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H. E. JOHNSON ET AL

3,562,968

SURFACE TREATING TOOL

Filed March 12, 1969

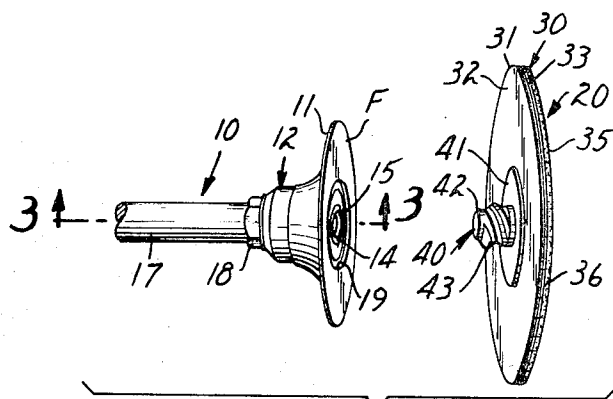


**FIG. 1**

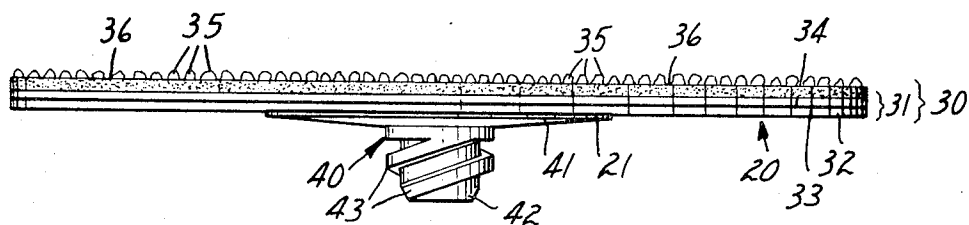


**FIG. 2**

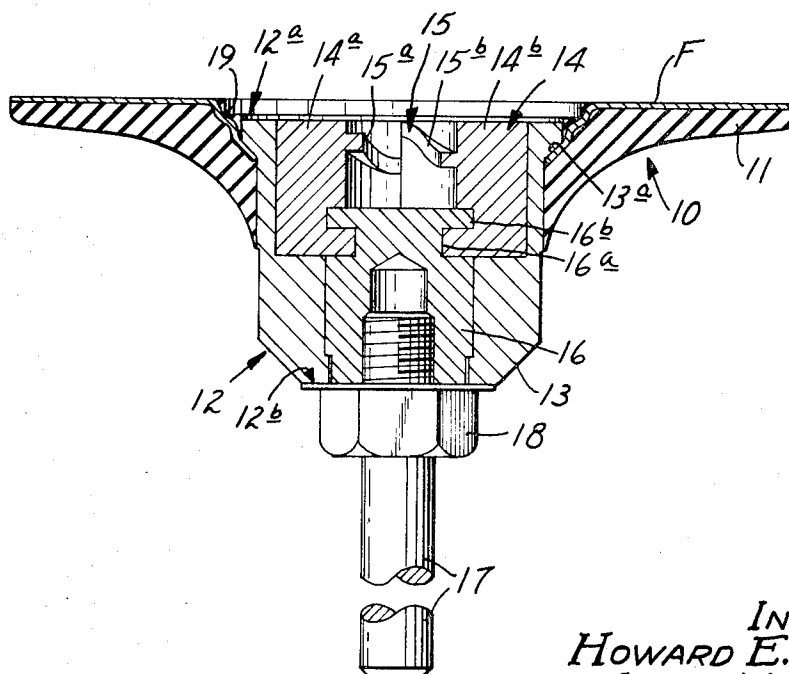


**FIG. 3**

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## SURFACE TREATING TOOL

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7 Claims

### ABSTRACT OF THE DISCLOSURE

A rotary surface treating tool having a drive assembly and a quick change abrasive disc or other surface treating device. The drive assembly has a hub with a cylindrical central opening having at least two helical ridged cams, and the back of the abrasive disc has a drive button with helically grooved complementary cam followers. The pitch of the cams and followers is steep, so that the disc can be mounted or demounted with no more than about one half turn.

### BACKGROUND OF THE INVENTION

This invention relates to tools employing coated abrasive discs and other surface treating devices.

