

Oct. 26, 1971

H. E. COOK

3,614,845

ABRADING IMPLEMENT

Filed July 18, 1969

FIG-1

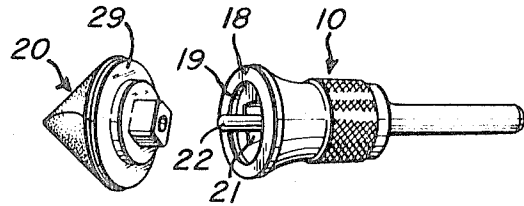
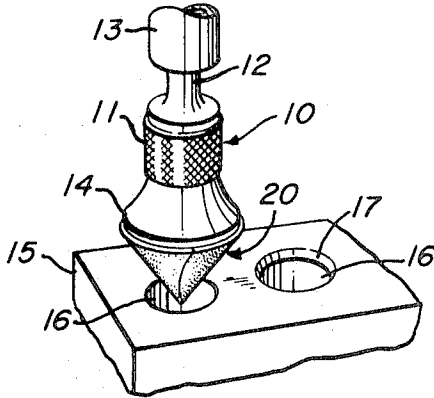


FIG-2

FIG-3

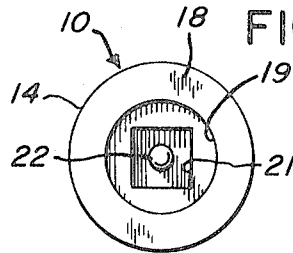
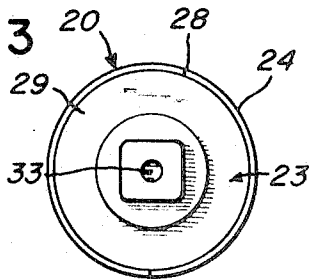


FIG-4

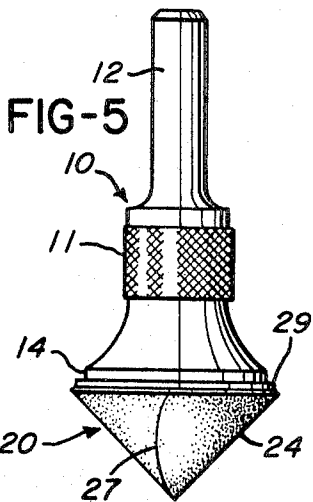


FIG-5

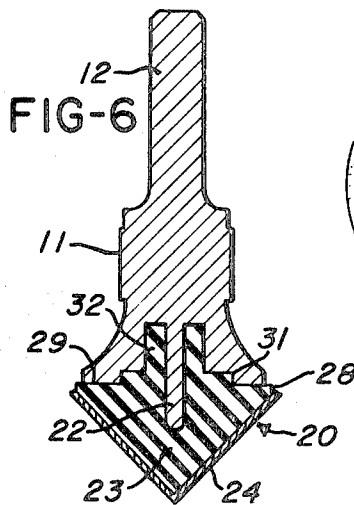


FIG-6

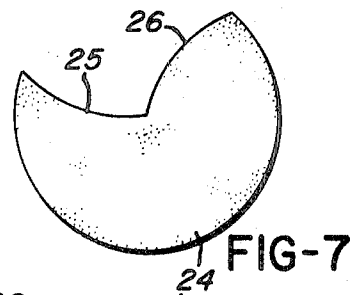


FIG-7

INVENTOR
HERBERT E. COOK

BY

John E. Deinger
HIS ATTORNEY

1

3,614,845
ABRADING IMPLEMENT
Herbert E. Cook, 98 W. Floyd Ave.,
Dayton, Ohio 45415
Filed July 18, 1969, Ser. No. 842,997
Int. Cl. B24d 17/00

U.S. Cl. 51—358

9 Claims

ABSTRACT OF THE DISCLOSURE

An abrasive cone assembly comprising a mandrel and an expendable cone tip. The rotary driving connection between the elements includes complementary projecting and recessed portion allowing a closed coupled connection therebetween, and features a projecting pin on the mandrel providing elongated central bearing support in the cone.

