

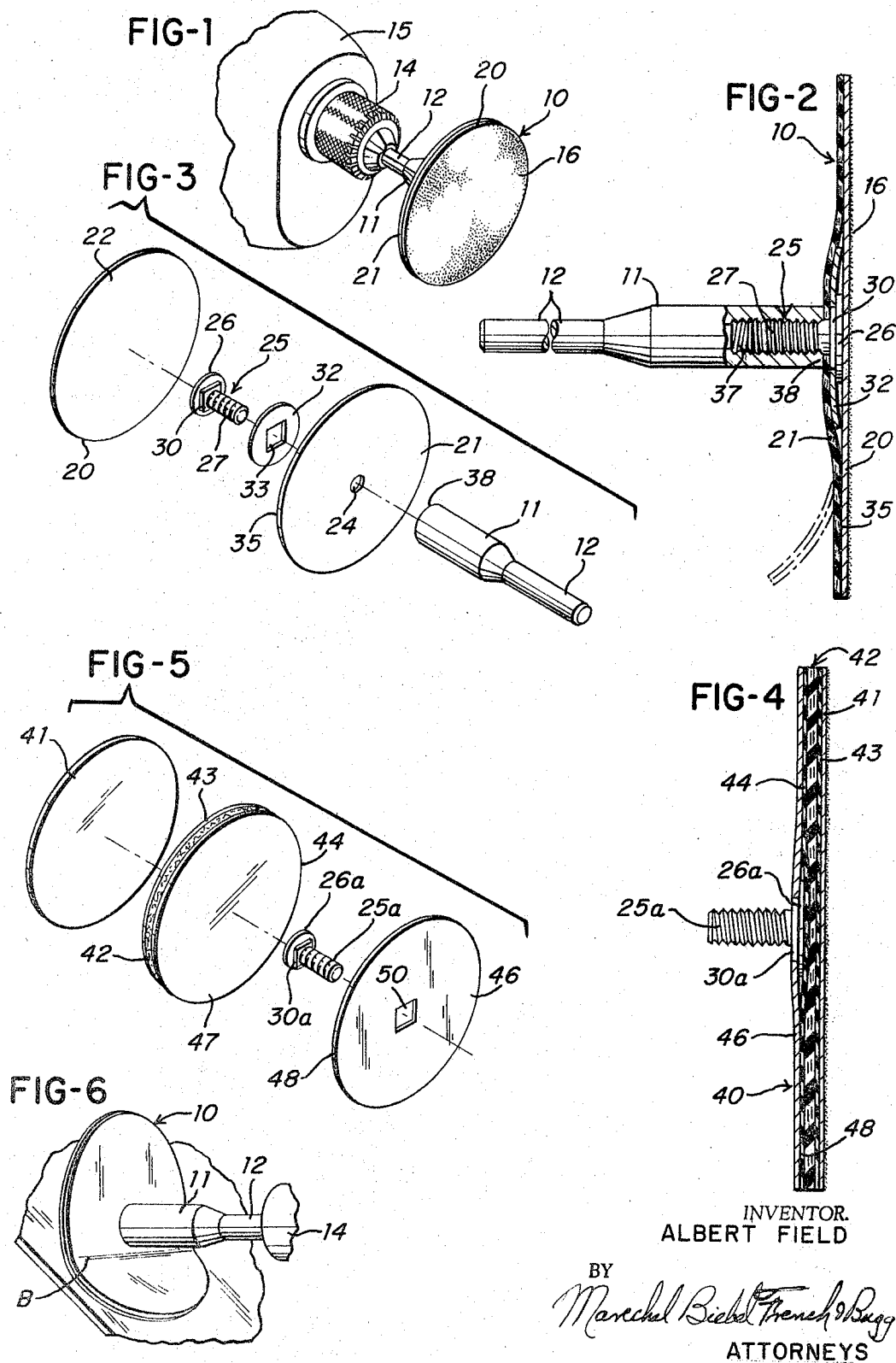
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A. FIELD

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ABRASIVE DISK UNIT

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1

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ABRASIVE DISK UNIT

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8 Claims. (Cl. 51—389)

This invention relates to abrasive disks for use in sanding and grinding, and particularly to abrasive disks which are adapted to be secured to the chuck of a power operated hand tool.

