Aug. 13, 1946. R. RUEMELIN 2,405,854

GUN FOR BLASTING AND SPRAYING

Filed Sept. 7, 1944 2 Sheets-Sheet 1

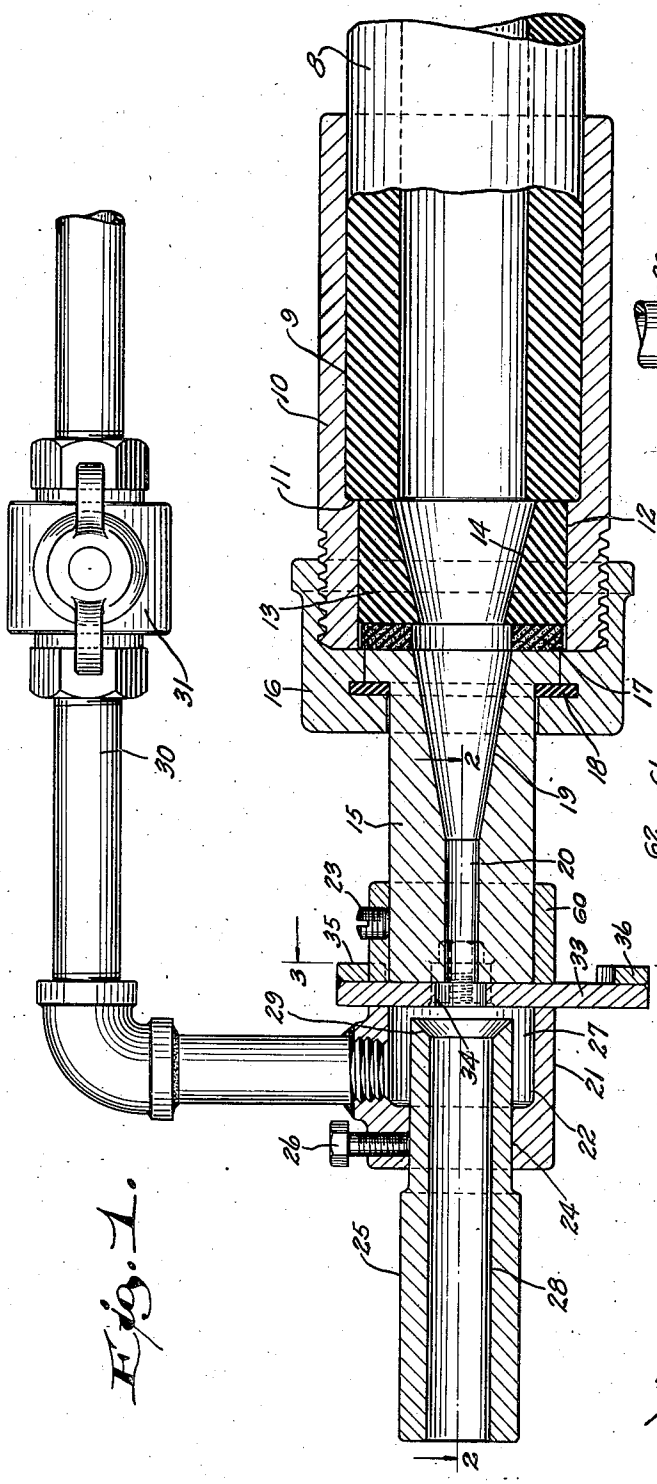

Fig. 1.

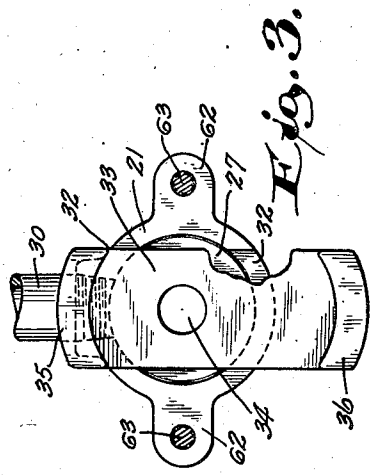

Fig. 3.

