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ABRADING APPARATUS

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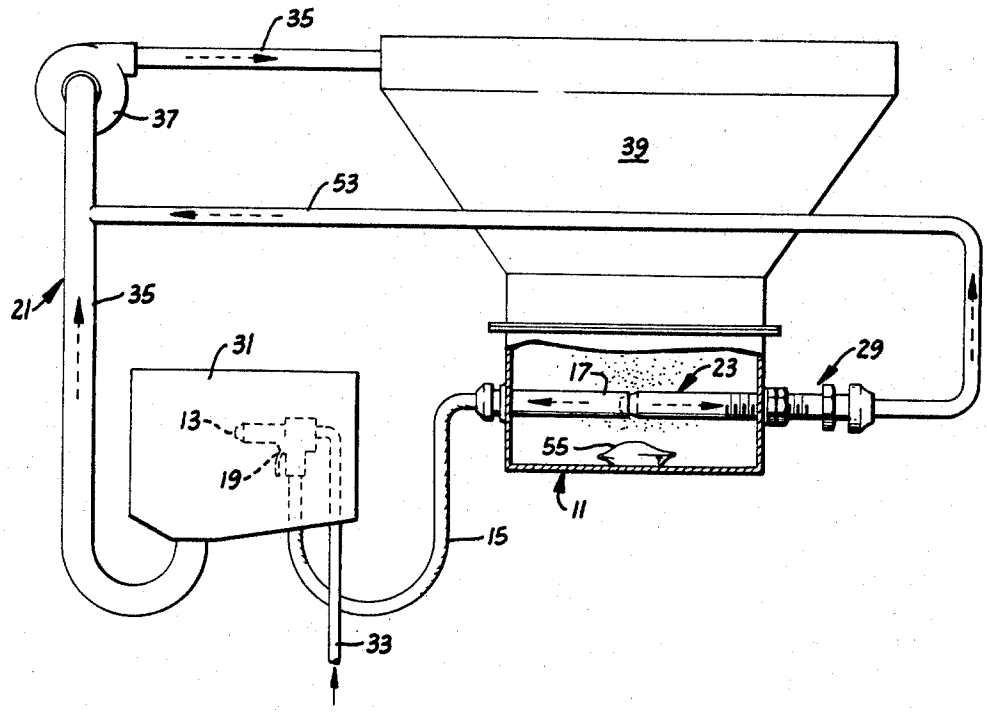


FIG. 1.

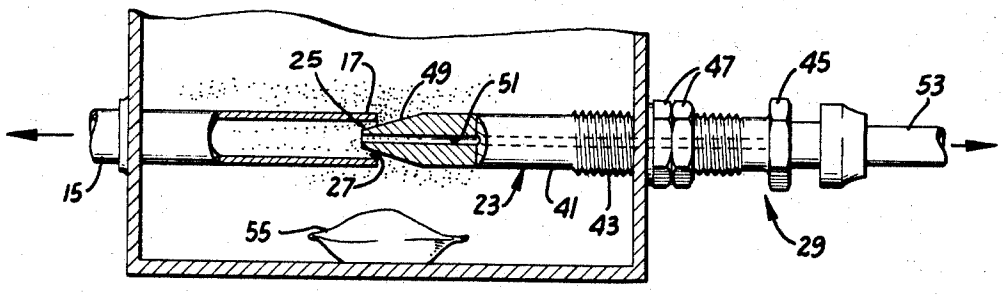


FIG. 2.

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ABRADING APPARATUS

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ABSTRACT OF THE DISCLOSURE

An abrasive apparatus having an adjustable orifice for admitting abrasive from a hopper to a delivery line, the adjustable orifice being provided by a tapered conical member movable axially toward and away from the open end of the delivery line, the orifice being kept open by applying suction at the orifice through an axial passage in the conical member which communicates with the intake side of the fan used to circulate the abrasive laden air from the abrasive blasting station to the hopper.

This invention relates to abrading apparatus, and more particularly to adjustable apparatus for varying the amount of abrasive used for abrading in dry honing apparatus.

