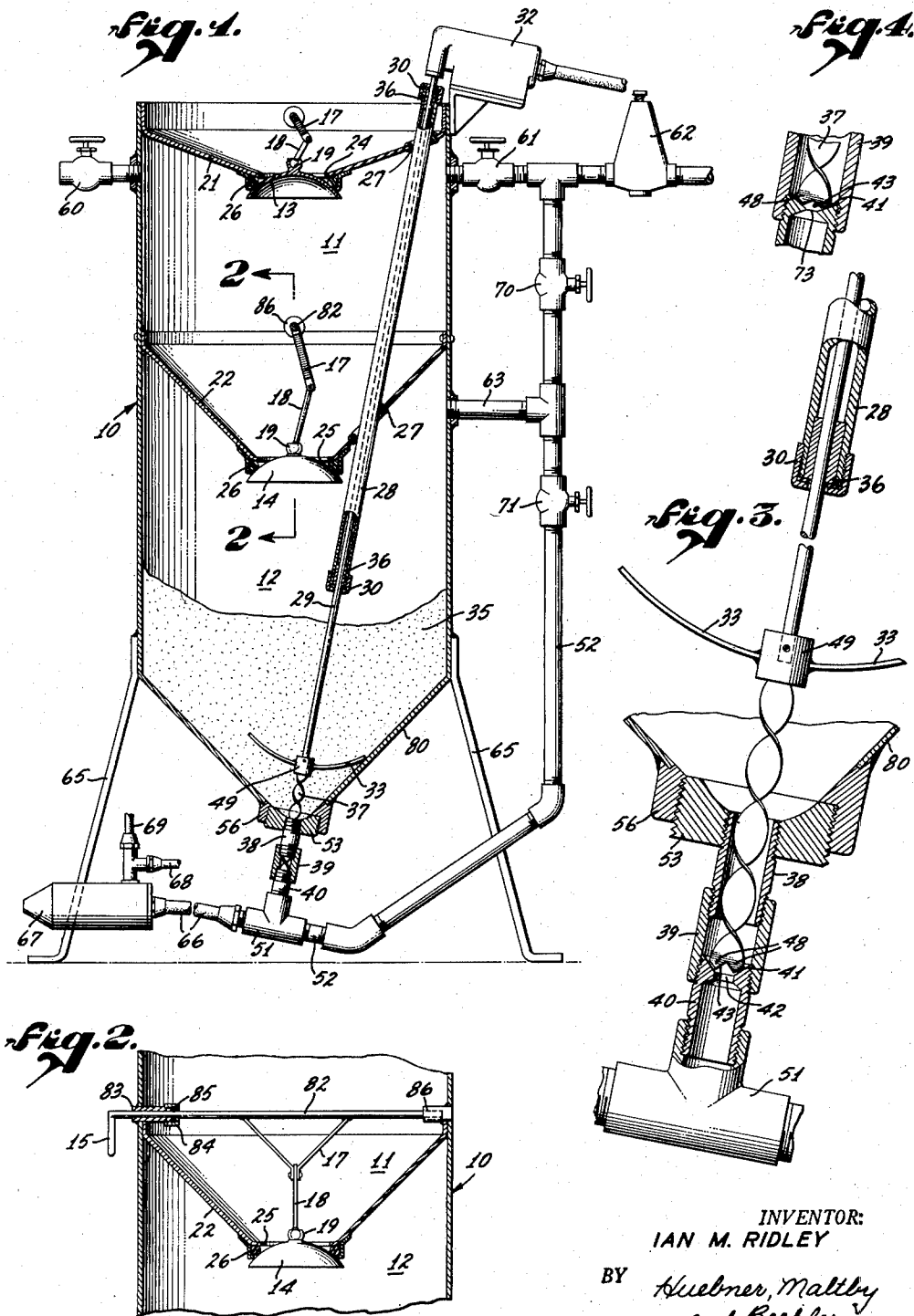


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CEMENT GUN APPARATUS

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CEMENT GUN APPARATUS

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1

This invention relates to cement gun sand-blasting equipment and the like, and more particularly to a new and improved sandblasting or cement gun apparatus of improved overall and metering construction.

Prior art devices must ordinarily be shut down while they are recharged with raw materials, such as cement or sand or both. Their operation is consequently intermittent. Presently known apparatus also tends to deliver sand or mixtures of sand and cement with an uneven, irregular and often spasmodic flow so that the size of the apparatus is ordinarily excessive for the purposes for which the instant apparatus is intended, and the supply of material to the delivery nozzle and place of application is relatively excessive because of the absence of a satisfactory metering device.