Hand tools having a sanding or grinding disk secured thereto are widely used throughout the manufacturing industry today to smooth rough surfaces on all types of materials and solids. For example, disks of this type are used to remove burrs from castings in the automobile industry. The usual practice is to secure the shaft of a rubber head or mandrel in the chuck of the hand tool, and use a pressure sensitive adhesive to secure the abrasive coated disk thereto. Once the disk is worn it is merely necessary to peel off the disk and place another one thereon by merely applying pressure thereto.

The practice is inexpensive since only the worn disks are disposed of but there are serious disadvantages in this procedure. There is a gradual build up of the adhesive material on the rubber mandrel causing it to become rough and weaken on the disks secured thereto, and it is difficult to center the disk on the mandrel so that when it is rotated at high speed there is an imbalance of centrifugal force acting thereon so that the disk is often thrown therefrom thus presenting the possibility of injury to those working nearby. The tendency of the disk to fly off the pedestal is even more pronounced when the abrasive surface is brought into contact with the work surface thus applying uneven force to the disk.

Another type of abrasive pad uses a circular abrasive disk having an opening in the center thereof through which a screw is used for securing the disk to the mandrel. This arrangement leaves the screw head exposed so that it can engage the work surface to cause scratching thereof, not to mention that the center area of the disk is not used in the abrasive action.

In both the arrangements described above, substantial time is consumed in changing the pad as required frequently when grinding or polishing metal or other hard surfaces. In one it takes time to pull off and replace the old disk, whereas in the other the screw must be removed and inserted through a new disk. The time required to change disks is an important consideration in production time, since the time taken to change disks is necessarily deducted from time that the workman can spend doing his primary tasks.

Accordingly, it is an important object of the invention to provide an improved abrasive disk unit which includes a solidly held abrasive disk having an abrasive surface entirely open and unobstructed, and particularly to provide such a disk unit which can be quickly secured to and removed from the power tool.

Another object of this invention is to provide an abrasive disk unit of the aforesaid type which is self-cleaning so that the particles of material removed from the work piece are thrown from the abrasive surface thus increasing the useful life of the abrasive unit and decreasing the frequency the units must be changed.

A further object of the invention is to provide an abrasive disk unit which is easy to manufacture from relatively inexpensive material so that the ultimate cost to the user justifies the disregarding of entire disk units rather than requiring the replacement of a pad on the disk unit as presently the practice.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

2

In the drawings:

FIG. 1 is a perspective view showing an abrasive disk in accordance with the invention mounted on a conventional power tool;

FIG. 2 is an elevation view partially in section of the abrasive disk secured to a mandrel;

FIG. 3 is an exploded view of the assembly shown in FIG. 2;

FIG. 4 is an elevation view partially in section of another embodiment of the invention;

FIG. 5 is an exploded view of the abrasive disk assembly as shown in FIG. 4; and

FIG. 6 is a perspective view illustrating the abrasive disk shown in FIG. 2 in operation.

Referring to the drawings wherein preferred embodiments thereof are illustrated, FIG. 1 shows an abrasive disk unit 10 including the mounting mandrel 11 which has the shaft portion 12 securely held within the conventional chuck 14 of the hand power tool 15 or its equivalent. The power tool 15 rotates the abrasive disk unit 10 at high speed, and allows the operator to position the abrasive surface 16 as desired to perform its intended purpose, for example, to remove burrs from a casting.

The disk unit 10 (see FIGS. 2 and 3) is an important part of this invention, and includes an abrasive coated cloth disk 20 which is flexible and has a diameter equal to the outer diameter of the assembled disk unit 10. A backing disk 21 having substantially the same outer diameter as the cloth disk 20 is bonded to the uncoated rear side 22 of the disk 20, and is made of rubber which is impregnated with cork, for purposes to be explained.

