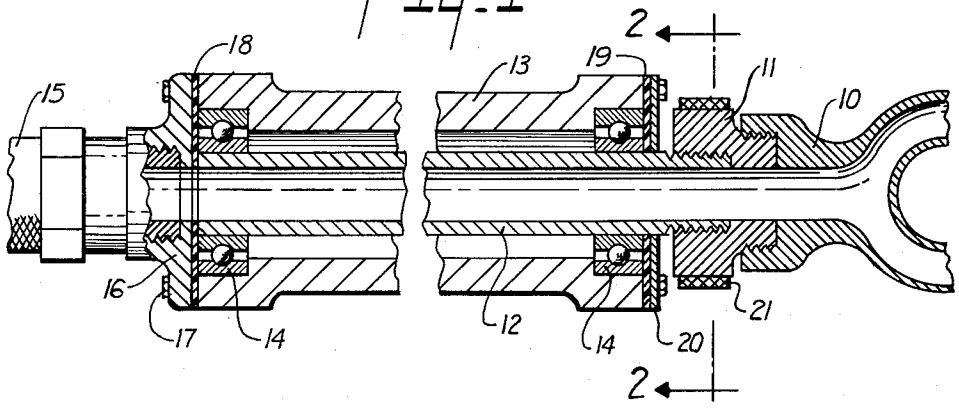
June 23, 1964 W. S. KIRKLAND 3,137,974

SPIN-BLAST TOOL

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Fig. 1



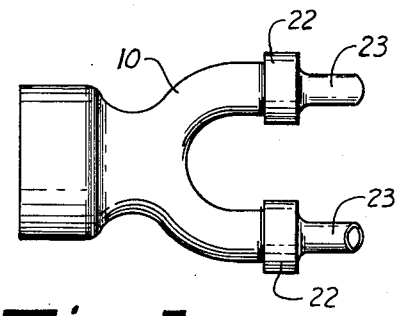


Fig. 2

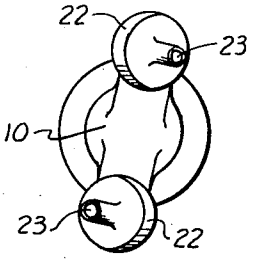


Fig. 3

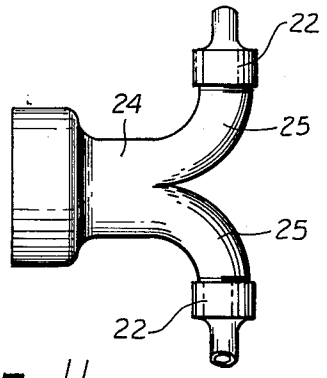


Fig. 4

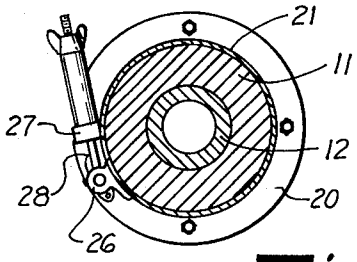


Fig. 5

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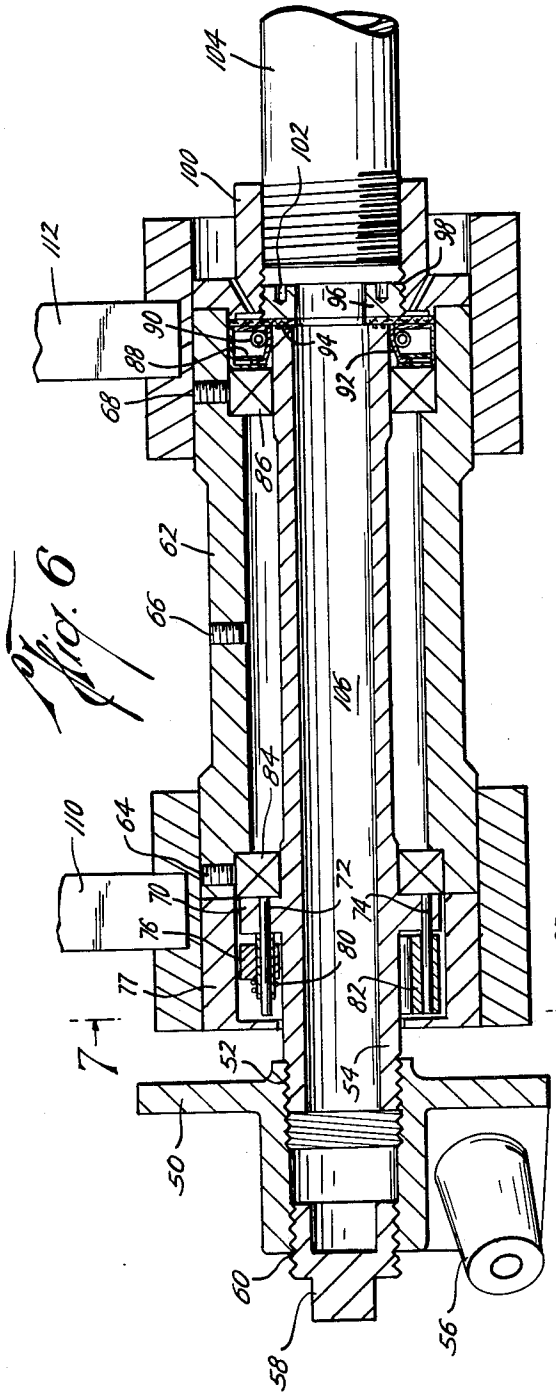


