Jan. 20, 1970 M. J. BRIGGS 3,490,183

SANDING DEVICE

Filed Aug. 5, 1968 2 Sheets-Sheet 1

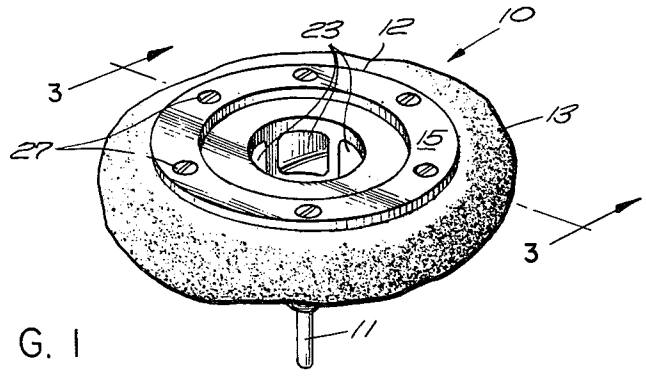


FIG. 1

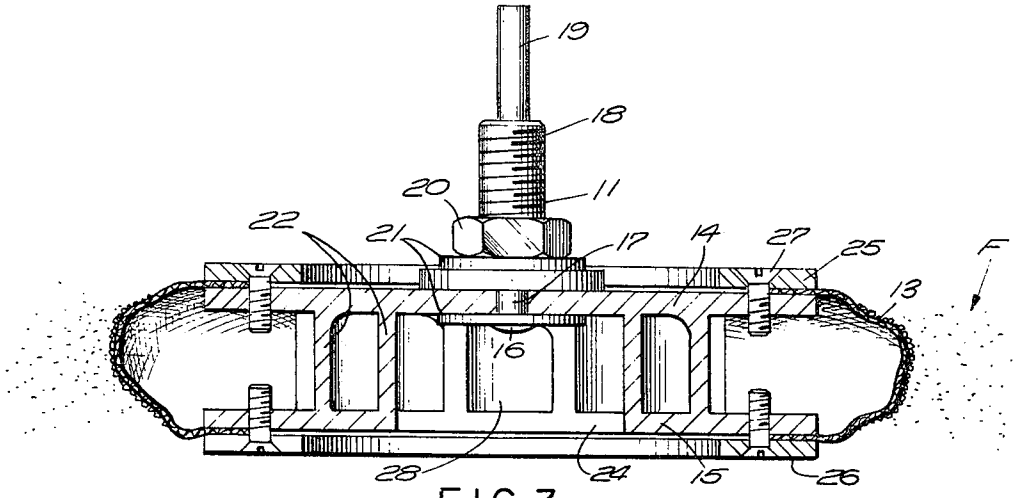


FIG. 3

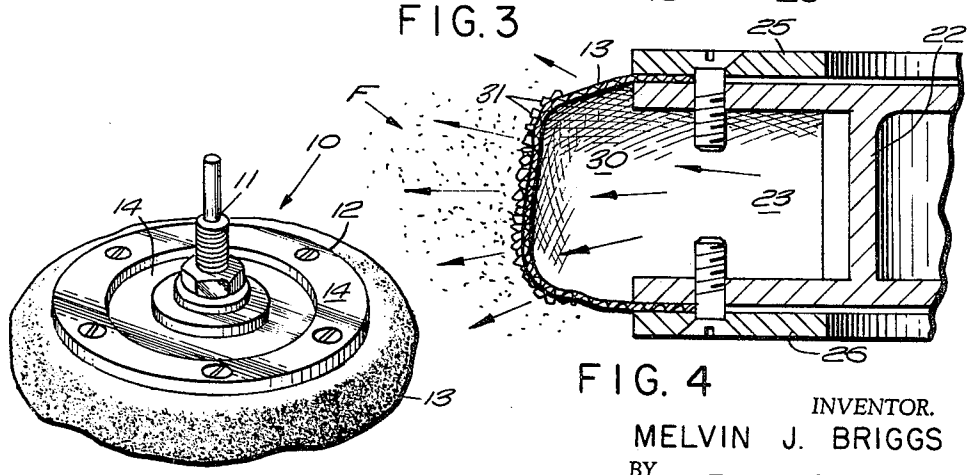


FIG. 2

FIG. 4

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Jan. 20, 1970 M. J. BRIGGS 3,490,183