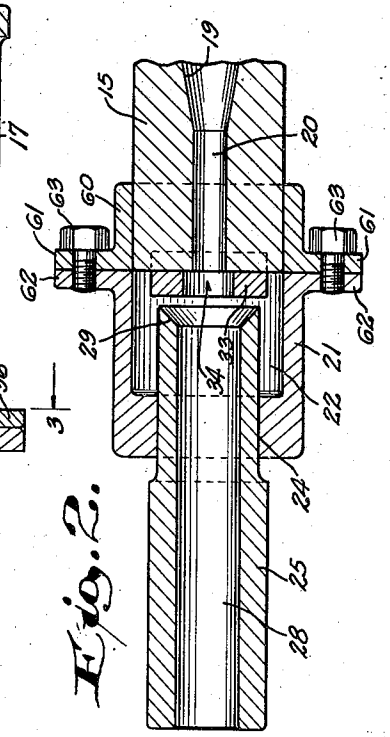

Fig. 2.

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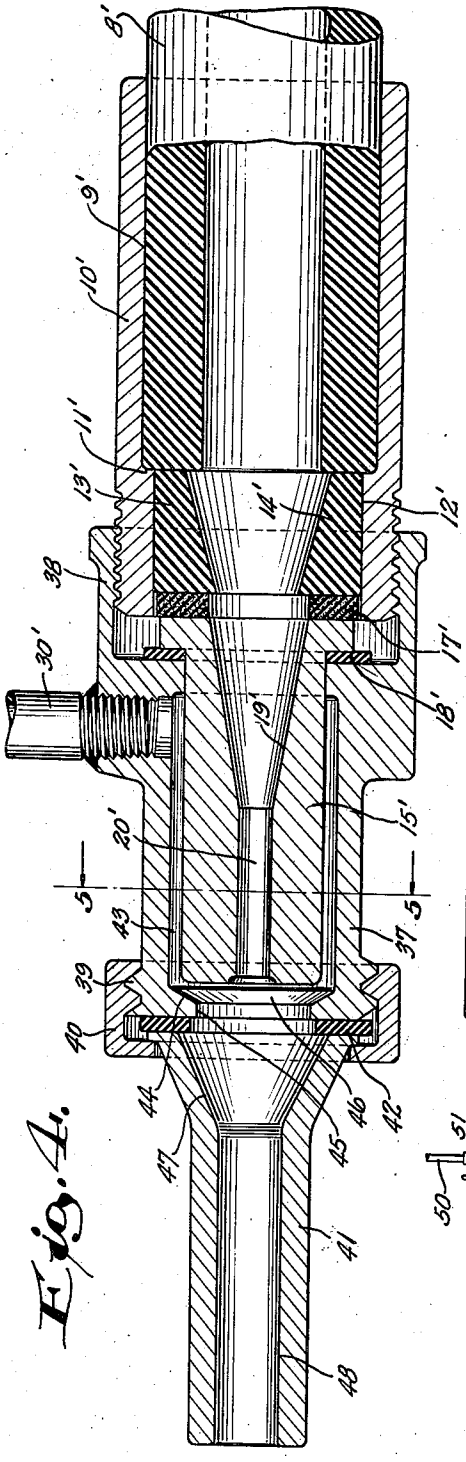

Fig. 4.

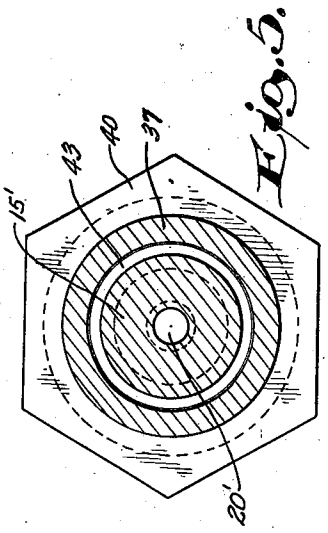

Fig. 5.