Coated abrasive discs, which have existed for decades in a wide spectrum of constructions, can be used to remove stock, cut grooves, polish a surface, etc. These discs are typically designed for mounting on a rotary drive means. In order to utilize the versatility of such products, it is important that the tool be so constructed that the disc can be mounted and demounted with a minimum of effort. That this has been an objective of many inventors, is evidenced by the number of patents directed to quick change tools. To the best of our knowledge and belief, however, all tools heretofore known have suffered from one or more of such disadvantages as high cost of fabrication, excessively complicated mechanism, danger of damaging either the disc or the drive assembly during installation or removal, necessity for special mounting tools, inability to resist the torque encountered in normal use, tendency to mar the workpiece, etc.

### SUMMARY OF THE INVENTION

The present invention provides a surface treating tool in which the treating element can be easily installed and easily removed, both without wrenches or other tools. The surface treating unit is inexpensive, light weight, simple to fabricate, and simple to install or remove, and durable in use. Although particularly adapted for use with coated abrasive discs, the invention lends itself to the use of low density nonwoven abrasive products, polishing pads, brushes, and the like.

### BRIEF DESCRIPTION OF THE DRAWING

Understanding of the invention will be facilitated by reference to the accompanying drawing, in which like numbers refer to like parts in the several views, and in which:

FIG. 1 is an exploded view of the units making up the tool of this invention;

FIG. 2 is an edge view of the disc shown in FIG. 1; and

FIG. 3 is a cross sectional view of the drive assembly shown in FIG. 1, taken along section lines 3—3 and looking in the direction of the arrows.

### DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the drawings drive assembly 10 comprises annular backup pad 11, typically formed of vulcanized rubber

reinforced with a layer of fabric F. Pad 11 is formed around and chemically and/or mechanically bonded to the outer surface of central hub 12, having front side 12a and rear side 12b. The outer portion of hub 12 comprises stepped sleeve 13, having tapered shoulder 13a, over which fabric F is conformed and adhered so that the centrifugal forces which will act on the bond therebetween will be exerted in shear, rather than in tension. In sleeve 13 is inserted split bushing 14, made up of halves 14a and 14b. Extending radially inward within bushing 14 are helical ridges, or cam segments, 15a and 15b, the helix angle of each such segment being rather steep, e.g., on the order of 15–20°, and preferably about 19°.

Positioned within the opposite end of stepped sleeve 13 is plug 16, which is noncircular in cross section. Regular hexagonal plugs in which the diameter of the circumscribed circle is slightly greater than the diameter of the circumjacent interior of sleeve 16, may be pressed into sleeve 16 and firmly wedged in place. The upper portion of plug 16 is machined to remove a portion of the periphery and leave a circular neck 16a and a hexagonal head 16b. Split bushings 14a and 14b are complementarily formed, i.e., provided with a groove having a hexagonal periphery to accommodate head 16b and provided with a circular base for encompassing neck 16a. The end of plug 16 distal from the head 16b is drilled and tapped to accommodate complementarily threaded shank 17, nut 18 being used to fasten shank 17 firmly in position. The entire drive assembly 10 is thus so constructed that all of the component parts function as a unit, none rotating independently of the others.

Although hub 12 could be made of fewer component parts (e.g., one part) the arrangement shown is inexpensive and simple. Thus, for example, split bushing parts 14a and 14b can be die cast from zinc alloys, sleeve 13 quickly machined from an aluminum rod, and plug 16 is easily formed from a hexagonal cold rolled steel rod.

Surface treating assembly 20 comprises abrasive disc 30 and drive button 40, joined to each other by adhesive 21. Disc 30 in turn comprises backing 31 to which abrasive grains 35 are adherently bonded by adhesive 36. Preferably backing 31 is made up of a raw drills cloth layer 32 and a saturated drills cloth 33, joined by laminating adhesive 34.

Drive button 40, which is advantageously formed from fiber-filled nylon, comprises a generally circular broad, thin, tapered, platelike, discoidal base member 41 from the center of which extends generally cylindrical stud 42. About the periphery of stud 42 are helical cam followers 43, the angle of the cam followers to the axes of stud 42 being the same as that of helical cam segments 15a and 15b to the axis of bushing 14 in drive assembly 10. The helix angle of cam followers 43 is such that the lead is at least about twice the length of the stud, thereby providing for complete seating of stud 42 in bushing 41 in no more than about one-half turn. It will, of course, be apparent that more than two helical cam segments and helical cam followers could be employed and the helix angle further increased, thereby providing for seating of stud 42 in less than one-half turn.