SANDING DEVICE

Filed Aug. 5, 1968 2 Sheets-Sheet 2

FIG.5

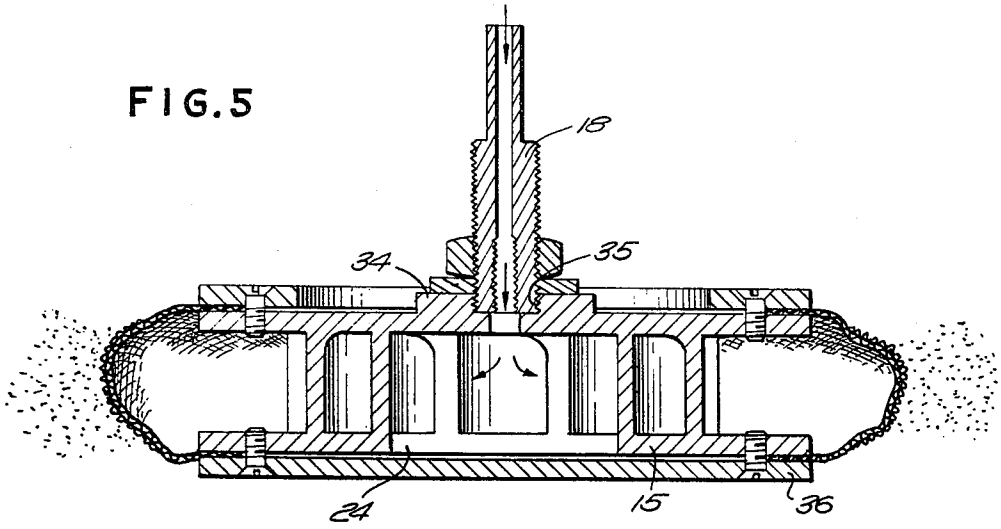


FIG.6

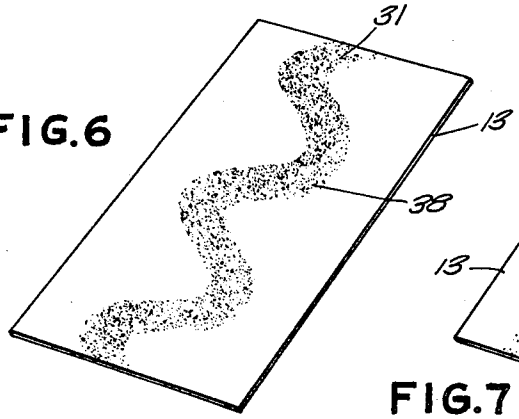
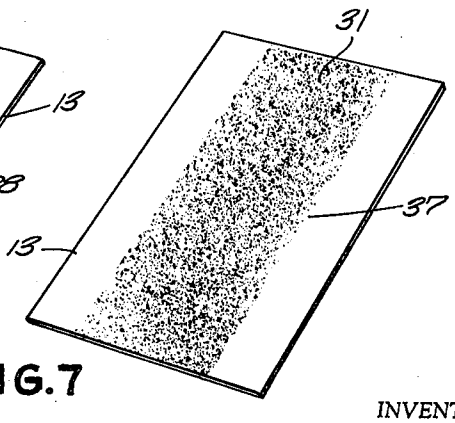


FIG.7



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3,490,183

SANDING DEVICE

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Continuation-in-part of application Ser. No. 439,684, Mar. 15, 1965. This application Aug. 5, 1968, Ser. No. 750,297
Int. Cl. B24b 55/02; B24d 9/02
U.S. Cl. 51—356 12 Claims

ABSTRACT OF THE DISCLOSURE

A rotary sanding device which is self-inflatable and self-cleaning. The device upon rotation draws air from its surroundings to maintain an abrasive portion thereof in an extended generally toroidal form. A fabric or like material comprises the abrasive portion which permits a portion of the air used to maintain inflation to pass therethrough so as to remove dust particles therefrom.