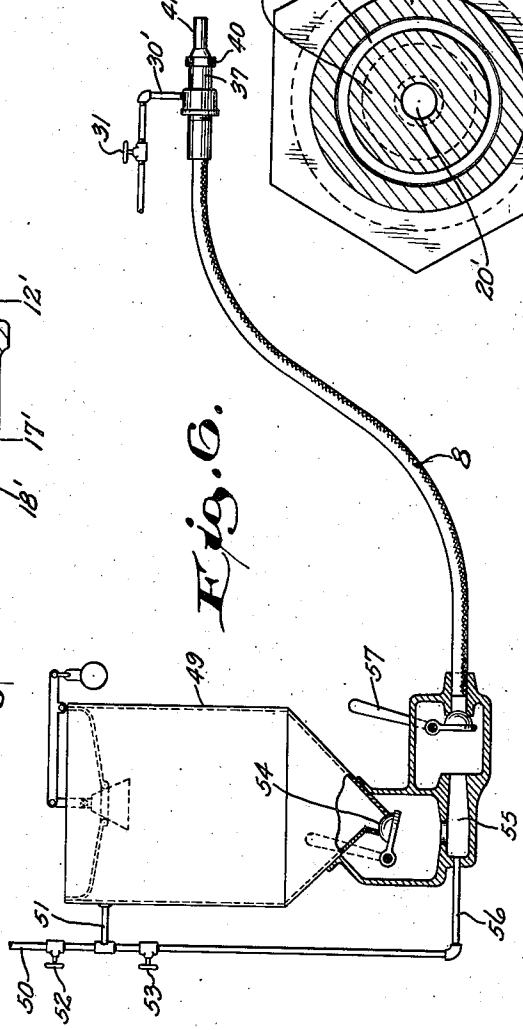

Fig. 6.

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UNITED STATES PATENT OFFICE

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GUN FOR BLASTING AND SPRAYING

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5 Claims. (Cl. 51—11)

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This invention relates to improvements in guns for blasting and spraying.

It is a general object of the present invention to provide a gun which may be used for a variety of purposes such as wet or dry sand blasting operations, water washing operations, spraying with rust-proofing chemicals, or the spraying of cement mixtures.

A further object of the invention is to provide a device of the class described in which there are tandem nozzles, together with means for delivering dry material, such as sand propelled by compressed air to the inner nozzle, and means for delivering a mixture of said dry material and a liquid to the outer nozzle.

A further object of the invention is to provide a gun of the type described wherein the outer nozzle, together with the liquid admitting conduit, may be readily detached from the inner nozzle so that the latter may be used for the discharge of dry material only.

A further object of the invention is to provide a wet blast gun wherein there is means for quickly effecting a longitudinal adjustment of the outer nozzle to thereby vary the effective size of the mixing chamber.

A still further object of the invention is to provide a device of the class described wherein the dry material discharge orifice of the inner nozzle is of less diameter than the inlet opening of the outer nozzle, there being a mixing chamber adjacent said discharge orifice of the inner nozzle which is so arranged that a vacuum is created in the mixing chamber to more effectively entrain liquid into the stream of dry material emerging from said inner nozzle.

A further object of the invention is to provide a construction in which the flow of liquid may be controlled or shut off adjacent the nozzle, and in which there may be a valve for controlling the flow of dry material from the inner nozzle.

With the above, and other objects in view, the invention consists of the improved gun for blasting and spraying, and all its parts and combinations, as set forth in the claims, and all equivalents thereof.

In the accompanying drawings, illustrating complete embodiments of preferred forms of the invention, in which the same reference numerals designate the same parts in all of the views:

Fig. 1 is a longitudinal sectional view through the gun showing the liquid conduit connected thereto;

Fig. 2 is a fragmentary sectional view taken on line 2—2 of Fig. 1;

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Fig. 3 is a sectional view taken on line 3—3 of Fig. 1, part of the valve being broken away;

Fig. 4 is a longitudinal sectional view through a modified form of gun;

Fig. 5 is a sectional view taken on line 5—5 of Fig. 4; and

Fig. 6 is an elevational view illustrating the gun connected to a source of supply for compressed air and dry material, part of the mechanism being broken away, and shown in vertical section.

Referring first to Figs. 1 to 3 inclusive, the numeral 8 designates the outer end of a hose, preferably formed of rubber, and this hose may lead from a source of dry material propelled by compressed air. This dry material may be sand or other abrasives, powdered cement, or the like. The hose end 8 is connected within the bore 9 of a sleeve 10; and the inner end of the hose may abut against a shoulder 11. Outwardly of the shoulder 11 is a bore 12 of smaller diameter. Within the bore 12 is a rubber ring 13 having a tapered bore 14.