Abrading or dry honing apparatus used for cleaning metal parts such as automobile valves, pistons, and body parts, conventionally utilize a very fine abrasive. Because of the extremely fine nature of the abrasives used, the angle of respose is very high and it has been difficult to feed the abrasive from the supply chamber into a line leading to the blast nozzle of the apparatus without fluidizing the abrasive material. Fluidizing of the material may be accomplished by injecting air from beneath through a porus partition so as to cause abrasive above the partition to boil up and move around in the air in the supply chamber.

Moreover, abrasive particles of different sizes are needed for different cleaning operations, and accordingly it is highly desirable that the abrading apparatus be adapted to accommodate various sized abrasives. Heretofore, this has been somewhat difficult due to the rather rigidly constructed and non-adjustable abrading apparatus. Furthermore, the particles of abrasive tend to accumulate around the inlet of the line leading from the supply chamber, thus clogging the line, and thereby reducing the effectiveness of the abrading apparatus.

One of the important objects of the present invention is the provision of abrading apparatus which is adapted to utilize abrasive particles of different and varying sizes, thereby increasing the effectiveness and versatility of the abrading apparatus.

Another object of this invention is the provision of abrading apparatus which is adjustable to permit the delivery of more or less abrasive from a supply container to the blasting nozzle.

A further object of the present invention is the provision of apparatus of the class described in which novel means is provided for preventing the accumulation of abrasive particles around a line leading from the supply container, thereby reducing the likelihood that the delivery line will become clogged with abrasive particles.

Another object of the present invention is the provision of abrading apparatus such as described in which the system for forcing air and abrasive particles through the apparatus also provides the force which removes the abrasive particles from adjacent the delivery line to prevent clogging.

A further object of the present invention is the provision of abrading apparatus of the class described which includes means for removing moisture from the abrasive particles as they are circulated through the abrading system.

Another object of the present invention is the provision of apparatus such as described which is simple and economical in construction, yet effective in operation.

Further objects and advantages of the invention will be apparent as the specification progresses, and the new and useful features of the abrading apparatus will be fully defined in the claims attached hereto.

In the accompanying drawings, in which one of various possible embodiments of the invention is illustrated,

FIGURE 1 is a view and side elevation of an abrading apparatus of this invention, certain parts being broken away and removed for clarity; and

FIGURE 2 is an enlarged fragmentary section of FIGURE 1.

Referring now to the drawings, an abrading apparatus of this invention is shown generally to comprise a containing means **11** for holding a supply of abrasive material, a blasting nozzle **13**, a delivery line **15** opening at one end **17** into the containing means **11** and connected at the other end **19** to the nozzle **13**. Forced air means **21** is provided for forcing air from the container **11** into the delivery line **15** so that the abrasive is carried into the line by the air forced thereinto. A flow control member **23** has an inner end **25** located adjacent the end **17** of delivery line **15** for blocking a portion of the inlet **27** of the delivery line. Means **29** is provided for permitting adjustment of the flow control member **23** to vary the effective size of the opening **27** at the one end **17** of the delivery line.

The nozzle **13** is enclosed within an abrading station or cabinet **31** in which the articles or parts to be cleaned or abraded are placed. Air under pressure is supplied to the nozzle **13** by a line **33** connected with an air pressure source (not shown) for forcing or blasting abrasive onto the parts being cleaned. The spent abrasive and air within the cabinet **31** is removed therefrom through a return line **35** by a blower **37** and deposited in a cyclone separator and hopper device **39**. Hopper **39** is connected to container **11** so that the abrasive particles will pass from the former to the latter.

The flow control member **23** includes an elongated stem **41** having a threaded portion **43** engaged with a side wall of the container **11**. A hexagonal head **45** is adapted to be grasped by a tool, such as a wrench, for turning the flow control member and thus moving it toward and away from the inlet **27** of delivery line **15**. Nuts **47** are provided for locking the flow control member in a desired position. The inner end of the stem **41** is tapered as indicated at **49** and the stem extends substantially coaxially with the delivery line **15**, i.e., the stem extends substantially normal to a generally vertical plane in which the inlet **27** lies, so that movement inwardly or outwardly toward or away from the inlet **27** causes the effective size of the inlet to be varied. This adjustment permits the inlet **27** to accommodate different sizes of abrasive particles.

