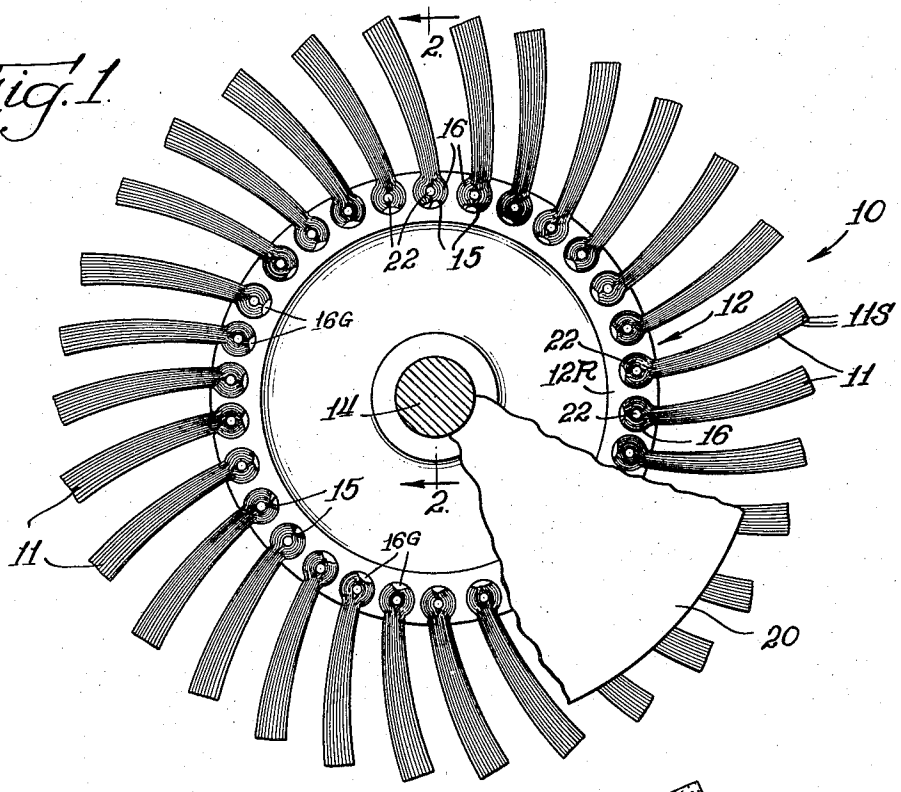
Feb. 3, 1959 A. J. COSMOS 2,871,632

ROTATIVE SURFACING TOOL AND TUFTED PACKS THEREFOR AND METHOD OF MAKING SUCH PACKS

Filed April 11, 1957 2 Sheets-Sheet 1

Fig. 1.



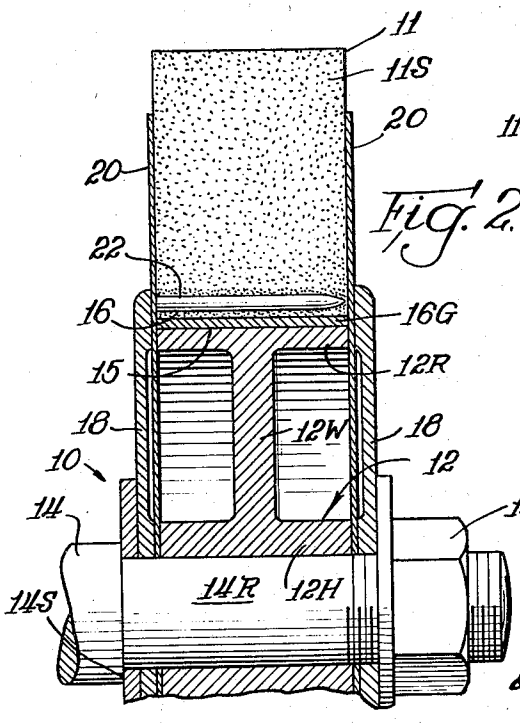
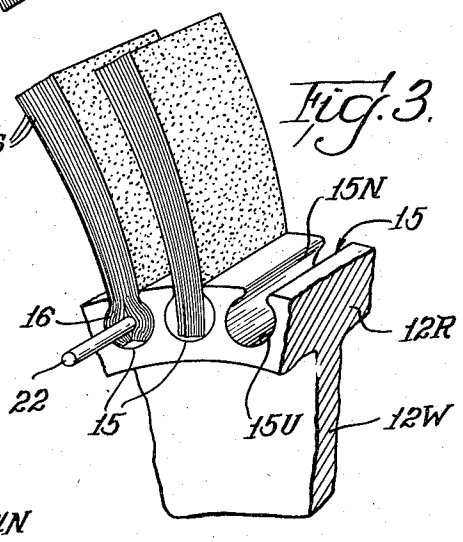


