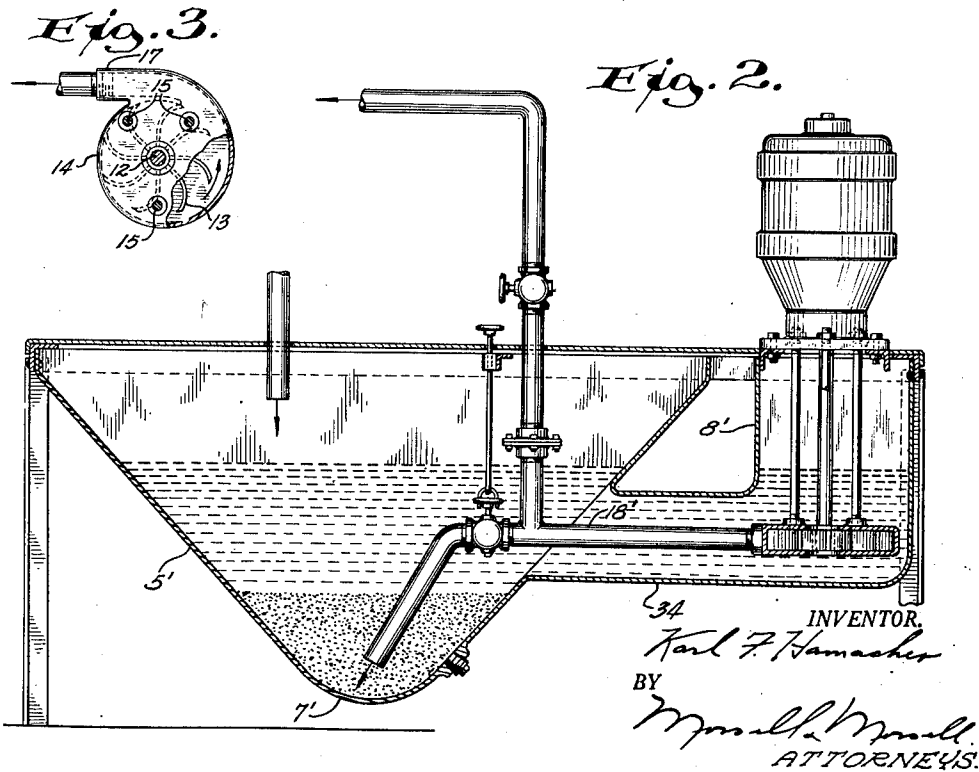
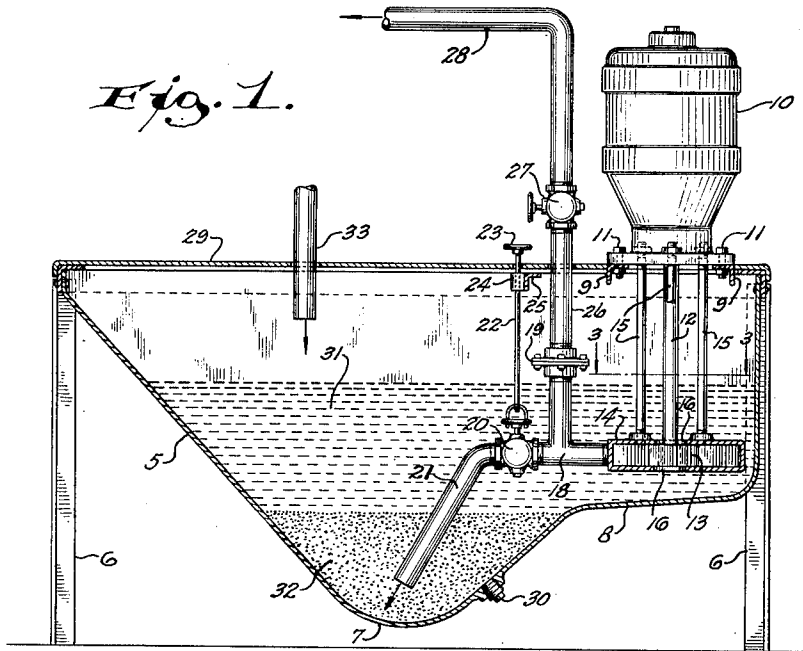


Oct. 14, 1952

K. F. HAMACHER
WET BLASTING APPARATUS

2,613,482

Filed Nov. 26, 1949



INVENTOR.
Karl F. Hamacher
BY
Myron H. Munnell
ATTORNEYS.

