Feb. 24, 1970 E. SCHMIDT ET AL 3,496,685

ABRADING TOOL

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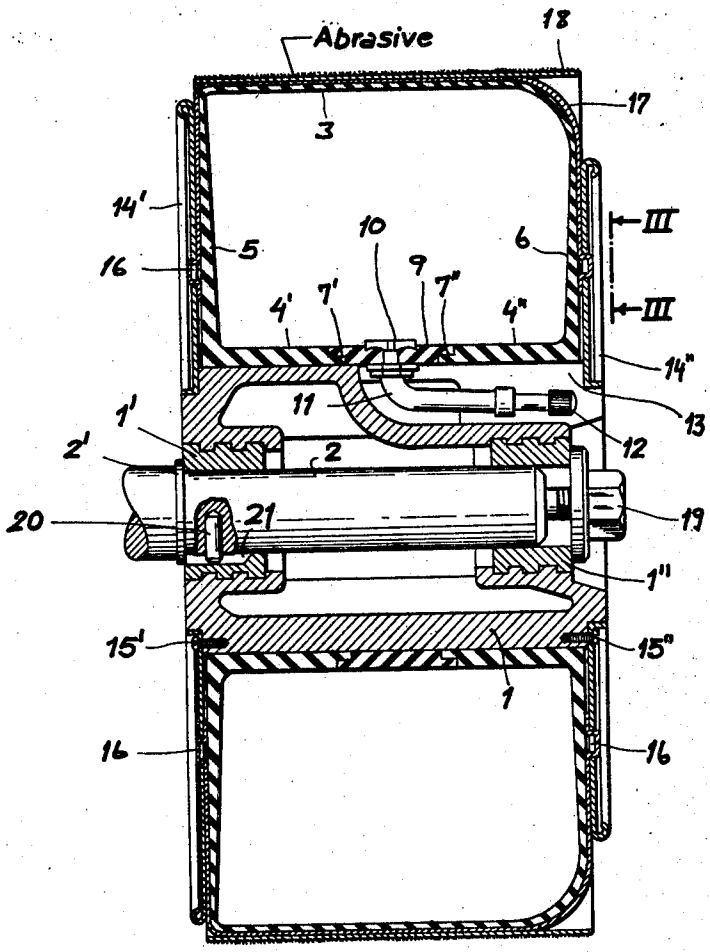

Fig.1

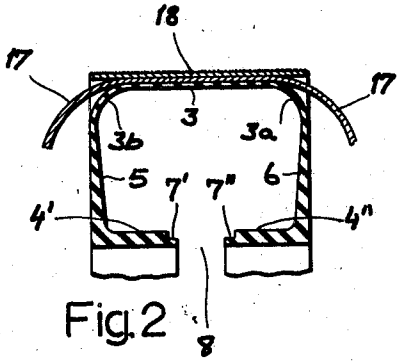

Fig.2

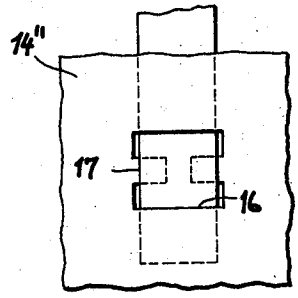

Fig.3

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ABRADING TOOL

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U.S. Cl. 51—373 10 Claims

ABSTRACT OF THE DISCLOSURE

An abrading wheel, designed for the sanding of elongate workpieces such as funiture legs, has an inflated toroidal body mounted on a central hub and supporting a surrounding abrasive band, the wall thickness of this body ranging from not more than about 2 mm. at its outer periphery to a substantially larger value at its inner periphery, the sidewalls of the body being of tapering thickness and being reinforced by adjoining flanking disks of metal or other stiff material.

Our present invention relates to a wheel-shaped abrading tool adapted to be used for the sanding of elongate workpieces, such as furniture legs, which may be moved past the rotating wheel on a conveyor, e.g. as disclosed in copending application Ser. No. 431,331, filed Feb. 9, 1955 by Erich Schmidt, now Patent No. 3,376,672.

In the shaping of such workpieces it is important that the abrasive surface of the wheel be sufficiently flexible to adapt itself to the desired contour and, in particular, that the workpiece-confronting edge of that surface be yieldable enough to avoid the formation of unsightly scratches which could otherwise occur upon minor shifts between the abrasive band and its rotatable support.