This is a continuation-in-part of application Ser. No. 439,684 filed Mar. 15, 1965, now abandoned.

BACKGROUND

This invention relates to abrasive wheels and more particularly refers to abrasive wheels of the type which are provided with a fluid expansible abrasive element and are particularly adapted for use in abrading, polishing and the like of curved and particularly reversely curved surfaces.

Abrasive wheels of this general character employing fluid expansible abrasive elements are known and this invention relates to improvements thereover. Illustrative of such known devices are those disclosed in U.S. Patent 490,419 to Webster, U.S. Patent 2,671,297 to Arms, and U.S. Patent 3,050,909 to Rawstron. Such patents represent that which may be considered prior art to the present invention in regard to their showing of abrading, buffing and polishing devices which employ fluid expansible members which are either in supporting or direct contact with the work to be abraded, buced or polished. A constructional feautre which is common to the apparatus set forth in these above elicited patents is the use of an outside source of fluid pressure so as to operatively expand the expansible element portion thereof. This is representative of the prior art in this field and due to the appurtenant mechanisms required by such outside fluid pressure sources presents limitations on the utility of such devices, especially those of a relatively small size which are particularly suited for home workshop and light industrial tasks. It is therefore a primary object of this invention to present a device which does not necessarily rely on such outside source of fluid medium but which in contradistinction thereto generates its own source of pressurized fluid medium so as to eliminate the above elicted disadvantages of prior art constructions.

Another drawback of devices of this type, which drawback is further generally present in abrasive sanding devices of all types, is the premature filling of such. The abrasive working surfaces of devices of this class are often prepared by the embeddation of abrasive particles such as grit, sand or the like into a carrying medium or secured thereto by means of an adhesive or the like. In this manner, the abrasive particles protrude from the remaining surface areas thereof so as to form a multitude of valleys or pockets therebetween. Particles of the work being abraded tend to lodge in such valleys and pockets

and if not removed therefrom tend to fill such spaces and create an overall undesirably smooth or even working surface to such abrasive element. Such undesirable condition reduces to a great extent the effective surface area of abrasive particles presented to the work and thus not only prematurely expends the useful life of such abrasive element, but further reduces the efficiency of such during use. The importance of this problem along with attempted prior art solutions thereof is set forth in the specification of U.S. Patent 2,347,244 to Colt et al. who also presents one possible solution thereof. Such solution and those attempted both since and prior thereto have met with either limited success or are unadaptable to fluid expansible abrasive devices hereunder consideration. It is therefore another object of the present invention to present a fluid expansible abrasive device wherein the aforementioned limitations of the prior art are overcome and whereby filling thereof with abraded material is substantially reduced and/or prevented so as to increase the useful life of abrasive elements utilized therewith and the efficiency thereof.

Not only does abraded material tend to fill interstices of the abrasive element, but further in many cases adheres to the surface being abraded and tends to form a hard non-workable surface thereon. It is thus another object of the present invention to reduce and/or prevent the adherence of such abraded material to the member being abraded and in such manner increase the efficiency of the abrasive device.

Other objects of the present invention will become apparent in the course of the following specification.

SUMMARY

The aforementioned objects of the present invention are achieved by the provision of a device of the class described having a rotatable member in part defining a fluid plenum and about which an expansible element is releasably engaged, which expansible element is formed of a slightly air pervious fibric material of which portions of the outer surface thereof are provided with a serpentine pattern of grit particles adherent thereto whereby upon the rotation of such device, air from the ambient atmosphere is drawn into the plenum by means of an impeller means whereupon such is directed against the inner surface of the expansible element so as to operatively expand such and whereupon a portion of such air passes through such element so as to remove abraded material tending to fill the interstices thereof and so as to direct air flow patterns of varying intensity to the surface of the work being abraded.

The invention will appear more clearly from the following detailed description when taken in conjunction with the accompanying drawings, showing, by way of example, preferred embodiments of the inventive concepts.

DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a perspective view of an abrasive device including a rotatable member, a plenum housing and a fluid expansible element in accordance with the principles of the present invention;

FIGURE 2 is also a perspective view of the abrasive device of the present invention and is similar to the showing set forth in FIGURE 1 but taken in an inverted position thereto;

FIGURE 3 is a sectional view taken along the line 3—3 of FIGURE 1;

FIGURE 4 is a partial sectional view on an enlarged scale of a portion of the device shown in FIGURE 3.

FIGURE 5 is a sectional view of the abrasive device of the present invention and is similar to the showing set forth in FIGURE 3 and shows a constructional modification thereto;

FIGURE 6 is a partial perspective view of one form of the expansible element having abrasive particles adhered to the outer surface thereof; and;

FIGURE 7 is a partial perspective view similar to FIGURE 6 and shows an embodiment thereto where abrasive particles are formed in a serpentine path upon the outer surface of the element.

DESCRIPTION

Throughout the specification, like reference numerals are used to indicate like parts.

Referring now to the drawings and in particular FIGURES 1 and 2 thereof, an abrasive device **10** is depicted therein. Such abrasive device **10** is comprised of a rotatable member **11**, a housing **12** and a fluid expansible element **13**. The housing **12** as clearly illustrated by FIGURE 3 of the drawings is in part made up of a pair of spaced circular plates **14** and **15**, one of said plates **14** is provided with means for attaching the rotatable member **11** thereto. Such means is illustratively shown as comprising a headed member **16** positioned within and through opening **17** formed within plate **14**. Member **16** is further threadably engaged with an element **18** having internal and external screw threads formed thereon. A cylindrical fitment **19** is further provided for attachment to chuck means of a suitable cooperating rotating device while nut **20** and washers **21** are further included so as to provide for the tight operative engagement of element **18** to the plate **14** and to conveniently assist in the mounting of the entire abrasive device **10** in connection with such rotating devices.

The space between the circular plates **14** and **15** although essentially open is provided with a series of radially extending curved blades **22** which in cooperation with such plates **14** and **15** serve to form a plurality of chambers **23** therebetween. The circular plate **15** is further provided centrally thereof with a rather large opening **24** which is in communication with the entrance to the chambers **23** and about the periphery of which the blades **22** terminate their inward extent. The other end of each of the chambers **23** is in communication with the open peripheral space between such plates **14** and **15**. About such space the expandable element **13** which is of partial toroidal configuration is placed by means of clamping rings **25** and **26** secured respectively to the plates **14**, **15** in cooperation with the blades **22** and the element **13** forms a plenum chamber **28** which in conjunction with the aforesaid members upon rotation thereof acts as an impeller designated by over-all reference numeral **29**. Thus, rotatation of the device causes fluid to be drawn from the ambient surroundings through the large opening **24** in the plate **15** into the plenum chamber **28** from which it is directed by the individual chambers **23** to the inner surface of the expansible element **13** so as to expand such in operative engagement with the surface of the member being worked upon.

The fluid expansible element **13** is in turn as depicted in FIGURE 4 of the drawings formed of a slightly air pervious fabric material **30** provided at the outer surface thereof with a plurality of individual abrasive elements **31** which are adherent thereto. Thus, a portion of the fluid which is brought to bear against the inner surface of the expansible element **13** is available in excess of that amount needed to maintain such element **13** in expanded condition against the material to be worked. Thus, fluid passes through the interstices of the fabric material **30** while further directly impinging under and side surfaces of the grit particles provided therein and thus provides for the dislodgement and removal of abraded material which tends to collect in the plurality of pockets and valleys presented by the rugose surface

of such individual abrasive elements **31** in cooperation with the outer surface of the fabric material **30**. The openings presented by the fabric material **30** may be varied by providing a closer or looser weave or mat thereto and thus provide an aspect of control for increasing or decreasing the flow of cleansing fluid desired. Thus in this manner means are provided by which abraded material which would tend to reduce both the effectiveness and the length of service of an individual fluid expansible element **13** is removed prior to filling the working surfaces thereof. Thus the elicited objects of the invention are accomplished while the device **10** is in rotational operation.