Fig. 6

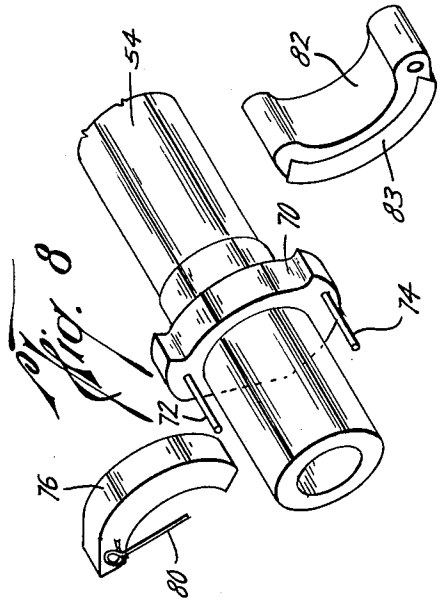


Fig. 8

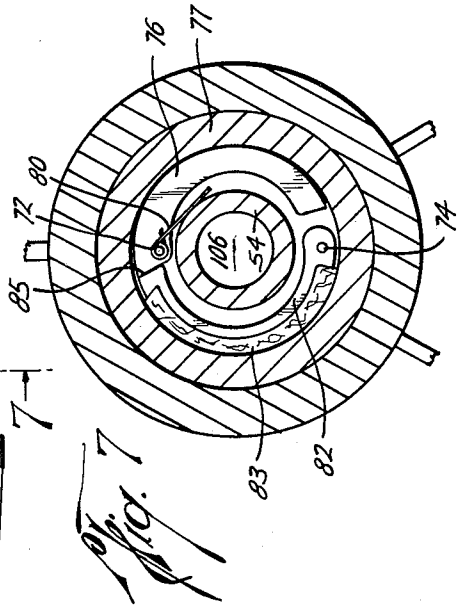


Fig. 7

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Fig. 9

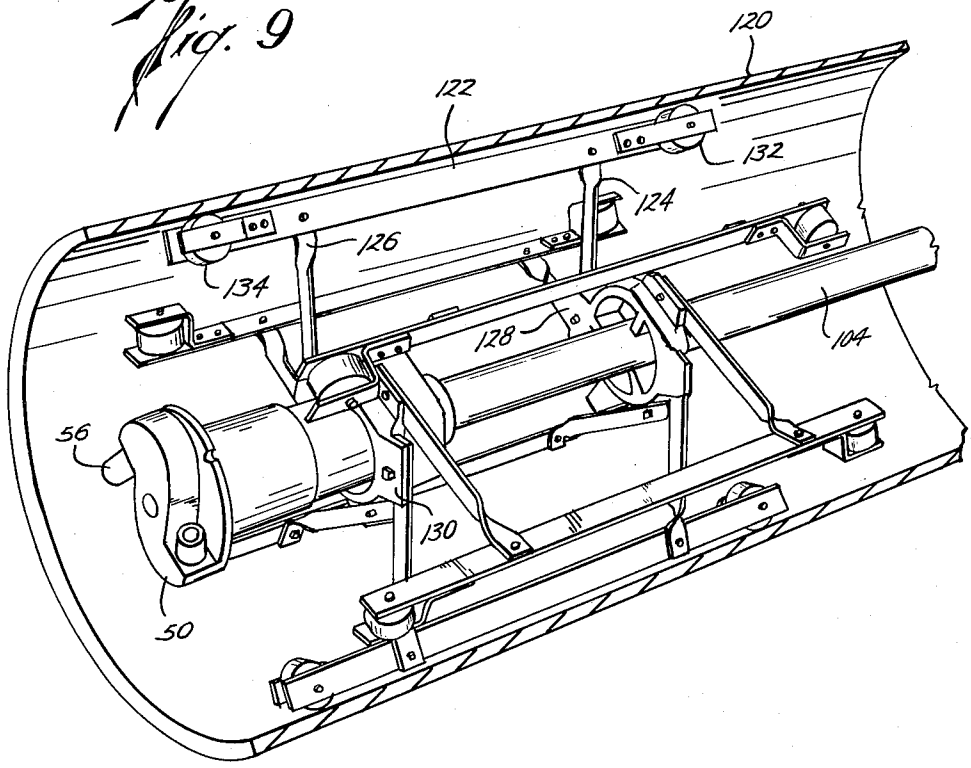
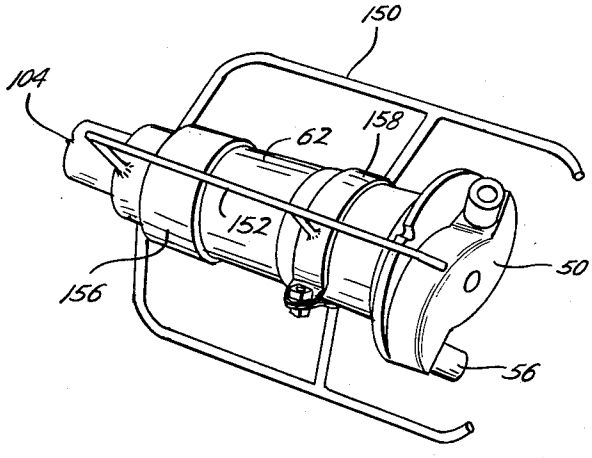


Fig. 10



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SPIN-BLAST TOOL

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Filed Jan. 29, 1962, Ser. No. 169,539
6 Claims. (Cl. 51—11)

This application is a continuation-in-part of my prior copending application Serial Number 1,811, filed January 11, 1960, now abandoned and entitled "Swirling Sand Blast Nozzle."

The present invention relates to the art of sand blasting and more particularly to an improved nozzle by which large areas may be sand blasted in an effective and uniform manner.

The principal object of the invention is to provide a nozzle for sand blasting equipment by which a swirling blast of sand may be applied to a surface to be cleaned in a uniform manner and with a minimum of effort on the part of the operator.

Another object of the invention is to provide a sand blast nozzle which will be rotated by reactive force as the blast of sand emanates from the end thereof.

A further object of the invention is to provide a nozzle for sand blasting equipment which may be effectively employed for cleaning and sand blasting the interior of metal fluid conducting conduits such as gas and oil pipe lines.

A further object of the present invention is to provide an abrasive blasting device which operates from a high pressure sand/air mixture.

Still another object of the present invention is to provide an abrasive blasting device which may be used for cleaning the interior wall surface of pipe underground, even though such pipe may vary in diameter.

Yet another object of the present invention is to provide an abrasive blasting device for cleaning the interior wall surface of pipe underground for considerable distances.

A still further object of the present invention is to provide an abrasive device for use wtih centering apparatus inside pipe or tubing to clean the same through prolonged spinning action of the abrasive axially through such pipe or tubing.

Other objects and advantages will be in part evident to those skilled in the art and in part pointed out hereinafter in the following description taken in connection with the accompanying drawing wherein there is shown by way of illustration and not of limitation a preferred embodiment of the invention.

In the drawing:

FIGURE 1 is a fragmentary sectional view taken along a vertical plane centrally through a nozzle embodying the invention,

FIGURE 2 is a side view of a nozzle tip such as is adapted for use with the arrangement shown in FIG. 1,

FIGURE 3 is an end view of the nozzle tip as shown in FIG. 2,

FIGURE 4 is a modification of the nozzle tip,

FIGURE 5 is a section view taken along line II—II of FIG. 1 showing a drag or brake for use with the nozzle as here shown.

