April 21, 1964 A. FIELD 3,129,541

ABRASIVE TOOLS

Filed Oct. 29, 1962 2 Sheets-Sheet 1

FIG-1

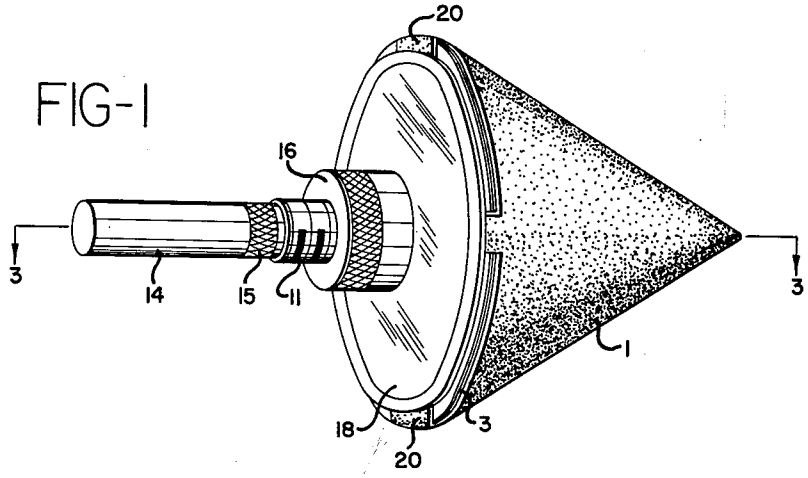


FIG-3

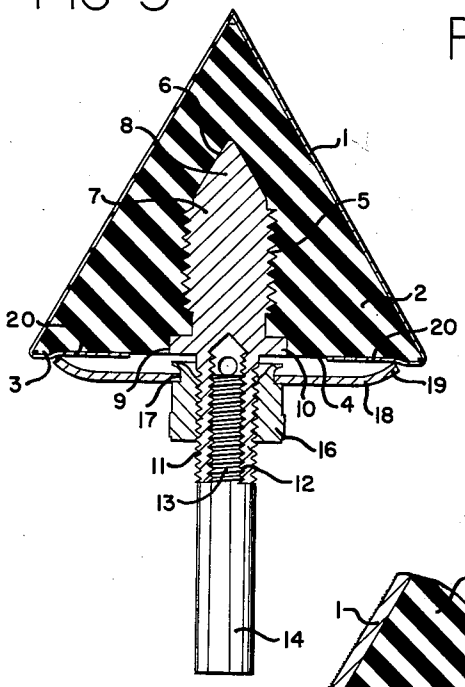


FIG-2

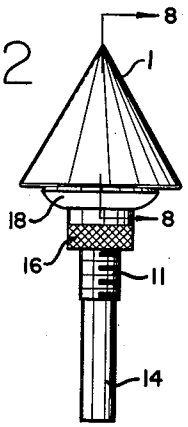


FIG-4

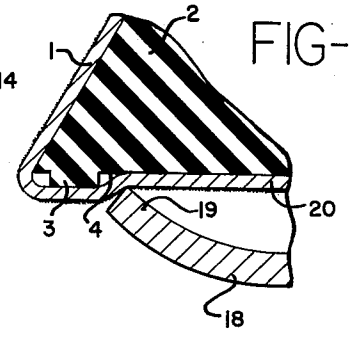
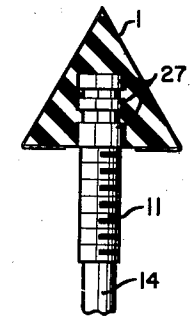