A further alternative embodiment of the invention is presented by the construction depicted in FIGURE 5 of the drawings wherein the abrasive device shown in FIGURE 3 has been modified so as to permit the conversion thereof to use with a separate outside source of fluid in conjunction with the fluid pervious and expansible element **13**. Such has been accomplished by removing the headed member **16** which forms a block for fluid passage **33** passing axially through element **18** and fitment **19** thereof. In such case the element **18** is threadably engaged to a boss **34** by means of a threaded opening **35** therein. Furthermore, the clamping ring **26** is removed and a solid plate **36** utilized in place thereof which plate serves to effectively close off the opening **24** in the plate **15** so as to in part form the plenum **28**.

Referring now to FIGURES 6 and 7 of the drawings, it may be seen that the fluid expansible element **13** utilized in the practice of this invention are provided at the outer surfaces thereof with a plurality of abrasive elements **31**. Such elements may be conveniently adhered thereto by means of a previous masked application of adhesive material. The pattern in which such abrasive elements **31** is formulated depends to a great extent upon the use to which the device is put. FIGURE 6 shows one such pattern **37** in which a solid central area of the expansible element **13** is more or less entirely covered by the abrasive. On the other hand, as hitherto before set out, it is desirable to place such elements **31** in a serpentine path **38** where the material abraided from the work has been found to undesirably adhere thereto. Thus with such a configuration as that shown in FIGURE 7 or with others similarly presenting areas of abrasive elements and areas in which no abrasive elements are present, permit upon rotation of the device a cleansing flow of fluid upon the worked surface of varying intensity so as to increase the effectiveness by which abraded particles adhering thereto are removed. Such abraded particles have been illustratively represented by the reference numeral F in the several drawings.

From the foregoing, it will be readily apparent that there have been devised several forms of relatively simple and convenient means by which the foregoing objects are accomplished. Upon reviewing a description of the various forms of the invention, it will be seen that novel and advantageous provision has been made for carrying out the desired end. However, attention is directed to the fact that other variations may be made in the example abrasive device and portions thereof and that its use is not entirely limited to abrasive work but that buffing and polishing as heretofore indicated can be advantageously carried out by practicing the foregoing principles of invention. Thus the above several examples set forth are not intended to be restrictive but that the spirit and scope of the invention is defined in the appended claims.

I claim:

1. In a device of the class described, a rotatable member providing a plenum housing in part defining a fluid plenum, and a fluid expansible element, means releasably operatively connecting said expansible element to said housing and about said plenum, means for introducing a fluid to said plenum, said expansible element being provided with an abrasive outer surface, and said fluid ex-

pansible element being formed of a slightly fluid pervious fabric material and portions of the outer surface of said material having grit particles adherent thereto whereupon a portion of the fluid passing through said plenum and acting upon said element so as to operatively expand such passes through the interstices of said element while further directly impinging under and side surfaces of said grit particles so as to reduce filling of said abrasive outer surface.

2. The device as set forth in claim 1 wherein said plenum housing comprises a pair of interconnected spaced generally circular plates.

3. The structure of claim 2 wherein said grit particles are placed upon the outer surface of said fluid pervious element in a serpentine path whereupon rotation of said first named member alternatively presents grit and non-grit outer surface areas of said second named fluid pervious element to a surface being worked upon.

4. In a device of the class described, a rotatable member providing a plenum housing in part defining a fluid plenum, and a fluid expansible element, means releasably operatively connecting said expansible element to said housing and about said plenum, means for introducing fluid under pressure to said plenum so as to operatively expand such expansible element comprising impeller means within said housing and opening means in said housing operatively associating said impeller means with a surrounding ambient fluid medium, said fluid expansible element being formed of a slightly fluid pervious fabric material and portions of the outer surface of said material having grit particles adherent thereto whereupon a portion of the fluid passing through said plenum and acting upon said element so as to operatively expand such passes through the interstices of said element while further directly impinging under and side surfaces of said grit particles so as to reduce filling of said abrasive outer surface.

5. The device as set forth in claim 4 wherein said opening means comprises an opening in said housing disposed generally centrally of said impeller means.