FIGURE 6 is a sectional plan view of another embodiment of the invention;

FIGURE 7 is a sectional view taken along line 7—7 of FIGURE 6;

FIGURE 8 is a perspective view of the brake-governor portion of the embodiment shown in FIGURES 6 and 7;

FIGURE 9 is a perspective cut-away showing one type of centering apparatus of the present invention inside a tubular member to be cleaned; and

FIGURE 10 is a perspective view of another type of centering apparatus of the present invention.

In sandblasting various objects, such as metal sheets,

castings and the like, it is the practice to project a blast of sand by air under pressure which impinges on the work to be cleaned or treated. In this operation the blast of sand abrades and thus cleans the surface of the casting or plate, as the case may be. Earlier it had been the general practice to use a single nozzle from which the air blast of sand was directed toward the work, but with such a nozzle it was necessary to keep the sand blast in movement over the surface otherwise a central zone would be highly abraded by the contacting sand, while at the margins of this zone there would be little abrasive effect. Therefore in cleaning a surface with such a nozzle the operator had to keep the nozzle in motion over the surface to be cleaned in order to accomplish a uniform effect upon the surface to be cleaned.

By my prior Patent No. 2,724,928, dated November 29, 1955 and entitled Double Sand Blasting Nozzle, I have provided a nozzle by which two blasts of sand may be activated from a single source of air under pressure, and while this nozzle is an improvement over earlier sand blasting nozzles it is still necessary for the operator to exercise a considerable amount of skill in its use in order that the cleaning effect produced thereby will be substantially uniform over the surface being sandblasted. This prior nozzle however does have the advantage that it is capable of covering a considerably larger surface in less time than is possible with a single blast nozzle as practiced prior thereto. Other known rotary cleaning devices using abrasives were structurally limited so that they could be used only on substantially flat workpieces. Such known rotary cleaning devices did not utilize the continual swirling action of the abrasives on the workpiece as provided in the present invention.

It is therefore a further and primary object of my present invention to provide a nozzle of novel construction having a plurality of blast producing outlets by which the blast of sand emanating therefrom will provide a reactive force which will impart a swirling of the sand blast as it emanates therefrom that will result in a more uniform distribution of the sand blast and thus avoid a pitting or overblasting such as might occur with a single nozzle when not skillfully operated.

For the purpose of illustrating my invention, I have in the accompanying drawing shown a nozzle **10** which, except for a definite modification, is somewhat similar to the sand blast nozzle that is the subject of my prior patent. In the present arrangement, however, the nozzle **10** is carried by a reducing collar **11** that is threaded upon the extending end of an internal conduit or support **12** which is journalled substantially centrally within an external body member **13** by ball races **14**. At its other end the external body member **13** is connected to the end of an air and sandblast conduit **15** that is axially arranged to project a blast of compressed air and sand through the nozzle supporting conduit **12**. The air and sandblast conduit **15** is threaded into a flanged fitting **16** secured to the end of the external body member **13** by means of machine screws **17** and interposed between the flanged fitting **16** and the external body member **13** there is a sealing gasket **18** which serves to protect the adjacent ball race against contamination by sand. At the other end of the external body member **13** there is a similar sealing gasket **19** which is held in protective relation over the other of the ball races **14** by means of a plate **20**. At this point it will be noted that the reducing collar **11** upon which the nozzle **10** is mounted has an outer cylindrical surface about which there is disposed a friction brake band **21** the operation of which will be explained hereinafter.

As shown in FIGURES 2 and 3 of the drawing the nozzle **10** carries a jet directing tip **22** upon each of its bifurcated ends but unlike the tips shown in my prior

patent the tips 22 are here shown as having discharge orifices 23 which are angled to project a jet of sand and air in a direction substantially tangent with the axis about which the nozzle 10 is rotated. With this improvement it will be readily seen that instead of requiring the operator to manipulate the grip forming member 13 in a circle as previously taught the nozzle 10 with its tips 22 as here proposed will of itself provide the desired rotary movement with the result that a substantially uniform impact of sand will be directed over the surface as the grip forming member is moved along a substantially straight line.

