when replacement thereof is necessary. A flexible tube such as a rubber hose 44 extend-

ing from the abrasive supply may be secured to the pipe fitting 42. The gun body 11 may be formed with side flanges to provide a trough shaped recess 43 for protecting the hose 44.

In carrying out the invention the gun is provided with a forward discharge nozzle which may be readily replaced by an operator devoid of skill in the art of ejectors or the science dealing with the creation of a partial vacuum by changes in velocity and pressure without altering the operating characteristics of the gun. It is for this purpose that the forward discharge nozzle is made in two parts so that the more rapidly wearing part may be readily replaced without disturbing the part which provides a precisely dimensioned annular opening around the forward end of the nozzle member 32. Thus the forward discharge nozzle may comprise a replaceable nozzle member 46 and a sleeve 48 which need not be replaced as often as the member 46. The sleeve 48 may be mounted within the opening in the annular end portion 18 of the gun body 11 in any suitable manner and in the embodiment illustrated the sleeve 48 is formed with an external dimension so as to fit tight in the opening in the annular end portion 18. The rear end portion of the sleeve 48 is preferably formed as a substantially cylindrical bore so as to surround the forward end of the nozzle member 32 in a spaced relation and provide an annular opening 52 therebetween. The forward end of the sleeve 48 is provided with an annular flange 54 which abuts against an annular shoulder provided in the end portion 18 of the gun body so as to limit the rearward movement of the sleeve 48 in the mounting thereof in the gun body 11. The forward end of the sleeve 48 is provided with a conical surface indicated at 56 for the purpose of providing a seating surface for the rear end of the nozzle member 46.

The discharge nozzle member 46 is preferably formed with a substantially cylindrical outer surface for fitting snugly within a retaining jacket 58. The rear end of the nozzle member 46 is provided with a conical surface 62 corresponding substantially to the taper of the conical surface 56 formed in the end of the sleeve 48. The retaining jacket 58 is provided with an intumed flange 64 at the forward end so that the conical end 62 of the nozzle member 46 will be urged into seated engagement with the conical surface 56 of the sleeve 48 when the retaining jacket is threaded on the threads 17 of the annular portion 18 of the gun body. The jacket member 58 is provided with an enlarged internally threaded skirt 61 having flat portions 63 thereon for manipulation by a conventional wrench. A resilient washer 65 may be interposed between the flange 64 and the forward end of the nozzle member 46. Thus the conical surfaces 56 and 62 cooperate to properly align the bore of the nozzle member 46 with that of the sleeve 48.

The area of the annular opening 52 provided around the forward end of the nozzle member 32 is of importance in the functioning of the gun so as to produce a pronounced partial vacuum in the space immediately in front of the nozzle member 32. The dimensions of the annular opening around the forward end of the nozzle may be adjusted at the factory and are not susceptible of variation during replacement of the discharge nozzle 46. The new nozzle member 46 having a conical end surface 62 thereon may be readily seated on the conical surface 56 without altering the annular opening 52 between the in-

ner surface of the sleeve 48 and the forward peripheral end of the nozzle member 32. The nozzle member 32 and the sleeve 48 may require replacement at less frequent intervals. These parts may be readily mounted in the gun body by a maintenance employee without altering the operating characteristics since the flange 36 fixes the position of the nozzle member 32 and the flange 54 fixes the position of the sleeve 48 so that the factory adjusted dimensions of the annular opening 52 are restored.

The bore of the discharge nozzle member 46 is preferably larger at the rear end thereof than at the forward end to provide an inwardly converging surface in proceeding forwardly through the nozzle. In the specific structure depicted in the drawing the rear end portion of the bore in the discharge nozzle 46 is conical shaped and merges with a similar shaped bore in the sleeve 48. Thus the propelling medium escaping from the chamber 22 through the annular opening 52 provides a conical jet hollow at the center thereof forwardly of the nozzle member 32 to create a pronounced vacuum in this space. The vacuum thus generated draws the abrasive material from the hose 44 into the hollow cone formed by the propelling medium where the abrasive is entrained and moved forwardly through the bore of the discharge nozzle. The propelling medium thus forms a sheath around the abrasive to prevent engagement of the abrasive particles with the inner wall of the sleeve 48 and the inner wall of the nozzle member 46 and thereby reduces the wear on this discharge nozzle assembly. As the composite blast stream moves forwardly the converging walls of the nozzle member 46 reduce the area of the hollow center to facilitate the entrainment of the abrasive particles by the propelling medium and to concentrate the abrasive in the center of the blast stream. The outer end portion of the bore in the nozzle member 46 may be cylindrical shaped as shown at 60.

The gun herein shown and described is designed primarily for use in hydroblasting wherein wet sand or a slurry of sand and water forms the abrasive material and water is employed as the propelling medium. The gun functions equally well when other abrasive material such as steel shot, grit and the like are employed and compressed air serves as the propelling medium.

I claim:

1. In a blast gun, an elongated gun body having an opening in the forward end thereof and a cavity rearwardly of said opening and a passageway extending rearwardly from the cavity,

a removable sleeve mounted in the opening at the forward end of the gun body, a flange carried by said sleeve engaging the forward end portion of the gun body, a nozzle member mounted in said passageway extending through said cavity into the rear end of the sleeve to provide an annular opening between the inner surface of the sleeve and the exterior surface of the nozzle member, a flange carried by the nozzle member engaging the gun body limiting the forward movement of the nozzle member, means for supplying a propelling medium under pressure to said cavity and around said nozzle member through said annular opening to provide a partial vacuum in said sleeve for drawing abrasive through said nozzle member, a discharge nozzle having a bore extending therethrough, a conical surface formed within the forward end of said sleeve, a conical surface on the rear end of said discharge nozzle, and removable means maintaining the discharge nozzle in substantially axial alignment with the axis of the sleeve and the conical surface thereon in seating engagement with the conical surface within said sleeve.

2. In a blast gun, an elongated gun body having an opening in the forward end thereof and a cavity rearwardly of said opening and a passageway extending rearwardly from the cavity, a removable sleeve mounted in the opening at the forward end of the gun body, a flange carried by said sleeve engaging the forward end portion of the gun body limiting rearward movement of the sleeve, a nozzle member mounted in said passageway and extending through said cavity into the rear end of the sleeve to provide an annular opening between the inner surface of the sleeve and the exterior surface of the nozzle member, a flange carried by the nozzle member limiting the forward movement of the nozzle member, said gun body having a passage therein for supplying a propelling medium under pressure to said cavity and around said nozzle member through said annular opening to provide a partial vacuum in said sleeve for drawing abrasive through said nozzle member, a discharge nozzle having a bore extending therethrough, an outwardly flared conical surface in the forward end of said sleeve, a conical surface on the rear end of said discharge nozzle, and a jacket embracing said discharge nozzle threaded on the forward end of said gun body retaining the conical surface of said discharge nozzle in seated engagement with the conical surface in said sleeve.

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