The backing disk 21 has a small round hole 24 cut in the center thereof, and the screw 25 extends therethrough with its relatively thin and flat head 26 sandwiched between the cloth and backing disks 20 and 21. Between the threaded portion 27 of the screw 25 and the flat head 26 is a relatively thin square boss 30 whose size is somewhat smaller than the diameter of the flat head 26. A flat anchor disk 32 is also interposed between the cloth and backing disks 20 and 21, and the square aperture 33 therein is complementary in size and thickness to the square boss 30 of the screw 25. The screw 25 thus extends through the aperture 24, and the boss 30 is snugly received within the aperture 33 so that relative angular movement therebetween is not possible without distorting or damaging the disk 32.

The anchor disk 32 is made of a semi-rigid material, such as fiberboard, and has an outer diameter which is only slightly larger than the flat head 26 of the screw 25. The outer peripheral portion of this anchor disk performs the important function of securing the screw to the cloth and backing disks 20 and 21, so that relative movement between the screw 25 and the remaining components of the disk unit 10 is prohibited in normal use.

The rear side 22 of the cloth disk and the inner side 35 of the backing disk 21 have a non-drying, pressure sensitive rubber base cement applied thereto before the disks 20 and 21 are placed together so that when they are held snugly together they will be substantially permanently bonded together with the anchor disk 32 and thus the screw 25, held against rotation therebetween.

The mandrel 11 has an internal threaded bore 37 in one end thereof for receiving the threaded portion 27 of the screw 25 for locking these two components securely together so that when the shaft 12 is mounted in the chuck 14 and the mandrel 11 rotated it tends to tighten the threaded connection between the disk unit 10 and the mandrel 12. The left end 38 of the mandrel 12 engages the disk unit 10 adjacent the backing disk 21, and the anchor disk 32 and backing disk 21 are clamped between the screw head 26 and the end 38 of the mandrel.

It should be apparent that a very minimum of time is required to change a disk unit 10 on the mandrel 12 since it is only necessary to stop the power tool, remove and discard the old disk unit, start the screw 25 of a new disk unit 10 into the bore 37 in the mandrel, and then energize the total 15 to tighten the new unit onto the mandrel.

Another important feature of the invention is the self-cleaning action of the abrasive surface 16 of the cloth disk 20 which results from the use of the rubberized cork backing disk 21. The rubberized cork prevents swelling of the backing disk when rotated at high speed since the cork exhibits characteristics which prohibit only a slight amount of expansion of rubber which occurs under pressure. This particular backing disk also reduces vibrations since the cork acts similar to voids within the rubber to dampen such vibrations. In addition, the backing disk is resilient so that it tends to quickly return to its original shape thereby causing a bend B (FIG. 6) in the abrasive cloth to cause metal or other particles to be thrown therefrom thus cleaning the abrasive surface and increasing the effective use thereof.

FIGS. 4 and 5 illustrate another embodiment of the invention including disk unit 40 having a flexible abrasive coated cloth disk 41 which is substantially identical to the disk 20 described in connection with the embodiment illustrated in FIGS. 1-3. This disk 41 is secured to a resilient support pad 42 which consists of a layer of rubberized cork substantially as described above and the thin rubber covering layers 43 and 44 which are bonded to the rubberized cork pad 42. The thickness of the rubberized cork pad 42 depends on the use to which the abrasive disk unit 40 is to be put since this thickness determines the resilience and the softness or hardness of the disk unit 40.

The semi-flexible backing disk 46 made of fiberboard or the like is secured on the surface 47 of the resilient support pad 44 and provides the unit with the particular stiffness characteristic desired, as will be more fully explained. Each of the cloth disks 41, the support pad 42, and the backing disk 46 are of substantially identical diameters, and they are preferably secured together by applying a non-drying rubberized adhesive to the adjacent surfaces so that when they are placed in contact they are substantially permanently bonded together.

This assembly also includes a mounting screw 25a which is substantially identical to that described above in connection with the embodiments of FIGS. 1-3 and the various features thereof are consequently identified by the same reference characters with a small a suffixed thereto. Thus the flat head 26a of the screw is interposed between the surface 47 of the support pad 44 and the surface 48 of the backing disk 46 with the square boss 30a extending through the complementary aperture 50 in the center of the backing disk 46 to prevent relative rotary motion between the screw 25a and the backing disk 46. Since the backing disk 46 is substantially permanently secured to the support pad 44 and the abrasive cloth disk 41, the screw 25a is similarly secured to form the finished abrasive pad unit 40.