FIG-8



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ABRASIVE TOOLS

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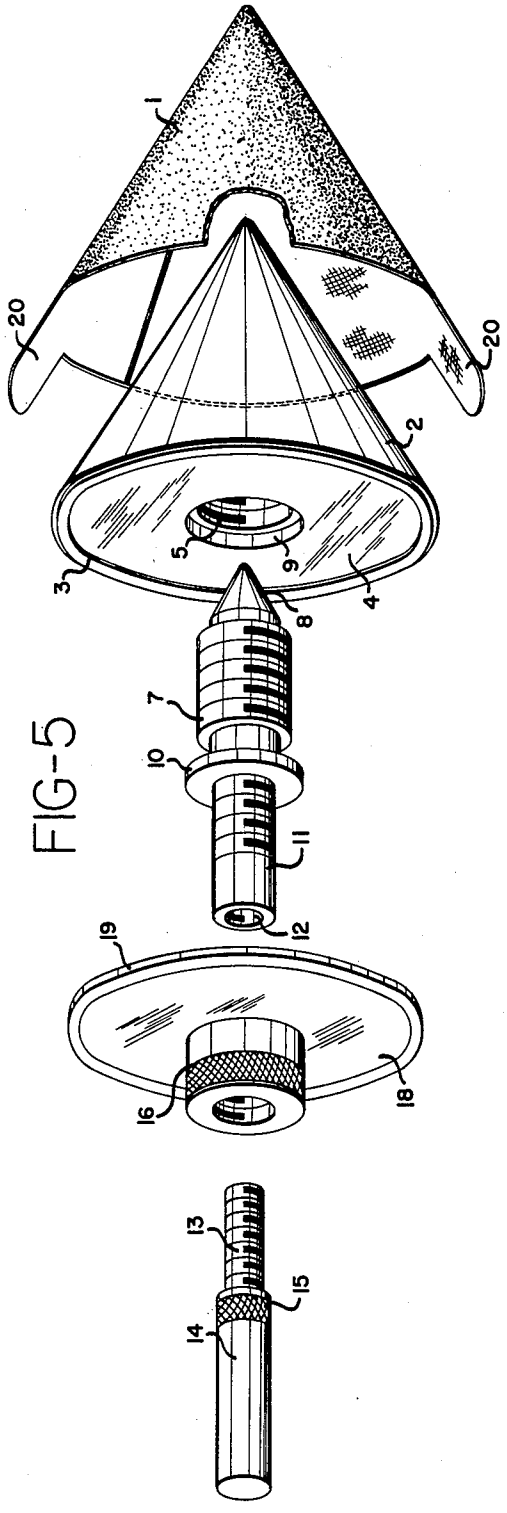


FIG-5

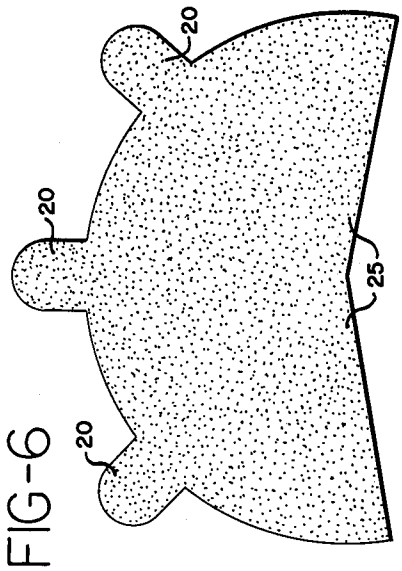


FIG-6

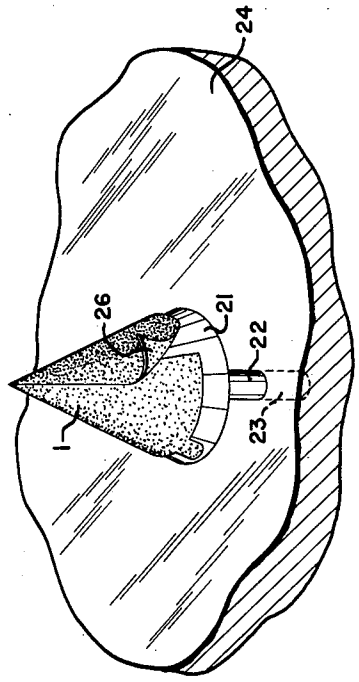


FIG-7

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3,129,541

ABRASIVE TOOLS

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2 Claims. (Cl. 51—194)

The present invention relates to abrasive tools employed for polishing, cutting and finishing metal, rubber, and plastic material.