BACKGROUND OF THE INVENTION

This invention relates to abrasive cone assemblies and in particular to means for mounting a replaceable abrasive cone member to a work tool or mandrel.

Devices of the class described are mounted in rotary power tools and perform chamfering and like operations in connection with drilled holes. The mandrel is a permanent or continuing part of the assembly and is adapted to be held in a tool chuck. The abrasive cone member comprises a moldable body having a covering of abrasive cloth. It is joined to the mandrel for unison rotation but is preferably made separable therefrom for ease of replacement. In use, the abrasive cloth becomes worn and it is the usual practice to consider the cone member including the body and abrasive covering to be expendable. In this manner the working surface of an abrasive cone assembly can be renewed at less cost and with less trouble than were the entire assembly including the mandrel to be replaced. A superficially worn cone member is detached bodily from the mandrel and replaced by a new member from a supply of pre-assembled units. When recovery or salvage is economically feasible, worn abrasive coverings are stripped from discarded cone members and the molded bodies being thus made available for reuse. The general application of abrasive cone assemblies is one in which continuing use of a tool involves frequent replacement of the cone tips. Speed and ease of attaching and detaching of the cone tips accordingly are factors of importance, as are reliability and the defining and maintaining of a precise, axial disposition of the cone tip relatively to the mandrel. Low cost is of course an important objective in view of the included concept of expendability. In the prior art these objectives have been only inconsistently or in part realized. For example, it has been known to provide a threaded connection between the mandrel and cone tip. This makes for a secure connection but is costly and replacement cannot be described as quick and easy. Designs of greater attachment and detachment facility have been susceptible to twisting and distorting forces and are not securely mounted or tend to become misaligned in use.

SUMMARY

In accordance with the present invention, an abrasive cone assembly achieves ends desirable in a device of its class to a greater extent than has been known heretofore, and it is an object of the invention to provide a device so characterized. In the illustrative embodiment of the invention the mandrel and moldable body have inherently interengageable portions which are made to interfit with one another by a simple axial approaching motion of the parts. A relatively projecting pin on the mandrel deeply penetrates the body. It provides a central bearing inhibit-

2

ing misalignment. Also it has a friction-vacuum fit in the body obviating accidental loss of the cone tip from the mandrel. The connection readily yields, however, to an applied axial pull for simplified removal of a worn cone.

5 According to a further feature of the invention the rotary driving connection between the parts is entirely contained within the mandrel. The result is a compact, close coupled device in which the driving connection is fully supported against the effects of torsional and angularly deflecting forces.

Other objects and structural details of the invention will appear from the following description, when read in connection with the accompanying drawings, wherein:

15 FIG. 1 is a view in perspective of an abrasive cone assembly in accordance with the illustrated embodiment of the invention, shown in the course of application to the work;

20 FIG. 2 is a view in perspective, showing the mandrel and cone elements of the assembly in a separated relation;

FIG. 3 is a view in front elevation of the inner or attaching face of the cone element;

FIG. 4 is a view like FIG. 3, showing the outer or attaching face of the mandrel element;

25 FIG. 5 is a view in side elevation of an abrasive cone assembly in accordance with the illustrated embodiment of the invention;

FIG. 6 is a view in longitudinal section of the abrasive cone assembly; and

30 FIG. 7 is a top plan view of an abrasive cloth blank which together with a moldable cone body to which the formed blank is applied comprises the cone element.

35 In its illustrated embodiment, the invention deals with an abrasive cone assembly. It will be evident, however, that since the invention is principally concerned with interengaging means between a mandrel or work spindle and an extended working end thereof the exact character of the tool involved is unessential.