Flow control member **23** has a centrally extending passage or bore **51** extending from its inner end to its outer end and the outer end of the member is connected by a line **53** to line **35** ahead of the connection thereof with blower **37**. It will be seen that blower **37**, when operated, creates suction in lines **35** and **53**. The suction in line **53** is exerted at the inner end of the stem **41** so that abrasive particles will be pulled away from the inlet opening **27** to prevent clogging of the latter.

A bag of dessicant **55** may be placed in the container **11** to remove moisture from the air and abrasive particles as they are circulated through the system.

Assuming it is desirable to use the apparatus for abrad-

ing some automobile parts, for example, operation of the apparatus is as follows:

First, the parts are placed in the cabinet and the latter is closed to prevent any leakage of abrasive and air. The blower **37** is energized, thus creating a low pressure or suction on the inlet side thereof and creating a high pressure on the outlet side thereof. The high pressure on the outlet side of the blower **37** is exerted inside the hopper **39** and container **11** so that the particles are circulated and blown around in a boiling manner. The low pressure or suction on the inlet side of the blower **37** creates suction in the cabinet **31**, which may be devoid at the present time of any abrasive material. The suction on the inlet side of the blower is also applied through line **53** and bore **51** to the inner end of the flow control member **23**. This suction causes any abrasive particles which tend to accumulate around the inlet **27** to be sucked through the bore and line **53** to the blower **37** where they are forced back into the hopper **39**.

As soon as the nozzle is operated by the operator, i.e., as soon as air is permitted to flow through line **33** into the nozzle, abrasive particles will flow through the inlet **27** and delivery line **15** to the nozzle under at least two forces. One force is that exerted by the suction created in the line **15** when the air delivered through line **33** rushes past the outlet **19**. The other force is that exerted by the high pressure within the hopper **39** and container **11** in combination with the low pressure in line **35** and cabinet **31** which causes the abrasive particles and air to be circulated through the system. While suction is still applied through bore **51**, this suction does not significantly affect the quantity of abrasive particles that are delivered through the delivery line **15** to the nozzle **13**.

As soon as the nozzle **13** is closed, i.e., as soon as the delivery of air under pressure through line **33** is terminated, the abrasive particles which have been drawn toward the inlet **27** tend to accumulate around the latter and thus form a solid blocking partition. However, the formation of such a blocking partition is prevented by the suction exerted through line **53** and the bore **51** in flow control member **23**. As mentioned previously, this suction causes any abrasive particles which are tending to accumulate around the inlet **27** of the delivery line **15** to be sucked away therefrom and into the bore **51**. From the bore **51**, the particles are conveyed through the line **53** and blower **37** back into the hopper **39**.

If it is desired to use abrasive particles having a different size, such as a larger size, the flow control member may be backed off, i.e., moved to the right as viewed in FIGURE 2, so that the annular orifice provided at inlet **27** is increased to accommodate the larger particles. Similarly, if it is merely desired to provide a large orifice or opening for some reason, the flow control member **41** may be moved to the right as viewed in FIGURE 2. For example, creating a larger orifice at inlet **27** with the same size of a particle would decrease the velocity which the particles have as they are drawn into the delivery line **15**.

In view of the foregoing, it will be seen that the apparatus of this invention provides an effective method of adjustment so that the apparatus can accommodate different sizes of abrasive particle material. It will also be seen that the apparatus prevents any undue accumulation of abrasive particles around the inlet **27** of the delivery line so that the latter does not become clogged.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. Abrading apparatus comprising a container for holding a supply of abrasive, a nozzle, a delivery line having an opening at one end communicating with container and connected at the other end to said nozzle, means for forcing air from said container into said delivery line, the abrasive being carried into said line by the air forced into the line, a flow control member having one end adjacent said one end of said delivery line for blocking a portion of the delivery line opening, said flow control member having a bore therein opening adjacent said one end of the flow control member, and means for applying suction to said bore to remove abrasive around said delivery line opening when abrasive is not being forced through said delivery line.

2. Abrading apparatus as set forth in claim **1** wherein said delivery line extends into said container, said flow control member being substantially coaxial with said delivery line and having said one end thereof tapered, said flow control member being adjustable toward and away from said delivery line opening to vary the effective size thereof.

3. Abrading apparatus comprising a container for holding a supply of abrasive, a nozzle, a delivery line having an opening at one end communicating with said container and connected at the other end to said nozzle, means for forcing air from said container into said delivery line, the abrasive being carried into said line by the air forced into the line, and means for applying suction adjacent said delivery line opening when air and abrasive are not being forced through the line to prevent accumulation of abrasive around the opening.