Prior art apparatus is also subject to excessive wear in use and the working parts are replaceable only with difficulty.

Therefore an object of this invention is to avoid the above objections and to provide an apparatus usable either as an applicator for a mixture of cement and sand or as a sandblasting unit which need not be shut down while in use, which may be readily made from available materials, which affords easy access to all of its working parts for replacement or repair, and which provides a steady controllable and continuous supply of preferably dry mixed cement and sand as desired.

It is another object of this invention to provide a tank type cement gun apparatus which is usable as a sandblaster, all parts of which may be powered by a single compressed air source and having an overall simplicity of construction.

It is another object of this invention to eliminate customary gears and other complicated mechanism for performing the desired function.

Another more specific object of the invention is the provision of an improved metering means associated with a new and improved metering orifice whether considered either alone or in the cited combination.

Another further object of the invention is the provision of a metering apparatus bearing a unique and satisfactory relationship to the feed chamber with which it is associated.

It is moreover an object of this invention to provide improvements over prior art devices generally intended to be put to a similar use.

With these and other objects in view, the invention consists in the construction, arrangement and combination of the various parts of the device whereby the objects contemplated are attained, as hereinafter set forth, pointed out in the appended claims and illustrated in the accompanying drawings.

2

In the drawings:

Figure 1 is a vertical sectional view, parts being cut away of an apparatus illustrative of this invention.

Figure 2 is a vertical sectional view as on a line 2-2 of Figure 1.

Figure 3 is a detailed enlarged view of the metering mechanism.

Figure 4 is a detailed view of a modified form of metering orifice.

Referring more particularly to the drawings, an apparatus embodying this invention by way of illustration and not of limitation comprises a tank 10 divided into an upper compartment 11 and a lower compartment 12. These compartments may be respectively fitted as with hemispherical cups 13 and 14, respectively, comprising check valves, the upper one 13 of which, at least, may be raised or lowered by means of a windlass type construction such as a handle 15 or automatically by compressed air as will be seen. The turning of the handle 15 may lower the hemispheres from the positions illustrated in Figure 1 by straightening the toggle links 17, 18, of the valve 13, or if desired, of the valve 14 as well. The lower link 18 may be provided with a ball set in a suitable socket 19 for universal movement.

The upper compartment 11 is defined by a top transverse wall 21, optionally funnel-shaped in the manner of a hopper, and a preferably funnel-shaped lower wall 22 which incidentally also comprises the top of the chamber 12. Orifices 24 and 25 associated with the hemispheres 13 and 14 are provided with packing rings 26 or the like to insure an air-tight closure of the hemispheres thereagainst.

A tube 23 and rod 29 project downwardly, most desirably, at an angle through the walls 21 and 22 so as to clear the openings 24 and 25, to provide outside mounting for the driving means as will be seen, and to facilitate acquisition of a desired angle for the metering means as will also be set forth hereinafter. The rod 29 extending therethrough is accommodated by ported caps 30 at the ends of the tube 28, and the tube is made air-tight in its passage through the tank as by suitable ring packing 27.

An air motor or the like 32 is operatively connected to the rod 29 to cause the rotation thereof, whereby the agitator arms or stirrers 33 welded to the rod 29 are caused to rotate and mix dry cement and sand 35 disposed in suitable proportions within the tank 10. The tube 28 may have either packing or bearings 36 for the rotatable reception of said rod 29 in an air-tight manner.

Continuous with the rod 29 is a twisted metal ribbon 37 extending into a preferably threaded

nipple 38, a sleeve 39, and another nipple 40 formed with a tapered shoulder 41 providing a constricted tubular-shaped orifice 42.

A notch 43 formed in the lower end of the ribbon 37 thereby forms wings 48 which, upon rotation of the rod 29 and the ribbon 37, optionally secured thereto in a releasable manner as by a keyed or recessed hub 49 and set screw arrangement, assist the screwing action of the ribbon 37 in metering a dry sand or cement and sand mixture 35 through the orifice 42.

A stirrer 33 may be welded or reverse threaded as by means of a sleeve or the like (not shown) to the hub 49.

The nipple 40 may be formed integrally with the shoulder portion 41 or separately therefrom as a removable insert as within the sleeve 39. Said nipple 40 is threaded into a T 51 across the run of which a pipe 52 leading from an air supply (not shown) is passed. A boss 53 may be threaded into a suitable reinforcing shoulder 56 at the bottom of the tank 10 in order to support the last mentioned mechanism in a preferred angular position as shown.