It is, therefore, the general object of our invention to provide an abraiding wheel for the purpose described which satisfies all the requirements of adaptability and yieldability while being sufficiently firm to insure proper machining.

This object is realized, pursuant to our present invention, by the provision of an abrading wheel having an inflated toroidal body whose outer periphery supports an encircling abrasive band or belt and whose inner periphery is mounted on a rigid hub serving to secure the wheel to a rotary shaft; the hub also carries a pair of stiff flanking disks which bear upon the sidewalls of the toroidal body, thereby preventing its outward bulging, while terminating short of its outer perpihery carrying the abrasive band.

Furthermore, in order that this body may have the desired degree of flexibility, its outer peripheral wall should be substantially thinner than its inner peripheral wall, with the sidewalls tapering from the thickness of the inner to that of the outer peripheral wall.

With the elastomeric materials currently available, including natural and synthetic rubbers as well as plastics such as polyethylene, the outer perihpheral wall of the toroidal body should have a thickness up to approximately 2 mm., a minimum thickness of about 0.1 mm. being adequate in many instances. The thickness of the inner peripheral wall may be several times that of the outer wall and should, of course, be sufficient to transmit the torque of the rotating shaft to the toroidal body in the face of the peripheral drag encountered by the abrasive band. This inner peripheral wall may be formed by integral annular extensions of the two sidewalls space axially apart to define a central gap which is occupied by an annular strip of the same or similar elastomeric material, heat-sealed or otherwise bonded to these extensions in a fluid-tight manner; this strip advantageously carries a nipple

for the admission of air or other inflating gas into the body. We have found that the degree of inflation should be limited to a range between 1 and 1.5 atmospheres absolute in order that the body and, with it, the abrasive band supported thereon may have the desired deformability; the higher limit will generally require somewhat heavier outer peripheral walls within the range of thicknesses specified above.

According to a more particular feature of our invention, the toroidal body has at least one rounded peripheral edge overhung by the abrasive band which extends tangentially of that edge along a cylindrical surface terminating substantially in the plane of the adjoining sidewall. The overhanging portion of the abrasive band will thus yield readily inwardly, being entirely supported except by the inherent stiffness of the band itself; the latter may be of the usual construction, including an endless paper carrier studded on its outer surface with corundum granules or the like. This abrasive band may be conveniently mounted on the wheel body with the aid of transverse straps having radially extending ends anchored to the two flanking disks.

The invention will be described in greater detail with reference to the accompanying drawing in which:

FIG. 1 is an axial cross-sectional view of an abrading wheel according to the invention;

FIG. 2 is a view similar to part of FIG. 1, drawn to a smaller scale and illustrating a modification; and

FIG. 3 is an enlarged fragmentary view taken on the line III—III of FIG. 1.

The abrading wheel shown in FIG. 1 comprises a metallic hub **1** removably molnted on the cantilever end of a shaft **2** which is rotatable about its axis by conventional drive means not shown, e.g. in a grinding machine of the type described in the above-identified Schmidt application. Hub **1** is provided for this purpose with a pair of mounting rings **1'**, **1''** clamped between a shoulder **2'** of a shaft **2** and a nut **19** engaging a threaded extremity thereof; a pin **20** projects into a keyway **21** of ring **1'** to insure positive rotary coupling between the hub and the shaft.

A toroidal body of elastomeric material, seated on hub **1**, has a relatively thin outer peripheral wall **3**, a pair of tapering sidewalls **5**, **6** and an inner peripheral wall of increased thickness formed in part by annular extensions **4'**, **4''** of wall **5** and **6**, these extensions being separated by a central gap **8** (FIG. 2) which is occupied by an annular strip **9** seated on ledges **7'**, **7''** of the two ring-shaped extensions **4'**, **4''**; strip **9** is bonded to the rings **4'**, **4''**, e.g. by vulcanization or heat-sealing, in a fluidtight manner. An inlet opening **10** in strip **9** receives the discharge end of a bent nipple **11** through which air or other gas may be admitted into the interior of body **3–6** under the control of a releasable check valve **12** of the type usually employed in automotive tires. Nipple **11** is accommodated in a peripheral recess **13** of hub **1** so as to be readily accessible from the side for purposes of attachment to a pump or compressor.