In certain types of castings, such as engine blocks, having openings of various sizes therein, or plates containing apertures, the edges of these openings or apertures often contain burrs. Sometimes the openings when used for bores are provided with a chamfer, it is necessary that the edges of these openings, with or without a chamfer, be finished or polished by being subjected to a fine cutting action, best brought about by an abrading tool. The latter is given a fast rotary movement, causing the abrading surface to grind off the burrs, and in the case of a chamfered edge, to polish the angular surface. When the chamfer is approximately 60°, I have found that a tool of about the same angular shape performs satisfactorily. The tool presents a series of different diameters but as a smooth surface to accommodate the usual run of opening and depth of chamfer.

Tools of this character usually employ a layer of emery cloth or sand paper, glued or otherwise secured to a base of hard rubber or metal, which may take the form of a cone having the requisite angle. However, as the abrading action proceeds, the emery paper covering wears down and a fresh layer becomes necessary. The gluing form of securement in such case on account of the need for discarding the worn out layer therefore becomes impractical.

Various forms of effecting a temporary joinder of the covering to the cone have been proposed, such as the use of a slot extending the length of the cone for receiving extended ends provided circumferentially about the cone shaped covering; but, it has been found that the covering may become loose so that the abrading surface does not do a good job of finishing or polishing.

The main difficulty of temporarily applying the emery cloth covering to the cone shaped base is on account of the peculiar shape of the latter, and at the same time, permitting the cone covering, as backed by the base, to present a continuous surface of revolution to the work.

Another consideration in permitting the discard of one abrasive layer for another is the fact that a workman may be located in remote positions while operating the abrading tool and finding the necessity for having to remove the used up emery cloth and replace it by a fresh unit it is essential that the replacement operation shall become as simple as possible in order not to slow down the work in progress.

The primary object of the invention is to provide a conically shaped tool carrying an abrading surface and in which the abrading layer can be quickly applied to and removed from the cone base, the layer adhering closely to the base so as to offer uniformity of the abrading action.

Another object is to provide a covering of abrading material for a cone shaped base, which covering can be applied and renewed even by an inexperienced workman who may find it necessary to change the covering while perched in a disadvantageous position.

Still another object is to provide a conically shaped tool carrying an abrading surface or covering and in which the covering is held tightly against the conical base without the use of slots or any other depressions or obstructions along the base as might interfere with the continuity of contact between any part of the tool and the work surface.

A further object is to provide an improved clamping device for holding a conically shaped emery cloth covering to a base of similar shape and in which the clamping device is effective at the base of the cone rather than along the working surface of the cone.

Still another object is to provide a relatively simple but highly effective clamping mechanism for causing a conically shaped emery cloth covering to adhere closely to a base member of similar shape, and in which the said covering can be easily affixed or removed from the base by a simple clamping or unclamping operation, without necessitating the removal of the conical base from the rotary mandrel.

The above objects are attained in brief according to the invention by securing the emery cloth covering, which has been preformed, not to the conical surface of revolution, but instead, to the base of the cone member, through the use of tabs or flaps, and then provide a readily accessible clamp which can be tightened or loosened against the flaps while still permitting the conical base member to remain on the rotatable mandrel. Thus, a quick change can be made by the workman without in any way interfering with the mandrel and possibly the air motor to which the mandrel is temporarily attached.

These and other objects and advantages of this invention will become apparent by reference to the following detailed description and accompanying drawings wherein:

FIGURE 1 is a perspective view of the conically shaped base member carrying the emery cloth covering and showing the exterior view of the clamping device by which the covering is secured to the base member;

FIGURE 2 is an elevational view showing in miniature, the combined base member and clamping device;

FIGURE 3 is a view taken along section line 3—3 on FIGURE 1;

FIGURE 4 is a fragmentary sectional view of the lower left hand corner of the base member and its emery cloth covering, showing a portion of the clamping device;