An outlet control valve 60 is openly connected with the upper chamber 11 and an inlet control valve 61 interconnected with the air supply pipe 52, preferably after the passage of the latter through a pressure reduction valve 62, controls the flow of air from the supply pipe 52 to the upper chamber 11.

The apparatus above described may be placed on wheels, skids, or the like for mobility, or may be provided with a supporting framework such as legs 65 to support the same in a vertical position as shown. In any event an air supply hose separate from the supply pipe 52 may be directly connected to the compressor or other air source (not shown) for operating the motor 32 which may likewise be provided with a regulating mechanism of conventional construction to control the speed thereof. A hose connection 66 may be continuous with the run of the T 51 and lead to a delivery nozzle 67 also of conventional construction. An auxiliary air supply hose 68 or the nozzle 67 may connect with the compressor source or the delivery hose 65, and another hose 69 may be connected to a water source to convey air and water, respectively, under pressure to the delivery nozzle 67 in order to disperse and throw the dry sand mixture from the T 51, optionally a venturi, and to spray the same with water vapor, to moisten the same to a desired extent so that it may adhere to a surface upon which it is directed. The apparatus is used for sandblasting. Manifestly the pressure reduction valve 62 may be eliminated or opened to its fullest extent, and the air and auxiliary water hoses 68 and 69 leading to the nozzle may be turned off or removed.

The handle 15 for controlling the upper hemisphere 13 for example may have a horizontal rod 82 extending therethrough provided with a sleeve bushing 83 with a cap 84 and rubber gasket 85 therein to make the same air-tight and also provided with a cup bushing 86 at its opposite end. The links 17 preferably are welded or otherwise connected to the rod 82.

Operation

In the operation of the apparatus above described dry sand and cement in appropriate proportions are fed into the upper chamber 11 through the opening 24 past the hemisphere 13

which may be lowered from its closed raised position by rotation of the handle 15, optionally also, or in addition, opening the outlet valve 60 any air under pressure within the upper chamber 11 will be exhausted to the atmosphere, the inlet valve 61 meanwhile having been closed in either case.

When the upper chamber 11 has been filled with entrant raw materials to a sufficient extent the valve 60 is closed and the valve 61 then opened permitting air under pressure to enter the chamber 11 and forcing the hemisphere 13 closed. Compressed air from its source in passing through the pressure regulator valve 62 bypasses the inlet valve 61 and enters the lower chamber 12 by pipe 63, whereby a constant pressure is maintained within said lower chamber normally equal to that within the upper chamber 11 when the inlet valve 61 is open. Thereby, the weight of an entrant dry sand and cement mixture above and upon the hemisphere 14 causes a pressure differential which automatically opens said valve 14 and permits the dry mixture to fall into the chamber 12 as the latter is exhausted, i. e., it may be noted that due to its weight the hemisphere 14 may remain open even when pressures within the chambers 11 and 12 are equal as when the outlet valve 60 is closed and the inlet valve 61 is opened.

However, upon the opening of the valve 60 and closing of the valve 61 the air pressure within the lower chamber 12 exceeds that within the upper chamber 11 forcing a closing movement of the hemisphere 14. Valves 70 and 71 in the supply pipe 52 control the flow of air to the lower chamber 12 and the nozzle 67.

During the normal operation of the apparatus, the passage of air from the source, through the pipes 52, through the T 51, and thence into the nozzle 67, carries with it the sand and cement mixture as it is metered through the orifice 42. In the nozzle 67, the preferably, though not necessarily, dry mixture 35 prior to its ejection from the tank 66 is wetted, as stated, with a spray of desired density formed by the injection of water or air and water under pressures of approximately 60 and 80 pounds respectively, thereby providing a discharge which upon contact with a treated surface clings and sets.

The pressure of the air within the lower chamber 12 tends to force the treated material outwardly through the orifice 42 as controlled by the rotating screw 37 whose lower tapered ends 48 preferably conform to the corresponding surface of the shoulder 41 and may be either slidable thereon or only placed in proximity thereto.

The notching 43 of the lower end of the screw-like ribbon 37 provides an appropriate outlet for the bulk of material contained within the enlarged sleeve portion 39. In combination with said slot and said interior of the sleeve 39 the fingers 48 in their revolving movement do not jam but provide a free stirring movement for the granular or powdered material thereabove. An evenness of flow is thereby obtained of said material which drops through the orifice 42 and into the T 51 where the same is picked up by the air stream passing through the supply pipe 52 to the left as illustrated in the drawings. In view of the granular nature of the material used the pressure of the air within the lower chamber 12 passes in part through the material because of said porous nature and assists in the transmittal of the same through the nipple 38 and the sleeve 39. Moreover the amount of extension of the twisted ribbon 37 into the upper orifice portion comprising the nipple 38 and sleeve 39 further

5

regulates and controls the flow through the restricted portion of the orifice 42.