A pair of metallic stiffening disks **14'**, **14''** are rigidly mounted on hub **1** and flank the toroidal body **3–6**, bearing upon the tapering sidewalls **5** and **6** thereof to prevent outward bulging of same. It will be noted that the radius of the outwardly curled peripheral edges of disks **14'** and **14''** is smaller than that of the outer peripheral wall **3** so that these disks, and particularly the exposed front disk **14''**, terminate short of a cylindrical surface tangent to this outer periphery, i.e. the inner surface of a thin abrasive band **18** encircling the body **3–6**. Band **18** is provided with a plurality of peripherally spaced straps **17** having their ends frictionally anchored in generally H-shaped slots **16** (best seen in FIG. 3) of disks **14'** and **14''**, this mode of fastening enables a quick

replacement of a worn sanding belt **18** upon deflation of the supporting body **3–6**.

As illustrated in FIG. 1, the toroidal body **3–6** has a rounded peripheral front edge *3a* at the junction of its walls **3** and **6**, this edge being normally closer to the workpiece to be machined than the rearward edge defined by walls **3** and **5**. As shown in FIG. 2, however, both edges *3a* and *3b* may be rounded off in this manner. The overhanging part of sanding belt **18** is thus readily deformable and does not exert any appreciable pressure upon the workpiece.

Except for this overhanging edge zone, the sanding belt **18** will apply itself under substantially uniform pressure to the entire contact surface of a workpiece held thereagainst. This is particularly so if the internal pressure of body **3–6** is kept within the aforestated limits of approximately 1 and 1.5 atmospheres absolute so that the elastomeric body has no appreciable tendency to expand, its internal volume remaining substantially constant. The band-supporting body portion **3** should have a thickness of not more than about 2 mm., as noted above, the band or belt **18** being preferably of the same order of thickness.

When necessary, the entire supporting body **3–6** may be withdrawn from its hub **1** after removal of one of the two stiffening disks **14'**, **14''** which are fastened to the hub **1** by respective sets of screws **15'**, **15''**.

Minor structural modifications of the tool described and illustrated are, of course, possible without departing from the spirit and scope of our invention as disclosed in the appended claims.

We claim:

1. An abrading wheel comprising an inflatable toroidal body of elastomeric material, an abrasive band encircling the outer periphery of said body, a rigid central hub supporting said body, and a pair of stiff flanking disks on said hub extending along the sides of said body but terminating short of the outer periphery thereof, said body having a relatively thin and highly deformable outer peripheral wall, a relatively heavy inner peripheral wall and sidewalls tapering from the thickness of said inner peripheral wall to that of said outer peripheral wall, said disks bearing upon said sidewalls.

2. A wheel as defined in claim **1** wherein said outer peripheral wall has a thickness ranging between substantially 0.1 and 2 mm.

3. A wheel as defined in claim **1** wherein said body in its inflated state has an internal pressure between substantially 1 and 1.5 atmospheres absolute.

4. A wheel as defined in claim **1** wherein said inner peripheral wall consists of two annular integral extensions of said sidewalls separated by a central gap and an annular strip in said gap sealed to said extensions, said strip being provided with inlet means for an inflating gas.

5. A wheel as defined in claim **4** wherein said inlet means includes an axially bent nipple, said hub being provided with a recess accommodating said nipple.

6. A wheel as defined in claim **1** wherein said body has a rounded edge at the junction of said outer periphery and at least one of said sidewalls, said abrasive band overhanging said rounded edge and extending tangentially thereof along a cylindrical surface terminating substantially in the plane of the last-mentioned sidewall.

7. A wheel as defined in claim **6** wherein said band is provided with fastening means for securing same to said body, said fastening means including a plurality of straps bent around said rounded edge and provided with radially extending ends anchored to the disk adjoining said last-mentioned sidewall.

8. A wheel as defined in claim **7** wherein said straps also have ends anchored to the disk adjoining the opposite sidewall.

9. A wheel as defined in claim **8** wherein said disks are provided with peripherally spaced slots receiving the ends of said straps.

10. A wheel as defined in claim **9** wherein said slots are generally H-shaped.

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