40 As shown in FIG. 1, an abrasive cone assembly according to the illustrated embodiment comprises a mandrel 10, and, as a separable work contacting extension thereof, a cone element 20. The mandrel 10 is made of tool steel or the like to be wear resistant and substantially unaffected by operational stresses. A cylindrical body portion 11 thereof is externally knurled so that the mandrel may be more effectively gripped in handling and in inserting it in and withdrawing it from the chuck of a power tool. A reduced diameter shank portion 12 extends from one end of body 11 and is adapted to be received in and held by chuck means 13 of a power tool. In the opposite direction from body 11, the mandrel progressively increases in diameter and terminates in a relatively broad flange 14. The cone element 20 projects from flange 14 as a working tip of the mandrel. It is suitably abrasive covered and is particularly adapted for the chamfering of small diameter holes. As shown, a work piece 15 provides a series of holes 16. Introduced axially into successive openings 16, the cone 20, when rotated, forms a chamfer 17 thereon having an angularity determined by and corresponding to the angularity of the cone element.

45 The flange 14 defines an outer end of the mandrel 10, more particularly represented by a flat, transverse face 18 (FIGS. 2 and 4). Centrally thereof the face 18 is formed with a shallow, circular recess 19. The bottom of recess 19 is in turn recessed, in this instance by a more deeply cut non-circular recess 21. In the illustrated instance recess 21 has a square configuration. Occupying an upright position within the square recess 21 is a pin 22. The latter forms an integral part of mandrel 10 and is coaxially disposed of the mandrel and of recesses 19 and 21. Having a diameter small in relation to transverse

3

dimensions of square recess 21, the pin is spaced from the walls thereof. It is, moreover, relatively elongated, extending through and beyond recess 21, recess 19 and through and beyond the transverse plane of face 18. The outer end of the pin 22 accordingly is in a relatively projecting relation to the outer end of mandrel 10.

The cone element 20 is comprised of a molded body 23 made of a resilient, deformable material. The body 23 has a cone shape. The conical, sloping sidewall thereof is covered by a layer 24 of abrasive coated cloth material. While the layer 24 may initially have various configurations it is in the illustrated instance, as shown in FIG. 7, normally comprised of a flat disc of flexible, cloth-like material. A segment of the disc is cut out to define curvilinear, spaced edges 25 and 26 of complementary curvature. One side of the disc is coated with abrasive particles. Upon adhesive being applied to the uncoated side, the disc is applied to a body 23 centrally thereof. It is pressed about the body to conform to the conical shape thereof, and, in the process, the complementary edges 25 and 26 are brought to an interfitted relation to define a butt joint 27. The abrasive coated layer 24 of material adheres to the body 23 and forms a unitary part thereof.

The molded body 23 has a short length cylindrical portion 28. A portion of the body presented forwardly thereof has the described conical configuration and mounts the abrasive layer 24. At what may be considered an inner end thereof the portion 28 terminates in an inwardly presented transverse face 29. A central, smaller diameter portion of face 29 is relatively projecting to define a shoulder lamination 31 of circular form. From the middle of lamination 31 further extends a square shaped projection 32. A central bore or hole 33 is in the center of projection 32, opening through the outer end thereof, and extends through and beyond lamination 31, face 29 and relatively deeply into body 23 toward the apex thereof. The face 29 of cone element 20 is adapted to make a flush, contacting engagement with face 18 of mandrel 10. The circular lamination 31 on the cone element is adapted to be received within circular recess 19 of the mandrel. Square shaped projection 32 of the cone is adapted to be received in mandrel recess 21. The hole 33 accommodates entry of pin 22. The lamination 31 and square shaped projection 32 have a reasonably close but not tight fitting engagement in their respective recesses 19 and 21 in the mandrel. Hole 33, however, is slightly undersize in diameter relative to pin 22.