As illustrated in Figure 3 said orifice 42 is shown to have substantial vertical depth from the bottom of its top tapered edge to the top of its lower tapered edge, but the same may be reduced to a relatively thin line 73 as illustrated most clearly in Figure 4, wherein other corresponding parts are designated by like numerals to those illustrated in Figures 1, 2 and 3. The orifice 73 per se is therefore shown as being without substantial cylindrical wall portions similar to those 42 of Figure 3.

Rotation of the screw 37 against the shoulder 41 may be achieved in either embodiment in order to retain a proper working condition of these parts to maintain a sharp line of contact therebetween and to prevent sticking by entrance of powdered or granular material between the adjacent sliding surfaces.

The construction of this apparatus is such that may be readily dismantled and any or all of the parts removed for replacement or repair. The notch 43 may thereby be enlarged or reshaped as needed and the length of the screw 37 may be regulated by suitable telescopic adjustment in the keyed relationship of the hub 49 and the shaft 29 to provide relative axial movement or provision for adjustment.

This invention features the provision of a convenient uniformly operating sandblasting and/or cement spraying apparatus of outstanding performance. A satisfactory size has been found to be an approximate 40" height for the tank and an approximate 18" diameter therefor, the openings 24 and 25 being preferably approximately 4" in diameter, and the angle of slant of the transverse portion 22 and bottom 80 approximately 45°. The agitator 33 may be shaped to conform to such bottom portion 80 along the most proximate wall thereto. The rod 29 and screw 37 may, if desired, although this is not the preferred construction, be given a vertical position to the other parts. A slight clearance between the lower end of the twisted ribbon 37 and shoulder 41 has also been found desirable with certain types of granular and powdered material.

While I have herein shown and described my invention in what I have conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of my invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices.

The invention having been herein described, what I claim as new and desire to secure by Letters Patent is:

1. In a cement gun apparatus comprising a hopper for dry sand and/or cement, a substantially vertical outlet formed at the bottom of the hopper, metering means rotatable on a substantially vertical axis in alignment with and above said outlet, drive means for rotating said metering means, a source of compressed air, a delivery means for discharging said dry material from a station below said outlet to a point of use by means of said air, said metering means comprising a vertical screw-shaped ribbon, said outlet being formed with a seat thereabove, said ribbon having a bifurcate lower end portion straddling said outlet, the lower ends of the bifurcate portion being slidable rotatively upon said seat, and means for rotating said ribbon,

6

2. In a cement gun apparatus comprising a hopper for dry sand and/or cement, a substantially vertical outlet formed at the bottom of the hopper, metering means rotatable on a substantially vertical axis in alignment with and above said outlet, drive means for rotating said metering means, a source of compressed air, a delivery means for discharging said dry material from a station below said outlet to a point of use by means of said air, said metering means comprising a vertical screw-twisted ribbon, said outlet being formed with a seat thereabove, said ribbon having a bifurcate lower end portion straddling said outlet, the lower ends of the bifurcate portion being slidable rotatively upon said seat, and means for rotating said ribbon.

3. In a cement gun apparatus comprising a hopper for dry sand and/or cement, a substantially vertical outlet formed at the bottom of the hopper, metering means rotatable on a substantially vertical axis in alignment with and above said outlet, drive means for rotating said metering means, a source of compressed air, a delivery means for discharging said dry material from a station below said outlet to a point of use by means of said air, said metering means comprising a vertical screw-shaped ribbon, said outlet being formed with an annular restricted shoulder having a tapered seat, said ribbon having a bifurcate lower end portion straddling said outlet, the ends of the bifurcate portion being tapered to correspond with the taper of the seat and to make line contact therewith on each side thereof and being rotatably slidable thereon, and means for rotating said ribbon.

4. In a cement gun apparatus comprising a hopper for dry sand and/or cement, a substantially vertical outlet formed at the bottom of the hopper, metering means rotatable on a substantially vertical axis in alignment with and above said outlet, drive means for rotating said metering means, a source of compressed air, a delivery means for discharging said dry material from a station below said outlet to a point of use by means of said air, said metering means comprising a vertical driving member, said outlet being formed with a seat thereabove, defining a central opening, said vertical driving member having opposed horizontally spaced finger-like stirring elements depending therefrom and straddling said outlet, the lower ends of said finger-like elements each moving around said seat, said finger-like stirring elements defining a space between them and above the opening in said seat, and means for rotating said driving member.

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