UNITED STATES PATENT OFFICE

2,613,482

WET BLASTING APPARATUS

Karl F. Hamacher, Milwaukee, Wis.

Application November 26, 1949, Serial No. 129,648

15 Claims. (Cl. 51—8)

1

This invention relates to improvements in wet blasting apparatus.

Wet blasting is the process of abrading or polishing in which abrasive particles are carried in a liquid vehicle which is directed under pressure at the work, usually through a nozzle. In the handling of the abrasive liquid suspension certain problems have heretofore been encountered. Because of the inherent nature of the abrasive, wear on the shaft, bearings and packing of the pump which handles the suspension is necessarily great. In addition, the settling of the suspended material when the equipment is not in use frequently causes blocking and stoppage of the pump due to the fact that the inlet for the pump is normally located near the bottom of the sump or hopper which contains the suspension.

With the above in mind, it is a general object of the invention to provide a wet blasting apparatus wherein the pump starts quickly and will not stall because of settling out of the suspended abrasive material.

A further object of the invention is to provide a wet blasting apparatus wherein the pump is immersed in the liquid suspension, said pump having no bearings or packing located to be subject to wear from the abrasive.

A more specific object of the invention is to provide an apparatus of the class described wherein the liquid suspension is contained in a hopper having a sloping bottom which terminates in an apex portion within which the suspended material tends to settle when the apparatus is not in use, and wherein the pump is positioned within the liquid above said apex portion to avoid the possibility of the pump becoming clogged with settled out material and to thereby insure quick starting.

A further object of the invention is to provide an apparatus of the class described wherein the pump is adapted to direct a portion of its discharge into the apex portion of the hopper to instantly and thoroughly mix the settled solids with the vehicle upon starting and to maintain continuous, thorough mixing during operation.

A further object of the invention is to provide an apparatus of the class described wherein the motor for driving the pump is positioned outside of and above the hopper which contains the suspension.

A further object of the invention is to provide in a device as above described a bearingless and glandless pump of the centrifugal type having a volute formed with opposite, centrally disposed

2

inlet apertures and having an impeller rotatably positioned in said volute, said volute being suspended from the motor mounting above the tank, and said impeller being fixed to an elongated shaft driven and supported by said motor.

A further object of the invention is to provide an apparatus of the class described wherein the pump and the motor can be removed from the hopper without draining the suspension from said hopper.

A further object of the invention is to provide an apparatus of the class described which is simple in construction, efficient in operation, and otherwise well adapted for the purposes described.

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

In the drawing accompanying and forming a part of this specification, wherein are shown two forms of the invention, and wherein the same reference characters indicate the same parts in all of the views:

Fig. 1 is a vertical sectional view through the hopper of a wet blasting apparatus illustrating the preferred form of the invention, part of the pump housing being broken away;

Fig. 2 is a vertical sectional view through the hopper of a wet blasting apparatus illustrating a modified form of the invention; and

Fig. 3 is a transverse sectional view taken approximately along the line 3—3 of Fig. 1.

Referring more particularly to Fig. 1 of the drawing, the numeral 5 indicates a hopper or tank which may be supported on suitable legs 6. The hopper 5 has sloping side walls which terminate in a downwardly extended apex portion 7. At one side of the hopper 5 is an offset portion 8 spaced a predetermined distance above the bottom of the apex portion 7, as shown.