Use of an abrasive cone assembly is, as previously described, substantially in accordance with the illustration of FIG. 1. The substitution of cone elements in the assembly is substantially as indicated in FIG. 2. In a relative approaching motion, the face 29 of the cone element is brought toward a seating relation to face 18 of the mandrel. In the process, pin 22 is caused to penetrate hole 33 and is pressed axially therein. The material of body 23 is, in the region of hole 33, slightly deformed thereby and responds with a reactant gripping pressure upon the pin. The relative approaching motions of the cone and mandrel elements is continued, guided by the pin 22 and by entrance of projection 32 into recess 21 and by entrance of lamination 31 into recess 19. The depth of hole 33, and the relative lengths of lamination 31 and projection 32 is such to allow relative approaching motion of the parts to continue until face 29 seats upon face 18 at which time the lamination 31 and projection 32 are fully accommodated in their respective recesses. With the parts so assembled, the interengagement of square shaped projection 32 in recess 21 defines a rotary driving connection between the mandrel and cone tip. Lamination 31, in addition to guiding the cone tip to a proper seat upon the mandrel positions it in a lateral sense, assisting in maintaining a constant axial alignment of the mandrel and tip. The pin 22 further acts as an axial guide and provides an elongated center bearing for the body 23. Forces developed in use tending to tilt or to cock the cone element are resisted by the pin 22. Still further, the pin 22,

4

since it is gripped by the resilient deformable material of body 23, prevents accidental detachment of the cone from the mandrel. In handling of the abrasive cone assembly, therefore, and in its application to and withdrawal from the work, the frictional fit of the molded body upon pin 22 holds the elements in an assembled relation.

Detachment of a worn cone member from the mandrel is accomplished by an axial pulling or separating motion applied to the cone element while the mandrel continues to be held. The close fit of pin 22 in hole 33 creates suction as well as friction forces yieldingly resisting detachment of the cone member.

The diameter of face 29 on the cone element is somewhat larger than the diameter of mandrel face 18. There is created thereby, in the assembled relation of the parts, a narrow annular shoulder on the cone element facilitating its gripping for removal.

The absence of an overlap in the abrasive covering 24 obviates problems of uneven wear and insures the formation of true, uniform chamfered surfaces. It will be understood, however, that any conventional methods of mounting an abrasive cloth material to a moldable body may be utilized in the practice of this invention.

The rotary driving connection between the mandrel and cone element is fully contained within the mandrel. All portions of the moldable body are accordingly extensively supported either within the mandrel or by the projecting pilot pin 22. Little or no unsupported resilient deformable material is presented to be subject to twisting and distorting forces. Further, the arrangement is one to make the cone assembly a compact, close coupled device providing direct axial backing for the cone and improving the facility of use and handling of the device.

A preferred embodiment of the invention has been disclosed but it will be evident that the invention has other applications, and, that structural modifications thereof are possible, and contemplated.

I claim:

1. An abrading implement, including a mandrel having an axially projected pin in an outer end thereof, a moldable body having an inwardly presented face to seat against the said outer end of said mandrel and formed to allow penetration thereof by said pin a substantial distance beyond said face, said body beyond said face having an outwardly presented abrasive covered portion, and interengageable means on the said outer end of said mandrel and on said face of said body comprising a rotary driving connection from said mandrel to said body, said moldable body being an expendable member detachable from said mandrel by an axial pulling motion, said pin having a friction fit therein tending yieldingly to maintain said moldable body in an attached position, with said face thereon seating to the said other end of said mandrel, said moldable body having a hole therein to receive said pin, said body being made of a resilient deformable material and said hole having a diameter slightly under size relative to that of said pin.

2. An abrading implement according to claim 1, said hole opening at one end through said face and terminating at its other end within the outwardly presented portion of said body, said pin providing a central bearing for said moldable body inhibiting tilting motions thereof relative to said mandrel.

3. An abrading implement, including a mandrel having an axially projected pin in an outer end thereof, a moldable body having an inwardly presented face to seat against the said outer end of said mandrel and formed to allow penetration thereof by said pin a substantial distance beyond said face, said body beyond said face having an outwardly presented abrasive covered portion, and interengageable means on the said outer end of said mandrel and on said face of said body comprising a rotary driving connection from said mandrel to said body, said moldable body being aligned with said mandrel and serving as an axial extension thereof, said interengageable means on said

5

body and said mandrel being interengaged by a relative approaching motion of said mandrel and body guided by said pin and having a complementary projecting and recessed relationship to one another allowing the face of said body a flush seating contact with the said outer end of said mandrel, the inwardly presented face of said moldable body defining the base of a cone, the conical portion of which begins adjacent to said face and defines with said face an intermediate cylindrical portion of minimal length, said moldable body having an axial hole to receive said pin, said hole opening through said face and extending toward the apex of the cone, said pin being received therein in a manner to provide elongated central bearing support for said body, said body being made of a resilient deformable material and said pin being oversized to have a friction fit in said hole.