An inner nozzle member 15 is connected by a nut 16 with the outer end of the sleeve 10, there being a rubber gasket 17 between the inner end of the nozzle 15 and the outer end of the rubber ring, and there being another gasket 18 within the nut member 16. The nozzle 15 is formed with a duct which includes a tapered section 19 and an outer straight section 20 of restricted diameter communicating with the discharge end of the inner nozzle 15.

A tubular injector housing 21 has a bore 22 which is preferably of the same diameter as the external diameter of the outer end of the inner nozzle 15. A ferrule 60, fitted on the end of the nozzle 15, has ears 61 which are connected to ears 62 of the injector housing by bolts 63 to hold the housing in position. The ferrule may be removably held in place by a set screw 23. The main bore 22 of the housing 21 communicates with a bore 24 of smaller diameter at the outer end of the housing, and this latter bore receives the inner end of an outer nozzle member 25. The outer nozzle member is adjustably held in position by a bolt 26.

The main bore 22 of the injector housing is of substantially larger diameter than the inner end of the outer nozzle member 25 so that a mixing chamber 27 is formed therearound. The inner end of the outer nozzle is spaced outwardly from the orifice of the inner nozzle so that dry material discharged from the inner nozzle can entrain liquid from the mixing chamber as it

passes into the bore **28** of the outer nozzle member. The bore **28** is of substantially larger diameter than the outer orifice **20** of the inner nozzle so that a vacuum condition is created in the mixing chamber as the dry material passes therethrough. The inner end of the bore **28** is preferably flared as at **29**.

A conduit **30** for water or for a chemical solution under pressure communicates with the periphery of the mixing chamber **22**, there being a liquid control valve **31** in said conduit. Slidable transversely of the injector housing through slots **32** is a slide valve **33** having an opening **34**. The slide valve is movable against the outer end of the inner nozzle **15**, and serves to control the discharge of dry material therefrom. The ends of the slide valve may be equipped with suitable stops **35** and **36**. When the stop **35** is in engagement with the top of the injector housing, then the valve opening **34** is in registration with the orifice **20**, and permits the discharge of dry material. When the stop **36** is in engagement with the lower side of the injector housing, then the discharge of material is shut off.

In the modified form of the invention illustrated in Fig. 4, the parts **8'**, **9'**, **10'**, **11'**, **12'**, **13'**, **14'**, **15'**, **17'**, **18'**, **19'**, and **20'**, correspond in construction and function to the unprimed parts having corresponding numerals in the form of the invention in Fig. 1 and will not be again described in detail.

In this modification, however, the injector housing, designated by the numeral **37**, is of increased length and surrounds the entire inner nozzle portion. The inner end of the injector housing **37** is in the form of a nut, as at **38**, to hold the parts in assembled position on the sleeve **10'**. The outer end of the injector housing is threaded as at **39** to receive a coupling nut **40**. The latter serves to removably connect the outer nozzle **41** to the outer end of the injector housing **37**, there being a rubber gasket **42** at the joint.

A pipe **30'**, corresponding to the pipe **30** of the form of the invention of Fig. 1, which is similarly equipped with a valve, such as the valve **31** of Fig. 1, is adapted to discharge liquid into a chamber **43** surrounding the exterior of the nozzle **15'**. This chamber is of larger diameter than the external diameter of the inner nozzle. The outer end of the chamber **43** is connected by a tapered offset **44** with a discharge orifice **45** of smaller diameter, there being a mixing chamber portion **46** in front of the outer end of the inner nozzle **15'**.

Dry material which is discharged from the orifice **20'** entrains liquid from the annular chamber **43** into the mixing chamber, and the mixture is directed into a flared inner end portion **47** of the bore of the outer nozzle. It is to be noted that the end of the flared bore portion **47** is of substantially larger diameter than the adjacent outlet end of the duct **20'** of the inner nozzle. The mixture from the flared bore portion **47** is directed outwardly into and through a straight discharge bore **48** of the outer nozzle.