6. In a device of the class described, a rotatable member, said member comprising a pair of spaced generally circular plates connected to each other, said plates defining in part a fluid plenum, means for introducing a fluid to said plenum, a fluid expansible element formed of slightly air pervious fabric material having an abrasive outer surface, means for releasably clamping said element to peripheral outer wall portions of said circular plates and in operative association with said plenum, said first recited means comprising a plurality of radially disposed and generally equally spaced blades connected to and operatively associated with said circular plates, a generally centrally disposed opening in one of said plates, said blades radially inwardly terminating generally about the periphery of said opening, and wherein said plates, blades and opening form an impeller whereby rotation of said member draws fluid from the ambient surroundings into said plenum and entirely against the inner surface of said expansible element so as to operatively expand such.

7. In a device of the class described, a rotatable member, said member comprising a pair of spaced generally circular plates connected to each other, said plates defining in part a fluid plenum, means for introducing a fluid to said plenum, a fluid expansible element having an abrasive outer surface, means for releasably clamping said element to peripheral outer wall portions of said circular plates and in operative association with said plenum, said means comprising a plurality of radially disposed and generally equally spaced blades connected to and operatively associated with said circular plates, a generally centrally disposed opening in one of said plates, said blades radially inwardly terminating generally about the periphery of said opening, said plates, blades and opening forming an impeller whereby rotation of said member draws fluid from the ambient surroundings into said plenum and against the inner surface of said expansible element so as to operatively expand such, and said expansible element further having a plurality of interstices therethrough whereupon a portion of the fluid passing through said plenum and acting upon said element passes through said member so as to reduce filling of said abrasive outer surface.

8. In a device of the class described, a rotatable member, said member comprising a pair of spaced generally circular plates connected to each other, said plates defining in part a fluid plenum, means for introducing a fluid to said plenum, a fluid expansible element member formed of a slightly air pervious fabric material and portions of the outer surface of said material having grit particles adherent thereto, means for releasably clamping said element to peripheral outer wall portions of said circular plates and in operative association with said plenum, said means comprising a plurality of radially disposed and generally equally spaced blades connected to and operatively associated with said circular plates, a generally centrally disposed opening in one of said plates, said blades radially inwardly terminating generally about the periphery of such opening, said plates, blades and opening forming an impeller whereby rotation of said member draws fluid from the ambient surroundings into said plenum and against the inner surface of said expansible element so as to operatively expand such whereupon a portion of the fluid so acting upon the inner surface of said expansible element passes therethrough so as to reduce filling of said abrasive outer surface.

9. In a device of the class described, a rotatable member providing a plenum housing in part defining a fluid plenum, and a fluid expansible element, means on said member releasably operatively connecting said expansible element to said housing and about said plenum, said element providing a peripheral surface about said rotatable member and operatively associated with said plenum, means on said member for drawing air from the atmosphere during rotation thereof and for introducing the air to said plenum under pressure, said expansible element being provided with an abrasive outer surface, said fluid expansible element being formed of a slightly air pervious fabric material and portions of the outer surface of said material having grit particles adherent thereto whereupon a portion of the air passing through said plenum and acting upon said element so as to operatively expand such passes through the interstices of said element while further directly impinging under the side surfaces of said grit particles so as to reduce filling of said abrasive outer surface.

10. The device as set forth in claim 9 wherein said plenum housing comprises a pair of interconnected spaced generally circular plates.

11. In a device of the class described, a rotatable member providing a plenum housing in part defining a fluid plenum, and a fluid expansible element, means on said member releasably operatively connecting said expansible element to said housing and about said plenum, means on said member for drawing air from the atmosphere during rotation thereof and introducing the air under pressure to said plenum so as to operatively expand such expansible element comprising impeller means within said housing and opening means in said housing operatively associating said impeller means with a surrounding ambient atmosphere, said fluid expansible element being formed of a slightly air pervious fabric material and portions of the outer surface of said material having grit particles adherent thereto whereupon a portion of the fluid passing through said plenum and acting upon said element so as to operatively expand such passes through the interstices of said element while further directly impinging under and side surfaces of said grit particles so as to reduce filling of said abrasive outer surface.

12. The device as set forth in claim 4 wherein said open-

ing means comprises an opening in said housing disposed generally centrally of said impeller means.

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U.S. Cl. X.R.

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