Sept. 17, 1968 E. H. WERN 3,401,489

APPARATUS FOR AIRLESS BLAST FINISHING

Filed Feb. 28, 1966

Fig. 1.

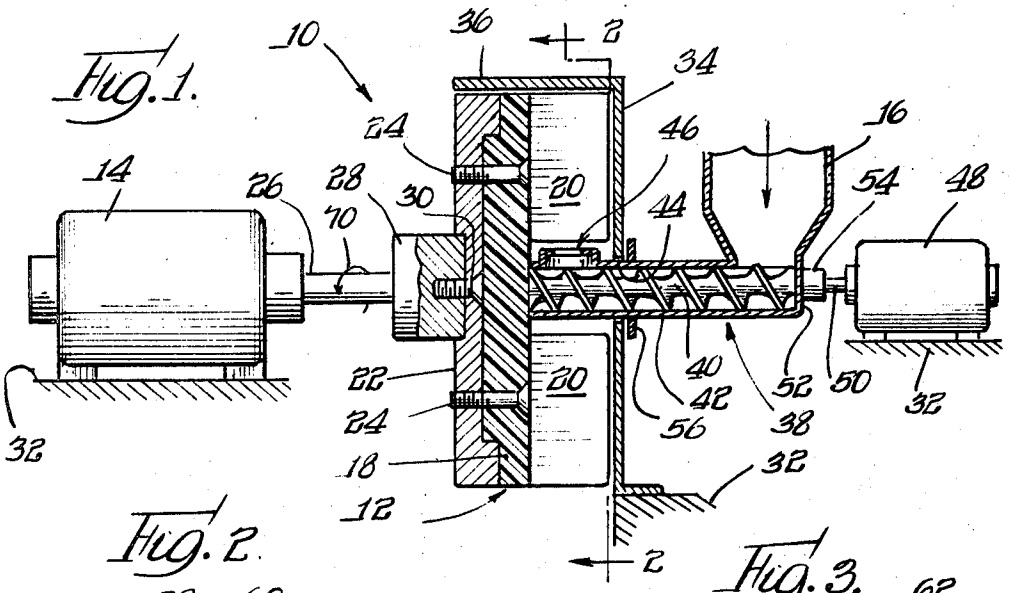


Fig. 2.

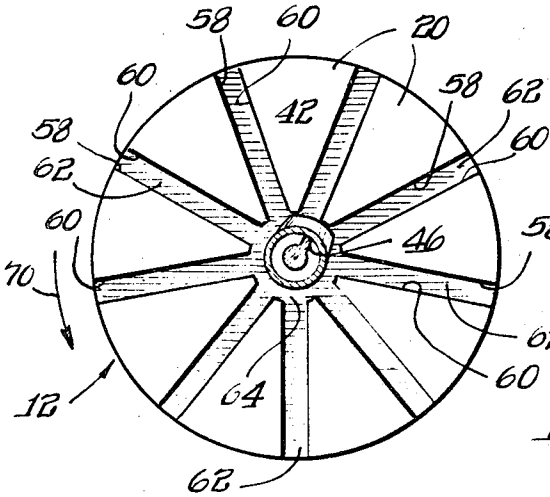


Fig. 3.

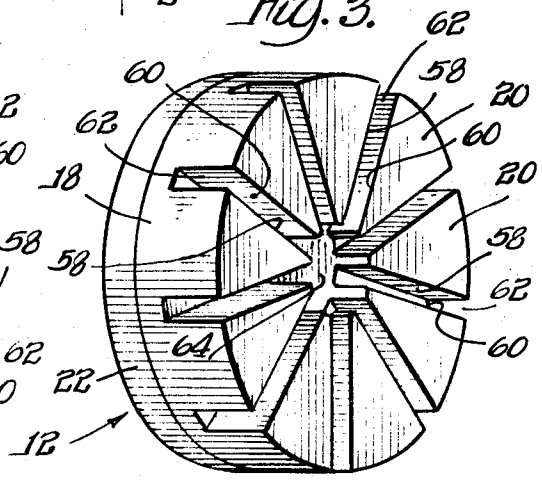


Fig. 5.

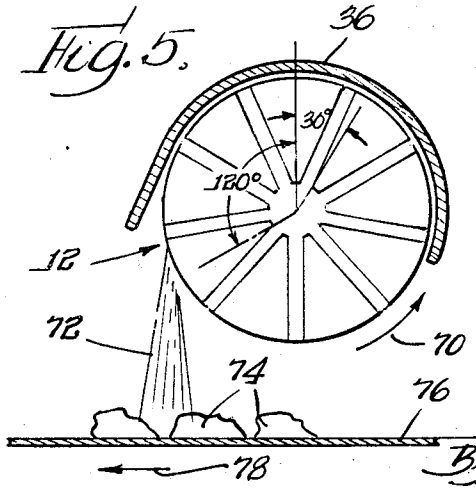
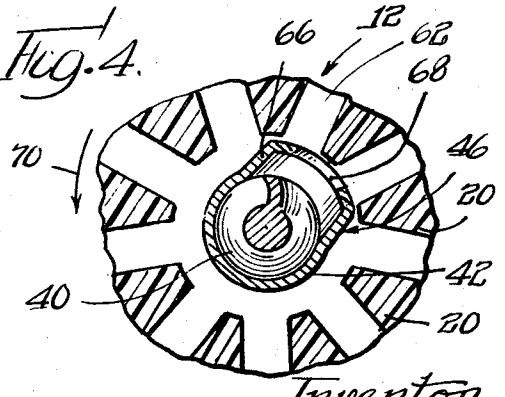


Fig. 4.