This embodiment thus provides additional rigidity so that more pressure can be applied to the unit 40. It however also has the inexpensive and easy to manufacture feature described above, as well as the self-cleaning feature which appears to result from the resilience of the rubberized cork backing disk 21 on support pad 42 which tend to quickly restore the units 10 and 40 to their original configuration thus causing the bend B (FIG. 6).

While the forms of apparatus herein described constitute preferred embodiment of the invention, it is to be understood that the invention is not limited to these precise forms of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. An abrasive disk unit adapted to be secured to a mandrel having an internally threaded bore therein, comprising a semi-rigid disk having a polygonal aperture of a preset configuration in the center thereof, a screw having a head portion and a threaded portion adapted to be received in the threaded bore, said head portion having an enlarged flat head which is larger in size than said aperture, a polygonal boss on said screw adjacent said flat head on the same side thereof as said threaded portion, said polygonal boss having said preset configuration so that said threaded portion can be inserted through said aperture to secure said screw to said semi-rigid disk against relative angular movement therebetween and with said head flat adjacent one side of said semi-rigid disk, a disk of relatively resilient material having one side secured to said semi-rigid disk, and an abrasive coated cloth disk secured to said resilient disk for cooperation therewith to remove particles of a work piece which may collect on said abrasive disk.

2. An abrasive disk unit adapted to be secured to a mandrel having an internally threaded bore therein, comprising a semi-rigid fiberboard disk having a square aperture in the center thereof, a screw having a head portion and a threaded portion adapted to be received in the threaded bore of the mandrel, said head portion having an enlarged flat head which is larger in size than said aperture, a square boss on said screw adjacent said flat head on the same side thereof as said threaded portion, said square boss having a size such that it is received in said aperture to secure said screw to said semi-rigid disk against relative angular movement therebetween and with said head flat adjacent one side of said semi-rigid disk, a disk of relatively resilient material having one side secured to said semi-rigid disk, and an abrasive coated cloth disk secured to said resilient disk for cooperation therewith to remove particles which may collect in said abrasive disk.

3. An abrasive disk unit adapted to be secured to a mandrel having an internally threaded bore therein, comprising a semi-rigid anchor disk having a polygonal aperture of a preset configuration in the center thereof, a screw having a head portion and a threaded portion adapted to be received in the threaded bore, said head portion having an enlarged flat head which is larger in size than said aperture, a polygonal boss on said screw adjacent said flat head on the same side thereof as said threaded portion, said polygonal boss having said preset configuration so that said threaded portion can be inserted through said aperture to secure said screw to said semi-rigid disk against relative angular movement therebetween and with said head flat adjacent one side of said semi-rigid disk, a backing disk of relatively resilient material having an outer diameter substantially greater than said anchor disk and being secured to the other side of said semi-rigid disk, and an abrasive coated cloth disk secured to said one side of said resilient disk and having an outer diameter substantially equal to said backing disk for cooperation therewith to remove automatically particles of a work piece which may collect on said abrasive disk.

4. An abrasive disk unit adapted to be secured to a tool holder having an internally threaded bore therein, comprising a semi-rigid anchor disk having a polygonal aperture of a preset configuration in the center thereof, connector means having a head portion and a connector portion adapted to be secured to the tool holder, said head portion having an enlarged flat head which is larger in size than said aperture, a polygonal boss on said connector means adjacent said flat head on the same side thereof as said threaded portion, said polygonal boss having said preset configuration so that said threaded portion can be inserted through said aperture to secure said connector means to said semi-rigid disk against relative angular movement therebetween and with said head

5

flat adjacent one side of said semi-rigid disk, a backing disk of relatively resilient material having an outer diameter substantially greater than said anchor disk and being secured to and covering the other side of said semi-rigid disk, and an abrasive coated cloth disk secured to said one side of said resilient disk and having an outer diameter substantially equal to said backing disk for cooperation therewith to remove automatically particles of a work piece which may collect on said abrasive disk.