Fig. 6 illustrates a typical hookup of a gun with mechanism for supplying abrasive material and compressed air. Referring to said figure, the numeral **49** designates a hopper for the dry material, and the numeral **50** is a conduit for supplying compressed air. The compressed air conduit has a branch line **51** which communicates with the interior of the hopper, and there are valves **52** and **53** on each side of said branch line. When the valve **54** at the bottom of the hopper is

opened, the compressed air and gravity will force dry material from the hopper into a chamber **55**. Compressed air from the line **56** will pick up said material and convey it through the hose **8** to one of the guns heretofore described. A manual valve **57** may control the admission of the dry blast into the hose **8**.

From the above description it is apparent that, in both forms of the gun, the dry material is discharged from a relatively small orifice of an inner nozzle toward a relatively large opening of an outer nozzle, there being a space between the adjacent ends of the two nozzles where the sand or other dry material effectively entrains liquid into the moving stream in a manner as to produce an excellent mixture. By having the dry material pass through the inner nozzle, the control valve **31** for the liquid may be shut off whenever desired to permit the discharge of dry material only. Furthermore, in the form of the invention of Fig. 1, by loosening the set screw **23**, the gun may be quickly converted into a dry blast device. The same object may be accomplished by removing the outer nozzle **41** from the structure of Fig. 4. In the form of the invention of Fig. 1, the slide valve **33** provides for convenient manual control of the dry material at the nozzle.

Various changes and modifications may be made without departing from the spirit of the invention, and all of such changes are contemplated as may come within the scope of the claims.

What I claim is:

1. A gun for blasting and spraying, comprising an inner nozzle having a duct therein, means for supplying dry material under pressure to the duct of said inner nozzle, an outer nozzle having a duct communicating with its inner end, means connecting the inner end of said outer nozzle adjacent the outer end of said inner nozzle with a space between said adjacent nozzle ends, means for admitting liquid to said space, and a valve on said gun positioned to coact with the duct of the inner nozzle for controlling the flow of material from the inner nozzle to said space.

2. A gun for blasting and spraying, comprising an inner nozzle having a duct therein, means for supplying dry material under pressure to the duct of said inner nozzle, an outer nozzle having a duct communicating with its inner end, means connecting the inner end of said outer nozzle adjacent the outer end of said inner nozzle with a space between said adjacent nozzle ends, means for admitting liquid to said space, and a slide valve operable in said space adjacent the outer end of the inner nozzle for controlling the flow of material from said end.

3. A gun for blasting and spraying comprising an inner nozzle having a duct therein, means for supplying a dry material under pressure to the duct of said inner nozzle, an outer nozzle having a duct communicating with its inner end, means connecting the inner end of said outer nozzle adjacent the outer end of said inner nozzle with a space between said adjacent nozzle ends, means for admitting liquid to said space, and a valve on said gun positioned for quick manipulation by the operator while holding the gun for controlling the flow of dry material from the inner nozzle.

4. A gun for blasting and spraying, comprising an inner nozzle having a duct therein, means for supplying dry material under pressure to the duct of said inner nozzle, an outer nozzle having a duct communicating with its inner end, means

connecting the inner end of said outer nozzle adjacent the outer end of said inner nozzle with a space between said adjacent nozzle ends, means for admitting liquid to said space, and a valve operable in said space adjacent the outer end of the inner nozzle for controlling the flow of material from said end.

5. A gun for blasting and spraying comprising an inner nozzle having a duct therein, means for connecting the inner end of said inner nozzle to a source of supply for one blasting material; an outer nozzle assembly including an outer nozzle having a duct communicating with its inner end, a tubular connection member secured to the outer nozzle and having a chamber therein communicating with the inner end of the outer

nozzle, and said outer nozzle assembly also including a conduit projecting laterally therefrom for supplying a second blasting material to said chamber; and means including laterally projecting cooperating members on the inner end of the connection member and outer end of the inner nozzle providing a quickly detachable connection between said connection member and the outer end of the inner nozzle with a mixing space between said adjacent nozzle ends and communicating with the connection member chamber whereby the outer nozzle assembly may be quickly detached as a unit to permit use of the inner nozzle alone.

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