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APPARATUS FOR AIRLESS BLAST FINISHING

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ABSTRACT OF THE DISCLOSURE

Blast finishing apparatus comprising a rotatable wheel of a one-piece, polymeric construction having a base portion and a plurality of wedge or sector shaped vanes extending from one surface of the base portion. The vanes are of a moderately flexible material and are angularly spaced about the wheel and have radially inwardly converging side walls to define therebetween substantially parallel walled abradant chutes. Abrasive material is provided at the center of the wheel by means of a rotating auger and, as the wheel is rotated, is delivered therefrom through the chutes and outwardly from the wheel.

This invention relates generally to finishing apparatus and more particularly to apparatus for airless blast finishing.

In the cleaning of metal castings, forgings and other fabricated elements, as well as in the cold working of metal surfaces, various particulate abradants are impelled at high velocity from the periphery of a bladed wheel. According to the conventional means for accomplishing this airless blast finishing, the wheel is formed of planar blades replaceably mounted between parallel disks; and gravity is employed to feed the abradant to the center of the wheel. An auxiliary impeller is commonly used to deliver the abradant into the spaces between the vanes. The prior art wheel arrangements are expensive to construct; and the large, sector-shaped regions between the blades permit undesirable turbulence in the abradant at high wheel speeds with resultant unevenness in the pattern of expelled abradant.

Therefore, a general object of the present invention is to overcome these limitations of the prior art and to provide new and improved airless blast finishing apparatus.

Another object of the invention is to provide blast finishing apparatus which promotes a uniform pattern of forcibly expelled abradant and which therefore produces a highly uniform surface finish on the treated workpieces.

Still another object of the invention is to provide blast finishing apparatus that can be operated efficiently at comparatively low wheel speeds.

A further object of the invention is to provide a blasting wheel arrangement that is easy and economical to construct.

These and other objects and features of the invention will become more apparent from a consideration of the following descriptions.

In order that the principles of the invention may be readily understood, a single embodiment thereof, but to which the application is not to be restricted, is shown in the accompanying drawing wherein:

FIG. 1 is a side elevational view, partially in section, of blast finishing apparatus constructed in compliance with the present invention;

FIG. 2 is an elevational view taken along the line 2—2 of FIG. 1 to illustrate details of the blasting wheel;

FIG. 3 is a perspective view of the blasting wheel used in the apparatus of FIGS. 1 and 2;

FIG. 4 is an enlarged view of the central portion of FIG. 2, showing the discharge means used in delivering abradant to the blasting wheel; and

FIG. 5 is a schematic view on a reduced scale, illustrating use of the apparatus of the invention in blast finishing parts being carried by a conveyor.

Referring now in detail to the drawing, specifically to FIG. 1, blast finishing apparatus indicated generally by the reference numeral **10** is shown to comprise a blasting wheel **12** which is rotated about a horizontal axis by means of a suitably energized motor **14** and which receives a supply of suitable abradant from a bin **16**. The blasting wheel **12** comprises a rotatable base plate **18** and a plurality of vanes **20** which will be described more fully hereinafter. The base plate **18** of blasting wheel **12** is secured to a mounting plate **22** by means of screws **24** or other suitable fasteners; and the mounting plate **22** is, in turn, secured to an output shaft **26** of motor **14** by means of a coupling block **28** and one or more screw fasteners **30**.

The blast finishing apparatus **10** additionally includes a machine frame which is indicated by the reference numeral **32**; and this machine frame serves to support the motor **14** and a stationary cover plate **34** which confronts the bladed face of blasting wheel **12**. A shroud or fender **36**, which is also shown in FIG. 5, is conveniently mounted to the cover plate **34**, although this shroud may also be secured independently to the machine frame **32**.

In compliance with the features of the present invention, abradant from bin **16** is mechanically delivered to the blasting wheel **12**; and continuing with reference to FIG. 1, a forced feeding unit **38** is shown to comprise a rotatable auger **40** which operates in a cylindrical casing **42**, casing **42** opening vertically into the bottom of bin **16**, passing through an aperture **44** in cover plate **34** and opening in a generally upward direction through an orifice unit **46** which is aligned radially with the blasting wheel blades **20**. The auger **40** is disposed generally horizontally and in alignment with the rotational axis of blasting wheel **12**. Furthermore, the auger **40** is rotated about its own longitudinal axis by a suitably energized drive motor **48**, motor **48** having an output shaft **50** which is connected to the auger **40** through an end wall **52** of casing **42** by means of a shaft seal **54**. Usefully, the cylindrical casing **42** is provided with a medially disposed support bracket **56**.