5. An abrasive disk unit adapted to be secured to a mandrel having an internally threaded bore therein, comprising a semi-rigid anchor disk having an aperture of a preset configuration in the center thereof, a screw having a head portion and a threaded portion adapted to be received in the threaded bore, said head portion having an enlarged flat head which is larger in size than said aperture, means on said screw adjacent said flat head on the same side thereof as said threaded portion for connecting said screw to said anchor disk and held against relative angular movement, said threaded portion being inserted through said aperture and with said head flat adjacent one side of said semi-rigid anchor disk, a backing disk of relatively resilient rubber impregnated with cork having an outer diameter substantially greater than said anchor disk and being adhesively secured to the other side of said semi-rigid disk, and an abrasive coated cloth disk adhesively secured to said one side of said resilient disk and having an outer diameter substantially equal to said backing disk for cooperation therewith to remove automatically particles of a work piece which may collect on said abrasive disk.

6. An abrasive disk unit adapted to be secured to a mandrel having an internally threaded bore therein, comprising a semi-rigid fiberboard backing disk having a polygonal aperture of a preset configuration in the center thereof, a screw having a head portion and a threaded portion adapted to be received in the threaded bore, said head portion having an enlarged flat head which is larger in size than said aperture, a polygonal boss on said screw adjacent said flat head on the same side thereof as said threaded portion, said polygonal boss having said preset configuration so that said threaded portion can be inserted through said aperture to secure said screw to said backing disk against relative angular movement therebetween and with said head flat adjacent one side of said semi-rigid disk, pad of relatively resilient material having one side secured to said one side of said disk, and an abrasive coated cloth disk secured to the other side of said resilient disk for cooperation therewith to remove particles of a work piece which may collect on said abrasive disk.

7. An abrasive disk unit adapted to be secured to a mandrel having an internally threaded bore therein, comprising a semi-rigid fiberboard backing disk of a predetermined diameter having a polygonal aperture of a preset configuration in the center thereof, a screw having a head portion and a threaded portion adapted to be received in the threaded bore, said head portion having an enlarged flat head which is larger in size than said aperture, a polygonal boss on said screw adjacent said flat head on the same side thereof as said threaded portion, said polygonal boss having said preset configuration so that said threaded portion can be inserted through said aperture to secure said screw to said backing disk against relative angular movement therebetween and with said flat head adjacent one side of semi-rigid disk, a pad of said predetermined diameter and constructed of relatively resilient material having one side secured to said one side of said backing disk, and an abrasive coated cloth disk of said predetermined diameter secured to the other side of said resilient disk for cooperation therewith to remove particles of a work piece which may collect on said abrasive disk.

6

prising a semi-rigid fiberboard backing disk of a predetermined diameter having a polygonal aperture of a preset configuration in the center thereof, a screw having a head portion and a threaded portion adapted to be received in the threaded bore, said head portion having an enlarged flat head which is larger in size than said aperture, a polygonal boss on said screw adjacent said flat head on the same side thereof as said threaded portion, said polygonal boss having said preset configuration so that said threaded portion can be inserted through said aperture to secure said screw to said backing disk against relative angular movement therebetween and with said flat head adjacent one side of semi-rigid disk, a pad of said predetermined diameter and constructed of relatively resilient material having one side secured to said one side of said backing disk, and an abrasive coated cloth disk of said predetermined diameter secured to the other side of said resilient disk for cooperation therewith to remove particles of a work piece which may collect on said abrasive disk.

8. An abrasive disk unit adapted to be secured to a mandrel having an internally threaded bore therein, comprising a semi-rigid fiberboard backing disk having an aperture of a preset configuration in the center thereof, a screw having a head portion and a threaded portion adapted to be received in the threaded bore, said head portion having an enlarged flat head which is larger in size than said aperture, means on said screw adjacent said flat head for securing said screw to said backing disk against relative angular movement with said threaded portion inserted through said aperture and with said head flat adjacent one side of said semi-rigid disk, a pad of relatively resilient material having one side secured to said one side of said semi-rigid disk, and an abrasive coated cloth disk secured to the other side of said resilient disk for cooperation therewith to effect removal of particles of a work piece which may collect on said abrasive disk, said backing disk, pad and cloth disk having substantially equal diameter so that the disk unit presents a uniform and uninterrupted abrasive surface.

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