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N. H. STINGLEY

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POLISHING AND DEBURRING WHEEL

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FIG. 1.

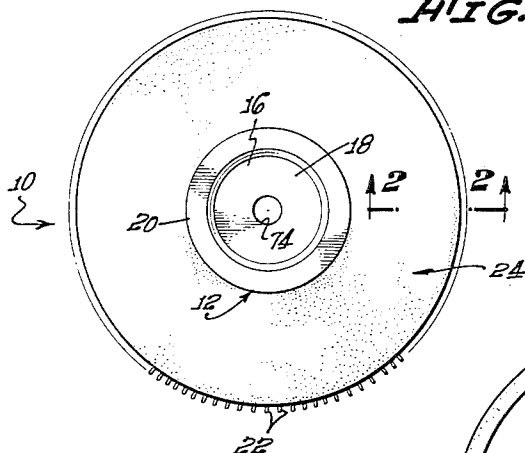


FIG. 3.

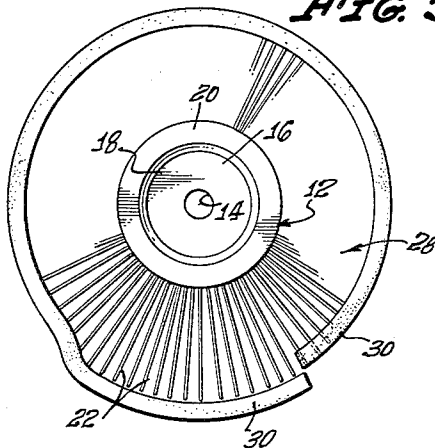


FIG. 2.

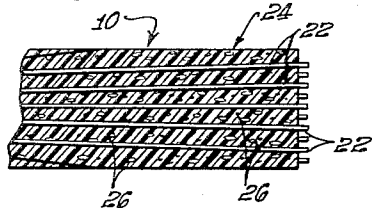
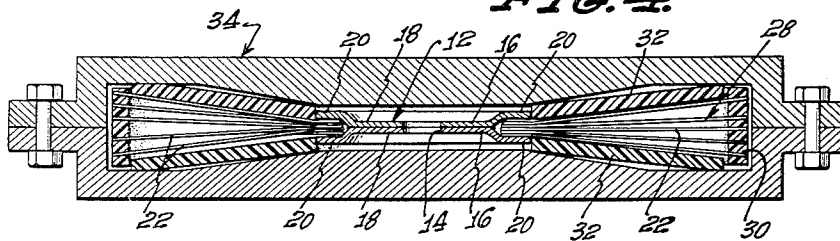


FIG. 4.



NORMAN H. STINGLEY,
INVENTOR.

BY

Edward D. O'Brien

ATTORNEY.

1

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POLISHING AND DEBURRING WHEEL

Norman H. Stingley, Garden Grove, Calif., assignor to The Osborn Manufacturing Company, Cleveland, Ohio, a corporation of Ohio

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8 Claims. (Cl. 15—179)

The present invention relates to new improved polishing and deburring wheels.

For cleaning castings and various like objects it has been established practice in many industrial organizations to remove unwanted material from these castings through the use of rotary brushes. Usually these brushes take the form of a wheel on the periphery of which are attached a large number of radially extending wire bristles. For many purposes such wheels are satisfactory. However, they are subject to several distinct disadvantages. Occasionally, one or more of the wire bristles will become broken due to use and will fly off of the wheel as it rotates. Also, such brushes are disadvantageous inasmuch as they are essentially incapable of providing a polished surface upon metal members.