Turning to a consideration of FIGS. 2 and 3 for a more detailed description of the blasting wheel **12**, the vanes or blades **20** of the blasting wheel are arranged, in compliance with the features of the invention, to take a wedge or sector shape. Each of the vanes **20** has radially inwardly converging sidewalls **58** and **60**; and since the vanes are annularly spaced apart, confronting pairs of sidewalls **58** and **60** define therebetween substantially parallel-walled abradant chutes **62**. The described arrangement of the vanes **20** and intermediate chutes **62** tends to preclude the development of turbulence in the radially exiting abradant and therefore promotes a more uniform pattern of expelled abradant. In further accord with the features of the invention, the radially inward ends of the vanes **20** are disposed radially outwardly from the center of base plate **18** which defines the rotational axis of the blasting wheel. This spacing of the inner ends of the vanes **20** establishes a hollow center **64** which receives the free end of cylindrical casing **42** and the orifice unit **46**. This arrangement of the blasting wheel and cooperating auger feed insures an even supply of abradant to the chutes **62**, even at comparatively low wheel speeds, and thus further promotes uniformity in the abrading action. The term "low wheel speed," as used herein, is intended to mean the peripheral speed of a blasting wheel having an outside diameter of about eight to twelve inches rotated at an angular speed of about 1200 to 1500 revolutions per minute. As is shown in FIG. 4, the orifice unit **46** comprises a housing **66** which extends radially outwardly from the casing **42** into close proximity with the inner ends of

chutes **62**. In addition, the radially outward end of housing **66** is provided with abradant-delivery orifice **68** which is sized and shaped appropriately to deliver a selected quantity of abradant to each of the chutes **62** as they rotate in turn passed the orifice unit. The delivery orifice may take elliptical or some other convenient shape.

In compliance with a yet further feature of the invention, the vanes **20** are fabricated from a moderately flexible, polymeric material; and such materials as polyurethane having a hardness of 70 to 90 durometer on the Shore A scale and nylon have proved eminently useful in this regard. The mild centrifugal flexing of vanes so fabricated has proved useful in promoting uniformity in the blast finishing operation. Moreover, when the vanes are fabricated from such polymeric material, the vanes **20** and the base plate **18** may be advantageously fabricated to be integral, as by molding for example. Such integral fabrication develops substantial economies in the manufacture of the blasting wheel, and it is recognized that the blasting wheel may be machined from a block of the polymeric material as well as being molded. The disclosed wedge or sector shape of the vanes **20** lends an acceptable degree of rigidity when the vanes are fabricated from polymeric material.

For purposes of affording a more complete understanding of the invention, it is advantageous now to provide a brief description of the operation of the blast finishing apparatus **10**. Referring to FIG. 5 and assuming that motor **14** is rotating the blasting wheel **12** in the general direction indicated by arrow **70**, a suitable abradant will be delivered to the hollow center of the blasting wheel by the auger **40** of forced feeding unit **38**. The particles of abradant will be expelled from the cylindrical casing of the unit **38** through the orifice **68** and into the chutes **62** of the blasting wheel. As is suggested in FIG. 5, the abradant passes into the chutes **62** at about 30° in advance of vertical. As the blasting wheel rotates, centrifugal energy is generated in the particles of abradant, and they exit from the outer tips of the vanes **20** at an angle of about 120° subsequent to vertical, as is suggested in the figure. The wheel **12** thus propels a blast **72** of abradant onto workpieces **74** being carried by a conveyor **76** in the path indicated generally by arrow **78**. The workpieces **74** may be recycled or transmitted through the blast **72** in a single pass as is desired. In accordance with the descriptions given hereinabove, a highly uniform abrading action is achieved.

While a particular embodiment of the invention has been shown and described, it should be understood, of course, that the invention is not limited thereto since many modifications may be made. It is therefore contemplated to cover by the present application any and all such modifications as fall within the true spirit and scope of the appended claims.

The invention is claimed as follows:

1. Blast finishing apparatus comprising: a one-piece, rotatable wheel of a moderately flexible material, having integrally formed therewith and extending from one surface thereof, a plurality of wedge-shaped vanes, said vanes being angularly spaced and having radially inwardly converging side walls which define therebetween substantially parallel-walled abradant chutes through which abradant is radially outwardly discharged upon the rotation of said wheel.

2. Blast finishing apparatus as claimed in claim **1** wherein said one-piece wheel is formed of a polymeric material.

3. Blast finishing apparatus as claimed in claim **1** wherein the radially inward ends of said vanes are disposed outwardly from the center of rotation of said wheel to form a hollow center portion for receiving abradant material therein to be distributed to said chutes therefrom upon the rotation of said wheel.

4. Blast finishing apparatus as claimed in claim **3** wherein the axis of rotation of said wheel is horizontally oriented and wherein abradant is fed from the hollow center of said wheel to said chutes at an angle approximately 30 degrees from the vertical in a direction opposite to that of the rotation of said wheel and said abradant exits from said chutes at an angle of approximately 120 degrees from the vertical in the direction of rotation of said wheel.

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