Fig. 2.

Fig. 3.



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Fig. 9.

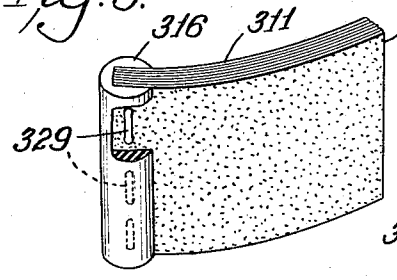


Fig. 4.

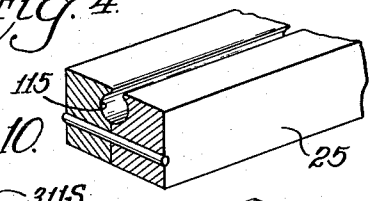


Fig. 10.

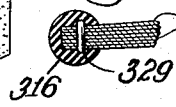


Fig. 5.

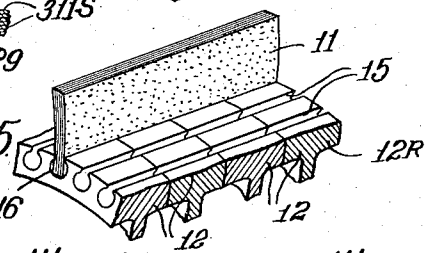


Fig. 6.

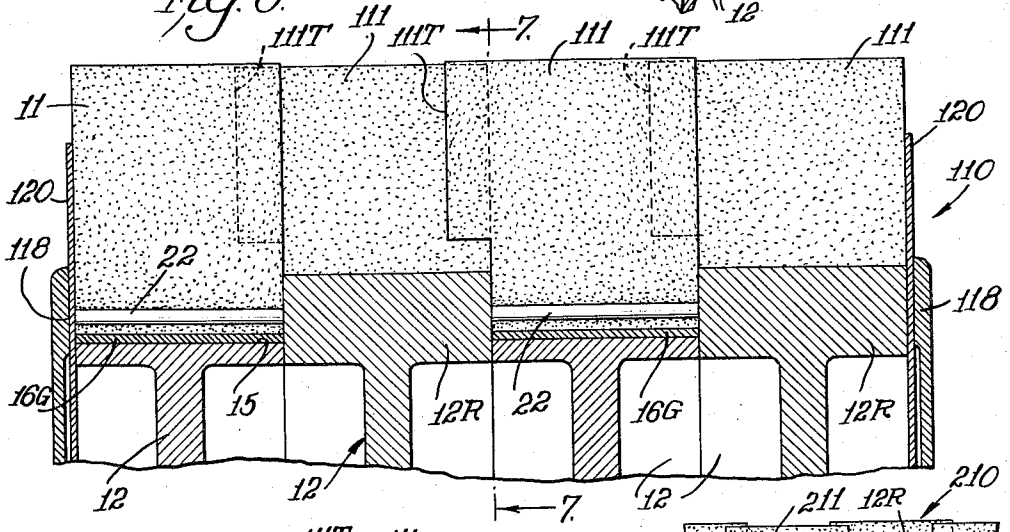
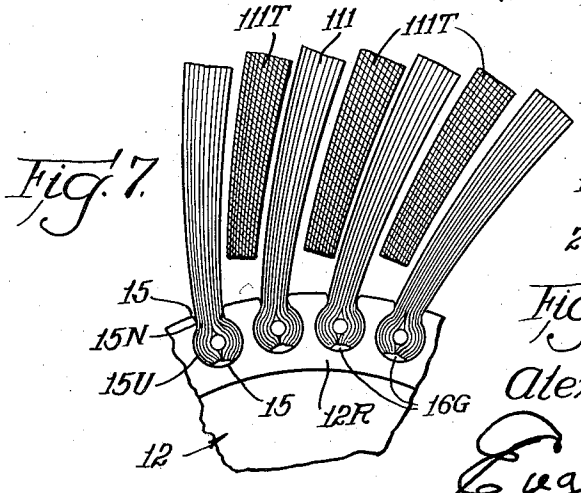


Fig. 7.