It has previously been suggested that wire deburring wheels of the class indicated in the preceding paragraph could be manufactured by embedding the bristles in various solid condensation polymers. Unfortunately, such structures are not considered to be advantageous for many purposes inasmuch as the solid nature of the polymers prevent these polymers from bending or flexing during the operation of the wheel. This is very disadvantageous when such deburring wheels are used on exceedingly irregular surfaces. Further, with such prior art wheels employing a solid resinous material to hold the individual wires, the resinous material does not in and of itself aid in the operation of the rotary brushes. In these prior constructions the polymers employed are merely designed so that they are broken away from the grinding wheel during the operation thereof without interfering with the operation or the effectiveness of the bristles employed.

It is a broad object of this invention to provide new and improved circular polishing and deburring wheels which constitute an improvement over various prior constructions such are briefly indicated in the preceding discussion. A related object of this invention is to provide wheels of the class described which are very efficient for both deburring and polishing irregular surfaces, which are comparatively easy to manufacture, and which are satisfactory in operation. Another object of this invention is to provide a method for producing such combined polishing and deburring wheels. Further objects of the invention and many advantages of it will be apparent in the remainder of this specification including the appended claims and the accompanying drawings in which:

Fig. 1 is a side view of a polishing and deburring wheel of this invention;

Fig. 2 is a cross-sectional view taken on line 2—2 of Fig. 1;

Fig. 3 is a side view illustrating a step in the formation of a polishing and deburring wheel as herein described; and

Fig. 4 is a cross-sectional view illustrating another step in the formation of polishing and deburring wheels of the invention.

In all figures of the drawings like numbers have been

2

used to designate like parts wherever convenient for purpose of illustration and explanation. Further, it is to be understood that the invention is not to be limited to polishing and deburring wheels in which the parts are of the proportional sizes shown in the drawings inasmuch as the sizes of certain of these parts have been altered for convenience of explanation and illustration.

The present invention is, of course, fully summarized or defined by the appended claims forming a part of this disclosure. The invention is concerned with a wheel of the class described which comprises a central hub: a plurality of bristles attached to said hub so as to project radially outward therefrom, said bristles being capable of exercising a deburring action when said wheel is employed for the purpose intended; and a flexible elastomeric material positioned around said bristles so as to hold these bristles with respect to one another, said resinous material being capable of exerting a polishing action when said wheel is employed for the purpose intended. Another aspect of the invention is a method which comprises forming a wheel having a central hub with a plurality of bristles projecting radially therefrom; attaching the periphery of said bristles to one another so as to hold said bristles in a relatively fixed location; placing uncured disks of elastomeric material on both sides of said bristles; and curing said elastomeric material in a mold whereby said elastomeric material is caused to flow between said bristles to position said bristles with respect to one another.

In Fig. 1 of the drawings there is shown a combined polishing and deburring wheel 10 of the invention which comprises a central hub 12 having a center opening 14 formed therein, this opening being designed to be engaged by an appropriate arbor during the operation of this wheel. The precise structure of the central hub 12 is best shown in Fig. 4 of the drawings, where this hub is illustrated as being composed of two bilaterally symmetrical disks 16 each of which has a flat center section 18 and an offset periphery 20. The two center sections 18 are attached to one another by appropriate means such as, for example, welding. Between the two peripheries 20 the inner ends of bristles 22 are secured through conventional means such as, for example, welding. If desired, a plurality of lugs may be formed upon or secured to the peripheries 20 and the bristles 22 may take the form of wires bent around such lugs.

The bristles 22 of the invention are preferably formed of relatively stiff material capable of exercising a very definite cutting or abrading action so that the wheel 10 is very efficient in deburring metal castings and the like. Exceedingly suitable wheels in accordance with this invention have been manufactured employing wire bristles. Other materials such as glass fibres, may however be employed with the instant invention.