Extending across the top of the hopper 5 above the offset portion 8 thereof are suitable, horizontal supporting members, such as the angles 9. Mounted on the members 9, is a source of rotative power, such as an electric motor 10 which is secured by means of the bolts 11. The motor 10 has an elongated, vertically extending drive shaft 12 which extends downwardly within the offset portion 8 of the hopper 5, and which has fixed to its lower end a centrifugal pump impeller 13.

The impeller 13 is rotatably positioned in a centrifugal pump volute housing 14 which is

3

suspended from the motor mounting by means of the rods or shafts 15. The volute 14 is formed with centrally disposed inlet openings 16 in its upper and lower walls. The motor shaft 12 extends through the upper inlet opening 16 as shown, and said opening is of sufficient size to provide adequate space for fluid to flow there-through around said shaft. It will be noted that there are no bearings or packings associated with the volute 14 or with the impeller 13.

The volute 14 is formed with a discharge connection 17 (see Fig. 3) to which is connected a T-pipe fitting 18. One arm of the T 18 extends upwardly and has connected to its upper end one-half of a flanged pipe connection 19. The remaining arm of the T 18 connects with a valve 20, from the opposite side of which projects a section of pipe 21 extending downwardly into the apex portion 7 of the hopper 5, as shown. The valve 20 is provided with a remote control rod 22 having a hand wheel 23 which is accessible from above the hopper 5 as shown. A suitable bearing 24 and supporting member 25 may hold the rod 22 in upright position.

The upper half of the flanged connection 19 is connected to a section of pipe 26 which extends upwardly and communicates with a valve 27. A pipe 28 connects with the other side of the valve 27 and leads to a blasting gun (not shown) or to a mixing tank (not shown). The hopper 5 may have a removable cover 29, and there may be a drain plug 30 positioned in the apex portion 7.

A quantity of liquid wet blast vehicle 31, such as water, is run into the hopper 5 up to approximately the level shown (which is preferably slightly below the flanged connection 19). A normally fine abrasive 32 is then placed in the vehicle 31 in the desired proportions. If the vehicle is not agitated, said abrasive particles will tend to settle in the apex portion 7 of the hopper.

To put the apparatus into operation, the valve 20 is opened and the valve 27 may be closed. Starting of the motor 10 causes the impeller 13 to rotate as indicated in Fig. 3, thereby drawing substantially clear liquid vehicle in through the inlet ports 16. Since this portion of the vehicle is not laden with the heavier semi-solid abrasive material which has settled in the apex portion 7, the pump runs freely with a quick starting action. The liquid discharged through the outlet 17 passes through the T 18, valve 20 and pipe 21, and is directed under pressure and as a stream into the mass of settled semi-solid abrasive particles 32 in the apex portion 7. This causes the vehicle and the settled particles to be violently mixed so that said particles are held in suspension in said vehicle. As the mixing continues, all of the liquid in the hopper becomes thoroughly mixed with the semi-solids, and a substantially homogeneous suspension is maintained by circulation through the pump.

When the proper mixing is accomplished, the valve 20 may be closed to a certain extent, and the valve 27 opened to permit the suspension to be pumped through valve 27 to the blasting gun or mixing chamber via the pipe 28. During operation, the valve 20 is adjusted by means of the hand wheel 23 so that proper mixing of the abrasive with the vehicle is assumed. The suspension is discharged at the work to be polished in a suitable booth (not shown), and the spent abrasive suspension is collected in a hopper in said booth and returned to the hopper 5 via a return pipe 33, to be used over again.

4

Since there are no bearings or gaskets associated with the volute 14 and impeller 13, there are no such parts which are subject to wear as is usually the case with pumps handling liquids with abrasives in suspension. By unbolting the flanged connection 19, the pump and the motor can be easily and quickly removed from the hopper 5 without the necessity of draining said hopper. Quick starting of the pump is assured, even after a relatively long period of idleness, since the pump is positioned in the upper portion of the hopper 5 and cannot be fouled by settled abrasive material. Throughout the operation of the apparatus thorough mixing of the suspension is assured.