As has been implied from the foregoing, mounting of abrading assembly 20 on drive assembly 10 is accomplished very simply. Stud 42 is inserted into the central opening of bushing 14, so maneuvering the two with respect to each other that cam followers 43 engage cam segments 15a and 15b. Abrading assembly 20 is then rotated approximately 180°, carrying cam followers 43 nearly to the end of cams 15a and 15b. Additional locking of abrading assembly 20 against drive assembly 10 is effected by making the surface of backup pad 11 somewhat concave and also by providing a depression 19 in the

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surface around the periphery of stepped sleeve 13. When stud 42 is firmly seated, the surface of raw drills cloth layer 32, is in firm frictional engagement with the face of backup pad 11. Additional frictional engagement is provided at the shoulder adjacent depression 19.

What we claim is:

1. A rotary surface treating tool comprising in combination:

a drive assembly, comprising

a hub means having front and rear sides, the rear side being adapted for being mounted on and rotated by the shaft of a motor or the like,

a cylindrical opening in the center of the front side of said hub means,

at least two helical cams, each integral with, and extending radially inwardly about a portion of, the circumference of said cylindrical opening,

a surface treating device, comprising a treating unit having a working face and a driving face

said working face being adapted to abrade, polish, clean, or similarly treat a surface,

said driving face having affixed thereto and extending at right angles therefrom

a generally cylindrical stud having at least two helically grooved cam followers generally complementary to said helical cams, each of said cam followers having a lead greater than the length of said stud,

said stud being positioned within said cylindrical opening in a manner such that the cams and cam followers are firmly engaged.

2. The tool of claim 1 wherein the stud is integral with a broad, thin base, said base being adhered to the driving face of the surface treating device.

3. A drive assembly for use in the tool of claim 1, comprising in combination an annular backup pad surrounding and bonded to a central hub,

said backup pad

being flexible and resilient and

having a working face which displays a high coefficient of friction to cloth,

said central hub comprising

a sleeve the exterior of which peripherally contacts the inner periphery of said backup pad,

a bushing inserted in said sleeve and firmly held therein, said bushing

having a plurality of internally protruding helical ridges, each such ridge extending no more than halfway around the internal periphery of said bushing, and

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being provided with means for attachment to a rotary drive means.

4. The drive assembly of claim 3 wherein the bushing is split diametrically into identical halves.

5. The drive assembly of claim 4 wherein the interior of the bushing is provided, adjacent the end distal to the working face of the backup pad, with a circumferential groove, and there is also provided a plug having a head complementary to said groove, said head being seated within said groove, said plug being drilled and threaded axially of said hub, and a threaded shank matingly engaged with the threads of said hub.

6. A surface treating device for use in the tool of claim 1 comprising in combination:

a disc formed of coated abrasive sheet material and having a back and a working face which is surfaced with abrasive grains,

a drive button adhered to the back of said disc, said drive button comprising

a broad, thin tapered plate-like base,

a generally cylindrical stud extending from the exposed surface of said plate,

said stud having at least two helical grooves, each groove having a helix angle of 15–20° and a lead equal to at least about twice the length of said stud.

7. A surface treating device for use in the tool of claim 1, comprising in combination:

a treating unit having a working face and a driving face, said working face being adapted to abrade, polish, clean or similarly treat a surface,

said driving face having adhered thereto a drive button comprising

a broad, thin tapered plate-like base,

a generally cylindrical stud extending from the exposed surface of said plate,

said stud having at least two helical grooves, each groove having a helix angle of 15–20° and a lead equal to at least about twice the length of said stud.

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OTHELL M. SIMPSON, Primary Examiner

U.S. Cl. X.R.

51—358

**UNITED STATES PATENT OFFICE**  
**CERTIFICATE OF CORRECTION**

Patent No. 3,562,968 Dated February 16, 1971

Inventor(s) Howard E. Johnson, Arlie M. Knutson and Vince Meye

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 18, delete the numeral "16"  
and insert therefor --13--.

Column 2, line 19, delete the numeral "16"  
and insert therefor --13--.

Column 2, line 56, delete the number "41"  
and insert therefor --14--.

**Signed and Sealed this**

Twenty-first **Day of** September 19

[SEAL]

*Attest:*

**RUTH C. MASON**  
*Attesting Officer*

**C. MARSHALL DANN**  
*Commissioner of Patents and Trademarks*