In accordance with the teachings of this disclosure the bristles 22 are secured together by a disk-like mass 24 of an elastomeric material. The properties of this elastomeric material are very important with respect to the functioning of wheels constructed as herein described. Particularly suitable wheels have been formed using chloroprene polymers and co-polymers of chloroprene with such vinyl compositions as isoprene and styrene. Various other elastomers such as are sold under the trade name "Hycar" (butadienestyrene polymers and butadiene-acrylonitrile polymers), and are manufactured by Goodrich Chemical Corporation of Cleveland, Ohio can also be employed with this invention. All of the elastomeric materials capable of being employed with this invention are comparatively flexible, and do not excessively smear the work or emit highly offensive odors under the normal operating conditions encountered during use of polishing and deburring wheels as herein described. Further these

3

elastomeric resins are substantially incapable of melting at the temperatures encountered during the use of such wheels of the invention.

All of these elastomeric materials are of less strength than the bristles 22 previously described so that during the operation of the wheels of the invention the elastomeric material tends to be broken off a short distance below the outer ends of these bristles leaving a small length, usually on the order of a $\frac{1}{16}$ to $\frac{1}{8}$ of an inch, exposed for use in deburring. In order to increase the insulation value of these elastomeric materials and in order that these elastomeric materials may be of such character that they are readily broken away from the extreme end of portions of the bristles it is preferred that they be manufactured so as to contain a plurality of small gas pockets such as pockets 26 illustrated in the Fig. 2 of the drawings. The cellular structure of such elastomeric material which is thus substantially uniformly intruded and interposed between the brush bristle wires or filaments facilitates limited controlled movement of such filaments relative to each other when engaging the work and also enhances erosion of the elastomeric material in the region of the working face of the tool. Furthermore, such cellular structure reduces the specific gravity of the elastomeric composition, thereby reducing the weight of the tool as well as rendering it more resiliently responsive.

The formation of polishing and deburring wheels such as wheel 10 is relatively simple. First, a basic wheel 28 consisting of the central hub 12 and bristles 22 projecting radially from this hub is manufactured in accordance with conventional procedures. Next, a strip of uncured elastomer capable of being used with the invention is placed about the outer periphery of such a basic wheel and the bristles are mechanically forced into this strip of elastomer so that relative positions of all the bristles will be maintained throughout subsequent treatment. This step utilizing the basic wheel 28 and a strip 30 is illustrated in Fig. 3 of the drawings.

After the strip 30 has been placed in position, disks 32 of uncured sheets of elastomer are placed in position on both sides of the wheel 28 and this wheel is placed in a suitable mold 34 of a type known to the prior art where it is subjected to heat tending to intrude and cure the elastomeric material. After the curing has been completed the complete wheel 10 is removed from the mold 34.

The uncured strips or sheets employed in these two steps are formed by rollers in accordance with conventional procedures well known to the rubber industry. They usually contain comparatively small amounts of curing agents, activators, accelerators, anti-oxidants, plasticizers, reinforcing agents, coloring agents, and blowing agents, such as are commonly employed in the rubber industry. All of these agents function either in curing, or in the final product produced in the expected manner. Thus, for example, the blower agents serve to produce the gas pockets 26 previously mentioned, and the coloring agent employed tends to color the cured elastomer.

Frequently, with the invention it is advisable to treat the bristles 22 employed prior to the application of elastomeric resin with a composition which serves to aid in bonding the elastomer utilized to these bristles in order that in the event the bristles should tend to break either during use or during the manufacture of the wheel 10, the segments of the bristles resulting from such breakage will be securely held so that they cannot fly off of the wheel 10. Suitable compositions for this purpose are well known to the art. With metal fibres, virtually any resinous bonding agent known to bond well to metal and to elastomeric polymers as herein described can be employed. Included in such agents are compositions based upon epoxy resins and/or phenolic derivatives. When the bristles employed with the invention are composed of glass fibres any of the various agents used

4

with glass fibres in the formation of re-enforced articles containing glass fibres and polyester-styrene or like resins can be employed.

Very satisfactory results in producing wheels of the instant invention have been achieved by treating wire bristles attached to a hub with Typly-S (a black viscous rubber cement marketed as a bonding agent for vulcanizing synthetic elastomers to metal) produced by Marbon Corporation of Gary, Indiana by dipping these bristles in this composition and heating them at a temperature of 85° F. for a period of 30 minutes.