Fig. 2 shows a modified form of the invention which is substantially the same as that shown in Fig. 1, with the exception that the hopper 5' is formed with a separate chamber 8' which communicates with the hopper 5' through a tubular portion 34. The latter is spaced above the bottom of the apex portion 7' about the same distance as the portion 8 is from the bottom of the apex 7 in the preferred form. In the modified form of the invention the T 18' has an elongated arm extending within the tubular portion 34.

Various other 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. In a wet blasting apparatus: a hopper adapted to contain a liquid suspension and having a bottom portion into which the suspended material in said suspension tends to settle, said hopper being formed with a side opening above said bottom portion and below the normal liquid level in said hopper; a housing fixed to the side of said hopper and communicating with the interior thereof through said hopper opening; and a pump positioned in said housing.

2. In a wet blasting apparatus: a hopper adapted to contain a liquid suspension and having a bottom portion into which the suspended material in said suspension tends to settle, said hopper being formed with a side opening above said bottom portion and below the normal liquid level in said hopper; a housing fixed to the side of said hopper and communicating with the interior of said hopper through said hopper opening; a pump positioned in said housing and having an inlet in communication with said liquid suspension; and an outlet conduit for said pump extending through said hopper opening into said hopper.

3. In a wet blasting apparatus: a hopper adapted to contain a liquid suspension and having a bottom portion into which the suspended material in said suspension tends to settle, said hopper being formed with a side opening; a housing fixed to the side of said hopper and communicating with the interior of said hopper through said hopper opening; a pump positioned in said housing and having an inlet in communication with said liquid suspension; an outlet conduit for said pump extending into said hopper; and a connection on said outlet conduit having a discharge opening positioned to direct a portion of the liquid discharged from the pump into the hopper.

4. In a wet blasting apparatus: a hopper adapted to contain a liquid suspension and having a bottom portion into which the suspended material in said suspension tends to settle, said hopper being formed with a side opening; a hous-

5

ing fixed to the side of said hopper and communicating with the interior of said hopper through said hopper opening; a pump positioned in said housing and having an inlet in communication with said liquid suspension; an outlet conduit for said pump extending into said hopper; and a connection on said outlet conduit having a discharge opening positioned to direct a portion of the liquid discharged from the pump into said bottom portion of the hopper.

5. In a wet blasting apparatus: a hopper adapted to contain a liquid suspension and having a bottom portion into which the suspended material in said suspension tends to settle, said hopper being formed with a side opening; a housing fixed to the side of said hopper and communicating with the interior of said hopper through said hopper opening; a pump positioned in said housing and having an inlet in communication with said liquid suspension; an outlet conduit for said pump extending into said hopper through said hopper opening; and a connection on said outlet conduit having a discharge opening positioned to direct a portion of the liquid discharged from the pump into said bottom portion of the hopper.

6. In a wet blasting apparatus: a hopper having a bottom settling chamber, said hopper also being formed with a lateral extension the bottom of which is above said bottom settling chamber, said hopper having a liquid suspension therein with a normal surface level above the bottom of said lateral extension; a pump positioned in said lateral extension and having a housing formed with inlet and outlet openings; and a discharge conduit connected to the outlet opening of said pump, said discharge conduit having a branch extending into the bottom settling chamber of said hopper.

7. In a wet blasting apparatus: a hopper having a liquid suspension therein with a selected surface level, said hopper having a bottom portion into which the suspended material in said suspension tends to settle, and the quantity of said material in said suspension being such that said material when fully settled has a maximum level which is spaced below the surface of said liquid suspension, said hopper being formed with a side opening above said maximum settling level and below the selected surface level of said suspension in the hopper; a housing fixed to the side of said hopper and communicating with the interior thereof through said hopper opening; and a pump positioned in said housing.