4. Abrading apparatus comprising a container for holding a supply of abrasive, a nozzle, a delivery line having an opening at one end communicating with said container and connected at the other end to said nozzle, means for forcing air from said container into said delivery line, the abrasive being carried into said line by the air forced into the line, a flow control member having one end adjacent one end of said delivery line for blocking a portion of the delivery line opening, means for adjusting said flow control member to vary the effective size of the opening at said one end of the delivery line, and a means located in said container and formed for absorbing moisture from the air and the abrasive in the container.

5. Abrading appaartus comprising a container for holding a supply of abrasive, a nozzle, a delivery line having an opening at one end communicating with said container and connected at the other end to said nozzle, means for forcing air from said container into said delivery line, the abrasive being carried into said line by the air forced into the line, a flow control member having one end adjacent said one end of said delivery line for blocking a portion of the delivery line opening, said flow control member extending substantially normal to a plane containing said delivery line opening, said one end of said flow control member being tapered, said flow control member being adjustable toward and away from said opening to vary the effective size of the opening at said one end of the delivery line, said flow control member having a bore therein opening adjacent said one end of the flow control member, and means for applying suction to said bore to remove abrasive around said delivery line opening when abrasive is not being forced through said delivery line.

6. Abrading apparatus comprising a container for holding a mixture of abrasive and air, a delivery line connected to said container, said line having an open inlet in the container and an outer end outside the container, the abrasive and air being adapted to flow from said container into said inlet and to said delivery line when the pressure at said outer end is less than the pressure at the inlet, and a flow control member having one end adjacent said inlet end for blocking a portion of the latter, said flow control member being adjustable to vary the effective size of said inlet, said flow control member being formed with a passage therein opening at a point adjacent the inlet of said delivery line, air and abrasive being sucked away from said inlet and into said passage upon

the application of suction to the passage so as to prevent accumulation of abrasive adjacent said inlet.

7. Abrading apparatus comprising a container for holding abrasive, an enclosed abrading station, a nozzle in said station, a delivery line having an opening at one end communicating with said container and adapted to be connected at the other end to said nozzle, a return line connecting said station with said container, means for circulating air from said container through said delivery line, nozzle, enclosed station and return line back to said container, abrasive being carried by the air as the latter is circulated, and means for applying suction adjacent the delivery line opening when air is not being circulated to prevent accumulation of abrasive around said opening.

8. Abrading apparatus as set forth in claim **7** wherein said means for applying suction adjacent the delivery line opening comprises a flow control member extending into said container and having one end adjacent said one end of said delivery line for partially blocking the delivery line opening, said control member having a passage therethrough opening at one end adjacent said delivery line, and means for applying suction to the other end of said passage to suck air and abrasive away from said delivery line opening and through said passage.

9. Abrading apparatus as set forth in claim **8**, and wherein said means for applying suction to the other end of said passage comprises communicating said other end of said passage with said return line upstream of said means for circulating air.

10. Abrading appaartus comprising a container for holding a mixture of abrasive and air, a delivery line connected to said container, said line having an inlet end in the container and an outlet end outside the container, the abrasive and air being adapted to flow from said container

into said inlet and through said delivery line when the pressure at the outlet end is less than the pressure at the inlet end, and means for applying suction adjacent the inlet end of said delivery line when air and abrasive are not being forced through the line to prevent accumulation of abrasive around the inlet end.

11. Abrading apparatus comprising an enclosed hopper formed for holding a supply of abrasive, a delivery line having an open end positioned in said hopper to receive abrasive therefrom, nozzle means at the other end of said delivery line, an enclosed abrading station accommodating said nozzle means, a return line communicating with said enclosed abrading station and said enclosed hopper, fan means interposed in said return line for forcing air therethrough from said station to said hopper, a flow control member of tapered form mounted in said hopper in coaxial relation to said open end of said delivery line for selective movement toward and away from said open end to define an adjustable orifice therewith, said flow control member having a central passage formed therethrough and a line communicating said passage with the intake side of said fan means for applying suction and removing accumulated abrasive from said adjustable orifice.

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