FIGURE 5 is an enlarged exploded view of the various parts of the abrasive tool and including the mandrel, together with a showing of the manner in which the clamping device and the support member of the base can be attached to and detached from the mandrel;

FIGURE 6 represents a plan view of the emery cloth blank from which the conically shaped covering is formed;

FIGURE 7 depicts in miniature and perspective, the manner in which the blank shown in FIGURE 6 is formed on a manufacturing base of conical shape to provide the abrasive covering shown in FIGURES 1 to 5; and

FIGURE 8 is a view taken along section line 8—8 of FIGURE 2. It illustrates, as a partly sectional view, an optional way in which the conical base member which supports the covering can be held on a shaft, which in turn is threadedly received by a rotatable mandrel.

Referring to FIGURES 3, 4 and 5, reference character 1 shows a covering of emery cloth or sand paper preformed, as explained hereinafter, to a conical shape. This coxering constitutes the abrading element of an abrasive tool. The covering is backed or supported by a similarly conically shaped element 2, constituted preferably of hard rubber, plastic, or even metal, the element being held snugly on its backing member.

In operation, the abrading element 1 is rotated at a fairly fast peripheral speed and is used for polishing or abrading bevels found at the edges of openings in castings or even burrs. By reason of its ascending diameter, due to the conical configuration, the same size covering can accommodate many different sizes of openings and beveled surfaces formed thereon.

The backing member 2 is formed with an annular ridge 3 which, in effect, provides a recessed portion 4 extending across the base of the cone. The interior of the cone is bored as indicated at 5 (FIGURE 3) which

is threaded. The opening terminates in a short conical shaped extension 6 for receiving a metal pin 7, threaded as indicated in FIGURE 3 and terminating in a conically shaped extension 8 that snugly fits the opening of similar shape within the cone. The latter is also provided with a counter-bore 9 at the base end which receives a flange 10 on the pin 7, thus to limit the distance that the pin may extend into the threaded opening 5.

The pin 7, as shown in FIGURES 3 and 5, is provided with a threaded extension 11, which is bored, as indicated at 12, and contains threads for receiving the threaded end 13 of a mandrel 14. The latter is preferably knurled at 15 for facilitating the enrtance of the threaded end portion 13 in the threaded end member 11 of the pin 7.

The threads on the extension 11 receive a nut 16 knurled at one end, having an annular groove 17 at the opposite or inner end for tightly receiving a spring-like disk 18, which would normally be pressed into this annular groove and supported on the shoulder thereof.

The disk 18 is provided at its outer periphery with an inwardly directed flare 19 which, when the parts are all assembled together, is adapted to bear against the base 4 of the cone member at a position just inside the annular ridge 3.

The assembly of the various parts is shown in FIGURE 3, and it will be noted that the more the nut 16 is turned on the threaded extension 11 the greater is the clamping effect between the disk 18 and the base surface 4 of the cone.

The conical covering 1 is provided, as shown in FIGURE 6, with a number of outwardly extending tabs or flaps 20, which can be bent over the circular edge at the base of the cone member 2, and the tabs are thus caused to extend along the base surface.

The enlarged view shown in FIGURE 4 will indicate the manner in which the flexible disk 18 serves to drag each of these tabs toward the center of the cone as the nut 16 is turned, so that the covering 1 is pulled down tightly over the solid cone member 2, and a smooth conical surface of revolution is presented to the workpiece at all diameters along the cone when the mandrel is rotated, for example, by an air or electric motor provided with a chuck.

In order to make the cone in conical form, I have shown in FIGURE 7 a forming cone 21 positioned on a round pedestal 22, which can be snugly held in an aperture 23 in a work plate 24.

Assuming that the covering has been cut to the general shape indicated in FIGURE 6 by means of a stamping die and including the angularly extending edges 25, the blank is wrapped around a forming cone 21, leaving an overlap as indicated at 26 which can be secured to the layer underneath by means of glue. An adhesive strip (not shown) may be wrapped around the formed covering to hold the covering tight on the forming member until the glue is set. The covering is then complete, ready to be placed on the working cone 2, after the adhesive strip has been removed.