8. In a wet blasting apparatus: a hopper having a liquid suspension therein with a selected surface level, said hopper having a bottom portion into which the suspended material in said suspension tends to settle, and the quantity of said material in said suspension being such that said material when fully settled has a maximum level which is spaced below the surface of said liquid suspension, said hopper being formed with a side opening above said maximum settling level and below the selected surface level of said suspension in the hopper; a housing fixed to the side of said hopper and communicating with the interior thereof through said hopper opening; a pump positioned in said housing, said pump having a housing formed with inlet and outlet openings; a discharge conduit connected to said outlet opening and extending into said hopper through said hopper side opening; and a branch line on said discharge conduit within said hopper extending into said bottom portion of the hopper

6

to agitate the suspended material which has settled in said hopper.

9. In a wet blasting apparatus: a hopper adapted to contain a liquid suspension and having a bottom portion into which the suspended material in such suspension tends to settle, said hopper being formed with a lateral extension having a bottom positioned above said bottom portion of the hopper and below the normal liquid level in said hopper, and a pump positioned in said lateral extension.

10. In a wet blasting apparatus: a hopper adapted to contain a liquid suspension and having a bottom portion into which the suspended material in such suspension tends to settle, said hopper being formed with a lateral extension having a bottom positioned above said bottom portion of the hopper and below the normal liquid level in said hopper, a pump positioned in said lateral extension, an outlet conduit for said pump, and a connection on said outlet conduit having a discharge opening positioned to direct a portion of the liquid discharged from the pump into said hopper bottom portion.

11. In a wet blasting apparatus: a hopper adapted to contain a liquid suspension and having a bottom portion into which the suspended material in such suspension tends to settle, said hopper being formed with a lateral extension having a bottom positioned above said bottom portion of the hopper and below the normal liquid level in said hopper, a pump positioned in said lateral extension, said pump having an inlet below the normal liquid level, an outlet conduit for said pump, and a connection on said outlet conduit having a discharge opening positioned to direct a portion of the liquid discharged from the pump into said hopper bottom portion.

12. In a wet blasting apparatus: a hopper having a bottom settling chamber, said hopper also having a lateral extension, the bottom of which is above said bottom settling chamber, said hopper having a liquid suspension therein with a normal surface level above the bottom of said lateral extension; a pump having an inlet opening in said lateral extension below the normal surface level and said pump having an outlet opening; and a discharge conduit connected to the outlet opening of said pump and having a branch extending into the bottom settling chamber of said hopper.

13. In a wet blasting apparatus: a hopper having a bottom settling chamber and having a bottom wall portion which is offset above said bottom settling chamber, said hopper containing a liquid suspension having a normal surface level above said offset bottom wall portion; and a pump in a position to be submerged in said liquid suspension and having an inlet communicating with the interior of said hopper at a point above said offset bottom wall portion and below said normal surface level.

14. In a wet blasting apparatus: a hopper having a bottom settling chamber and having a bottom wall portion which is offset above said bottom settling chamber, said hopper containing a liquid suspension having a normal surface level above said offset bottom wall portion; and a pump positioned in said hopper above said offset bottom wall portion and having an inlet opening above said offset bottom wall portion and below said surface level.

15. In a wet blasting apparatus: a hopper having a bottom settling chamber and having a lateral extension the bottom of which is above said

bottom settling chamber, said hopper having a liquid suspension therein with a normal surface level above the bottom of said lateral extension; and a pump positioned in said lateral extension below said normal surface level, said pump being formed with an inlet opening and having a discharge conduit.

KARL F. HAMACHER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,273,214	McConaghy	Feb. 17, 1942
2,276,824	Carruthers	Mar. 17, 1942
2,355,472	Ruthman	Aug. 8, 1944
2,395,160	Anderson	Feb. 19, 1946
2,462,480	Eppler	Feb. 22, 1949
2,493,215	Barnes	Jan. 3, 1950