As a modification of the invention and particularly to provide a rotatable nozzle for sandblasting the interior surfaces of a cylindrical cavity as for example the interior of a gas or oil pipe line, I have in FIGURE 4 of the drawing shown a bifurcated nozzle 24 having its ends flared outwardly in opposite directions as at 25 and at their ends these conduits 25 carry the blast directing tips 22 so that they will project jets of sand and air with a reactive force which will cause the nozzle 10, the reducing collar 11 and its support 12 to rotate and thus provide for a substantially uniform blasting about the interior of a cylindrical surface by merely moving the nozzle axially therethrough.

In order to avoid any possibility of an excessive speed being set up in the rotation of the nozzle 10 I have in FIGURE 5 of the drawings shown the gasket securing plate 20 as also carrying a clevis 26 to which one end of the brake band 21 is secured. At its other end the brake band 21 is secured to an adjustable clamp 27 which is threaded upon a stud 28 carried by the clevis 26. With this latter arrangement it will be seen that by adjusting the tightness of the brake band 21 it will be possible to retard and/or regulate the speed of rotation of the nozzle 10 as determined by the inclination of the jet projecting tips 22 and the velocity of the sand blast emanating therefrom.

Another embodiment of the present invention is shown in FIGURE 6. Nozzle head 50 is of unitary construction and has a base plate portion which is threadedly coupled at 52 to a suitable tubular member 54 which may be made of brass or other suitable material. Nozzle head 50 includes a body having coupled thereto a plurality of nozzle orifices similar to nozzle orifice 56. Such nozzle orifices may be lined with a suitable wear-resistant material such as tungsten carbide to insure longer life. Such nozzle orifices are coupled to planar portions of the body. These planar portions have an opening to provide communication between the chamber of the body and the exterior of the body. Plug 58 is threadedly coupled at 60 to close the bore extending through nozzle head 50.

Disposed as a sleeve over tubular member 54 is main body housing 62 having a plurality of lubrication screws similar to screws 64, 66, and 68. Inside housing 62, tubular member 54 has a shoulder 70 through which pins 72 and 74 are disposed. A governor control arm 76 is positioned on pin 72 with spring 80 providing force to cause radial outward movement of the governor control arm 76. Brake 82 is positioned on pin 74 and the function of the brake 82 and governor control arm 76 will be explained subsequently. Brake and governor housing 77 is disposed over the brake and governor assembly.

Front bearing 84 is positioned around tubular member 54 and adjacent shoulder 70. Rear bearing 86 is positioned around tubular member 54. Rear bearing 86 is positioned around tubular member 54 and adjacent rear bearing 86 is bearing seal 88 which includes a coiled spring member 90 and a face plate 92. A dust seal 94 is adjacent bearing seal 88. Such dust seal may be made of leather and serves to keep abrasive material from entering the main body housing 62 and causing damage to the component parts inside said housing.

A seal adjusting nut 96 is threadedly engaged at 98 to rear end plate 100 which may be coupled to the main body housing 62 with suitable fastening means such as screws (not shown). Seal adjusting nut 96 has recesses 102 which allow the seal adjusting nut to be tightened against seal 94. For optimum operation of the spin blast device, the seal adjusting nut should be tightened so that the nozzle head is difficult to rotate by hand.

Member 104 is coupled to the rear end plate 100 for providing a pneumatic source with an abrasive supply. A rubber washer (not shown) may be positioned between the end of member 104 and seal adjusting nut 96. The pneumatic source provides pressurized air through chamber 106 of tubular member 54 and as the air and abrasive mixture is discharged from the nozzle head 50, tubular member 54 rotates as explained previously.

Dust seal 94 should be replaced after about eight hours of use of the spin blast device. Also, as previously stated, seal adjusting nut 96 should be tightened periodically against the seal 94 to insure ideal performance. Members 110 and 112 are part of centering apparatus which will be explained subsequently.

Referring now to FIGURES 7 and 8, governor control arm 76 and brake 82 are shown. Brake lining 83 engages brake and governor housing 77 to control the rotational speed of the nozzle head 50 and tubular member 54. The engagement of brake lining 83 with the brake and governor housing occurs through the radial outward movement of governor control arm 76. The governor control arm has a tendency to move radially outward due to spring 80 and the centrifugal force applied to the control arm. Rotation of tubular member 54 is in a counterclockwise direction for the view shown in FIGURE 7. The outward movement of arm 76 causes brake 82 to be engaged at tapered portion 85, thereby causing the brake to move radially outwardly so that lining 83 engages the brake and governor housing 77. Thus the speed of rotation is controlled and excessive rotational speed indicates worn or defective brake lining or worn or defective governor control arm.