4. An abrading implement, including a mandrel having an axially projected pin in an outer end thereof, a moldable body having an inwardly presented face to seat against the said outer end of said mandrel and formed to allow penetration thereof by said pin a substantial distance beyond said face, said body beyond said face having an outwardly presented abrasive covered portion, and interengageable means on the said outer end of said mandrel and on said face of said body comprising a rotary driving connection from said mandrel to said body, said interengageable means including a non-circular recess in the said outer end of said mandrel and a projection of corresponding configuration on the said face of said moldable body, said recess and said projection interfitting in response to a relative approaching motion of said mandrel and said body guided by said pin, said pin projecting from the bottom of said recess through and beyond the transverse plane of the said outer end of said mandrel.

5. An abrading implement according to claim 4, characterized in that said projection on the face of said body is centrally positioned thereon, said body being formed with an axial hole opening at one end through said projection and terminating within the outwardly presented portion of said body to receive said pin in a manner to allow the face of said body to seat on said mandrel and to provide through said pin a central bearing for said body inhibiting relative tilting motions thereof.

6. An abrading implement, including a mandrel having an axially projected pin in an outer end thereof, a moldable body having an inwardly presented face to seat against the said outer end of said mandrel and formed to allow penetration thereof by said pin a substantial distance beyond said face, said body beyond said face having an outwardly presented abrasive covered portion, and interengageable means on the said outer end of said mandrel and on said face of said body comprising a rotary driving connection from said mandrel to said body, said interengageable means including a recess in the outer end of said mandrel and complementary means on said face of said body adapted to be received in said recess, said pin being based in said recess and spaced from side walls

6

thereof, the said complementary means on said face of said body being formed with a coaxially disposing hole facilitating penetration of said body by said pin.

7. An abrading implement according to claim 6, wherein said pin is a relatively slender elongate member substantially uniform in cross section over the major part of its length, said moldable body being made of a resilient deformable material with said hole therein being formed in substantial correspondence with the pin but slightly undersize in transverse dimension for a utilizing of suction and friction forces to resist detachment of the body from the mandrel.

8. An abrading implement, including a mandrel having an axially projected pin in an outer end thereof, a moldable body having an inwardly presented face to seat against the said outer end of said mandrel and formed to allow penetration thereof by said pin a substantial distance beyond said face, said body beyond said face having an outwardly presented abrasive covered portion, and interengageable means on the said outer end of said mandrel and on said face of said body comprising a rotary driving connection from said mandrel to said body, said outer end of said mandrel being recessed in a surrounding relation to said pin, a portion of said face of said body being projected to be accommodated in the said outer end of the mandrel and said portion having a longitudinally extending hole receiving said pin with a friction fit.

9. An abrading implement, including a mandrel having an axially projected pin in an outer end thereof, a moldable body having an inwardly presented face to seat against the said outer end of said mandrel and formed to allow penetration thereof by said pin a substantial distance beyond said face, said body beyond said face having an outwardly presented abrasive covered portion, and interengageable means on the said outer end of said mandrel and on said face of said body comprising a rotary driving connection from said mandrel to said body, said pin being a slender elongate member substantially uniform in cross section over the major part of its length, said moldable body being made of a resilient deformable material and being formed with a coaxially disposing hole facilitating penetration of said body by said pin, said hole being formed in substantial correspondence with the pin but slightly undersize in transverse dimension for a utilizing of suction and friction forces to resist detachment of the body from the mandrel.

References Cited

UNITED STATES PATENTS

2,958,166	11/1960	Foland	51—358
2,581,567	1/1952	Wiley	51—358
2,864,208	12/1958	Ringer	51—392 X
2,826,014	3/1958	Field	51—190
3,129,541	4/1964	Field	51—380 X

JAMES L. JONES, JR., Primary Examiner