In order for a workman to apply the abrasive covering 1 on to the cone 2, it is merely necessary to unloosen the knurled nut 16 which allows the disk 18 to be retracted from the base of the working cone. Whereupon, the covering is then inserted over the cone and the flaps bent around the lower periphery thereof and inserted between the base of the cone and the outer edge 19 of the disk 18. The nut 16 can then be tightened on the threaded member 11 and, as shown, a continued tightening of the threaded member will cause the flaps to be drawn slightly in toward one another, and thus tighten the covering on its back-up member 2.

The mandrel 14 can then be screwed into the interior threaded opening of the nut 16. The mandrel is normally received by the chuck of an air motor which rotates the entire assembly, including the emery paper covering, to abrade any surface to which the cone shaped element is particularly adaptable.

Just the reverse operation is necessary to replenish or substitute a new abrasive covering on to the working cone member 2 in that the nut 16 is loosened to allow the disk edge 19 to be retracted away from the base of the working cone, in which case the flaps can be pulled outwardly and the covering entirely removed, ready for a fresh covering to be applied.

It is apparent that the entire assembly of the covering and its cone-backing member, together with the flap tightening disk 18, are independent of the mandrel 14 and its threaded end piece 13. Consequently the latter can be left in the chuck of the air motor or electric motor while the abrasive covering is either being applied or removed from the working cone 4. The covering tightening nut 16 operates independently of the threaded mandrel in that it threads on an extension of the permanently located pin 7.

Instead of providing a pin 7 which permanently threads into the working cone 2, I may, if desired, mold the threaded stem portion 11 directly in the rubber working cone 2, as shown in FIGURE 8. The stem portion 11 is provided at its end with a number of spaced collars 27, around which the rubber or plastic material in a liquid state, can harden so that, in effect, it would be almost impossible to pull the stem 11 out of the working cone.

The stem 11 in this case is provided with the nut 16, similarly to FIGURE 3, and also the flexible disk (not shown) by which to hold the tabs on the preformed cone covering in place.

It will be understood that this invention is susceptible to modification in order to adapt it to different usages and conditions and accordingly, it is desired to comprehend such modifications within this invention as may fall within the scope of the appended claims.

What is claimed is:

1. In combination, a conically shaped support member of moldable material, a threaded opening therein, a rod threaded into said opening, a covering of abrasive sheet material over the support member and having extensions of limited width which extend away from the covering, said extensions being folded over the base of said member and in contact therewith, a flange on said rod entering into a recess in the support member when the rod is screwed therein, said rod having a threaded portion at the end remote from the base of said support member, a nut received by the threaded portion of the rod, a disk loosely mounted on said nut at the end thereof nearer the support member whereby as the nut is tightened pressure is applied against the disk, which in turn serves to clamp the extensions of the covering directly against the base of the support member, and when the nut is loosened the disk is moved away from said base in order that the covering can be removed from the support member and a new covering applied, and a mandrel attached to and forming part of said rod in order to rotate the support member and its covering of abrasive sheet material after the nut has been tightened and the disk is pressed against the said extensions of the covering.

2. In combination, a conically shaped support member of moldable material, a threaded opening therein, a rod threaded into said opening, a covering of abrasive sheet material over the support member and having extensions of limited width which extend away from the covering, said extensions being folded over the base of said member and in contact therewith, a flange on said rod entering into a recess in the support member when the rod is screwed therein, said rod having a threaded portion at the end remote from the base of said support member, a nut received by the threaded portion of the rod, a disk loosely mounted on said nut at the end thereof nearer the support member whereby as the nut is tightened pressure is applied against the disk, which in turn serves

to clamp the extensions of the covering directly against the base of the support member, and when the nut is loosened the disk is moved away from said base in order that the covering can be removed from the support member and a new covering applied, and a mandrel attached to and forming part of said rod in order to rotate the support member and its covering of abrasive sheet material after the nut has been tightened and the disk is pressed against the said extensions of the covering, each of said disks and nut being of smaller diameter than the base of said support member.

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