When the apparatus of the present invention is used to clean the inside of pipe or tubing, such apparatus is used with known centering devices to insure optimum operation.

FIGURE 9 shows the spin blast device mounted on suitable centering apparatus inside a pipe 120. The centering apparatus shown in FIGURE 9 includes a plurality of longitudinal members such as member 122 positioned on radial members 124 and 126. Radial members 124 and 126 are coupled to a rear mounting 128 and a front mounting 130, respectively. The front and rear mountings are coupled to the spin blast device. Suitable means may be provided to allow the centering apparatus to be adjusted for pipe of various sizes. The longitudinal members may have a plurality of rollers such as rollers 132 and 134 for engaging the inside wall of the pipe thereby allowing the centering apparatus and the spin blast device to be moved longitudinally within the pipe or tubular structure to be cleaned.

FIGURE 10 shows centering apparatus of the skid type which may be utilized whenever small diameter tubular structures are to be cleaned. Skids 150 and 152 extend from rear mounting 156 and from front mounting 158. Suitable clamping means on front mounting 158 allows the centering apparatus to be easily adjusted or removed from the spin blast device.

While I have, for the sake of clearness and in order to disclose my invention so that the same can be readily understood, described and illustrated specific forms and arrangements I desire to have it understood that this invention is not limited to the specific forms disclosed, but may be embodied in other ways that will suggest themselves to persons skilled in the art. It is believed that this invention is new and all such changes as come within the scope of the appended claims are to be considered as part of the invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A unitary nozzle head including in combination
a base plate,
a body coupled to said base plate to provide a chamber in said body, said body having at least two planar portions on the exterior of said body,
at least one opening in each of the planar portions to provide communication between the chamber of said body and the external portion of said body, and
a bore extending through said base plate and through said body to provide communication with each of the openings in the planar portions of the body.

2. A unitary nozzle head defined by claim 1 wherein the external contour of said body includes at least two half circle portions, each of the two half circle portions having a center spaced on either side of the center of the bore and along a common line extending through the centers of the half circle portions and through the center of the bore.

3. A unitary nozzle head adapted for use in bombarding the interior wall of a tubular structure with granular abrasive material, said nozzle head including in combination
a base plate,
a body disposed on said base plate to provide a chamber in said body, said body having at least two planar portions on the exterior of said body,
at least one opening in each of the planar portions to provide communication between the chamber of said body and the external portion of said body,
a bore extending through said base plate and through said body to provide communication with each of the openings in the planar portions of the body, and
a plug coupled to said body to close said bore whereby a layer of abrasive material builds up on said plug in the chamber to minimize wear on said body and on said base plate as pressurized abrasive material is fed to the chamber from the bore opening in said base plate.

4. A device for cleaning the interior wall surface of a tubular member, said device including in combination,

rotatable means including a nozzle head operable in response to a pressurized fluid source, and
centering apparatus coupled to said rotatable means for positioning said device in said tubular member, said rotatable means including braking means for controlling the rotational speed thereof, said braking means including a pivotal arm, a pivotal brake member adjacent said pivotal arm, said pivotal arm having, on one end thereof, means to cause said brake member to operatively contact a non-rotating portion of said device to thereby retard the rotation of said rotatable means.

5. A rotatable sand blast nozzle having a plurality of said blast directing orifices so disposed as to project a blast in a path substantially tangent to the path of rotation, an external body member having connection with a source of air and abrasive material, a tubular member rotatably supported within said external body member said tubular member supporting said nozzle in coextending relation, with said nozzle being constructed so as to be rotatably responsive to the flow of air and abrasive material through the coextensive portions of said tubular member and said nozzle, and braking means attached to said tubular member and including a pivotal portion operatively adjacent to and tending to press against a nonrotatable portion of said external body member.

6. The device of claim 5 wherein a centering device is operatively attached to said external body member, said centering device including a plurality of longitudinally displaced elements, each of said elements extending in a direction parallel to the longitudinal axis of said external body member.

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