Next in forming a wheel of the invention an uncured strip containing:

	Parts by weight
15 Neoprene GN-A (polymerized chloroprene produced by the Du Pont Corp., Wilmington, Delaware) -----	100
Magnesium oxide -----	4
Neozone "D" (phenyl-beta-naphthylamine, an anti-oxidant produced by the Du Pont Corporation, Wilmington, Delaware) -----	2
20 Permalux (di-o-tolyl guanidine salt of dicatichol borate, an activator produced by the Du Pont Corporation, Wilmington, Delaware) -----	0.5
25 Sodium acetate -----	0.5
Dutrex 30 (unsaturated hydrocarbon derived from acid petroleum sludge, a plasticizer produced by the Shell Oil Co. of Emeryville, California) ----	35.0
Stearic acid -----	1.0
30 Zinc oxide -----	5.0
Red iron oxide -----	1.0
Celogen ammonium carbonate (a blowing agent sold by the Naugatuck Chemical Division of U.S. Rubber Co., Naugatuck, Conn.) -----	3.0

35 approximately $\frac{5}{16}$ " thick and one inch wide was pushed onto the outer end portions of the bristles treated as above in the manner indicated in Fig. 3 of the drawings. Then two disks of the same composition and thickness were placed on both sides of these bristles and the entire assembly was placed within a mold approximately one inch thick at the outer end having the approximate shape indicated in Fig. 4 of the drawings and heated for a period of 30 minutes at 285° F. As a result of this operation a complete wheel such as the wheel 10 is produced in which all of the individual wire bristles were securely bonded to one another throughout by cured neoprene containing uniformly dispersed gas pockets. This structure is very efficient when used for the purpose indicated.

Those skilled in the art will realize what a large number of modifications can be made in this invention without departing from the essential basic character of this invention. All such modifications are considered as part of the inventive concept insofar as they are defined with the appended claims.

I claim:

1. A combined polishing and deburring wheel which comprises: a hub having a central opening formed therein; a plurality of wire bristles attached to said central hub so as to project radially therefrom; a material capable of bonding well to metal and to a flexible elastomeric material placed upon said wire bristles; and a flexible elastomer having a plurality of gas pockets formed therein positioned around said bristles, said elastomer being bonded to said material, said elastomer holding all of said bristles with respect to one another.

2. A wheel as defined in claim 1 wherein said flexible elastomer is a polymerized chloroprene base composition.

3. A rotary brushing tool having a central rotatable hub, brush bristle material secured thereto and extending generally radially therefrom, and elastomeric material interposed between said bristles adjacent the working face of the tool and resiliently spacing the bristles apart; wherein said elastomeric material is a resiliently deformable cellular composition.

5

4. The brushing tool of claim 3, wherein said elastomeric material is a cellular polymerized chloroprene base composition.

5. The brushing tool of claim 3, wherein said elastomeric material is bonded to said bristle material.

6. The brushing tool of claim 3, wherein said bristles are of wire, and said elastomeric material is cellular polymerized chloroprene base composition bonded thereto.

7. A brushing tool having a large number of abrading filaments and a cellular elastomeric material substantially uniformly intruded and interposed between said filaments substantially the entire length of the latter, the outer ends of said filaments projecting only very slightly beyond the body of cellular elastomeric material, said sponge elastomeric material being relatively susceptible to erosion at the working face of the tool to maintain substantially the same extent of projection of said filaments throughout the working life of the tool.

8. A circular brushing tool in accordance with claim 7, adapted to be mounted for high speed rotation, the voids

6

in such cellular elastomeric material facilitating a limited controlled movement of said filaments relative to each other when engaging the work and also enhancing erosion of said elastomeric material in the region of the working face of the tool.

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