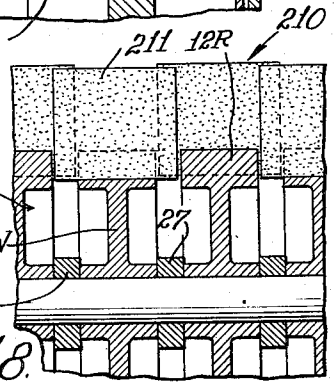


Fig. 8.

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ROTATIVE SURFACING TOOL AND TUFTED PACKS THEREFOR AND METHOD OF MAKING SUCH PACKS

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Application April 11, 1957, Serial No. 652,166
9 Claims. (Cl. 51—193.5)

This invention relates to rotative surfacing tools wherein a rotatable wheel or drum is provided at intervals around the periphery thereof with outwardly projecting tuft like assemblies or packs of surfacing sheets, such for example as sheets of abrasive cloth or paper which are arranged in side by side relation, like the leaves of a book, and bound together at their corresponding edges in a manner to provide an enlarged welt or beading for securement of the assembly or pack in undercut grooves in the periphery or rim of the wheel or drum.

The invention also includes the construction of the individual assemblies or packs of surfacing sheets and a method of securing the sheets of the pack together with an enlarged edge formation by which the pack is secured to the wheel or drum.

These wheels or drums are rotated at high speed to perform the surfacing function thereof and it is particularly important that the sheets thereof be anchored to the wheel or drum sufficiently securely to preclude accidental release thereof.

Also the surfacing sheets of such wheels or drums are worn down in use and it is important that they be readily replaceable to restore the tool to its required effectiveness.

Moreover such surfacing wheels or drums are usually employed in shops where it is necessary that they be available for constant or repeated use without delay and it is desirable that worn or damaged surfacing sheets may be quickly replaced whenever required.

Furthermore the surfacing operations of such wheels or drums oftentimes create fine particles or dust which is readily blown into the air and it is desirable to minimize the blower effect of the rotating sheets to avoid dissemination of the particles and dust into the surrounding atmosphere.

The principal objects of the invenion are to provide an improved rotary tool of the type having surfacing sheets projecting from the periphery thereof; to insure a secure attachment of the sheets which will preclude accidental release thereof; to permit convenient and quick replacement of the surfacing sheets; to provide a construction in which the sheets may be prepared in advance for interlocking with the wheel or drum, or formed with the interlocking facilities directly on the wheel or drum; to permit wheels of narrow width peripheral face to be employed individually or assembled in groups for continuous wide expanse of surfacing; and to minimize the blower effect of such wheels, these and other objects being accomplished as pointed out more particulary hereinafter and as shown in the accompanying drawings in which:

Fig. 1 is a side elevational view of a rotary surfacing tool made in accordance with the invention, one of the side clamping members having been removed to show details of internal construction;

Fig. 2 is a cross sectional view taken substantially along line 2—2 of Fig. 1;

Fig. 3 is an enlarged fragmentary perspective view illustrating one way in which packs of surfacing sheets may be formed with anchoring means for attachment to the body of the tool;

Fig. 4 is a view showing a mold that may be used in forming the packs of surfacing sheets;

Fig. 5 is a fragmentary perspective view illustrating the way in which a surfacing tool may be made in an elongated drum-like form;

Fig. 6 is a view illustrating another embodiment of the invention wherein surfacing packs are alternately arranged in an overlapping relationship;

Fig. 7 is a cross sectional view taken substantially along line 7—7 of Fig. 6;

Fig. 8 is a longitudinal sectional view showing another embodiment of the invention;

Fig. 9 is a perspective view illustrating an alternative surfacing pack construction, and

Fig. 10 is a cross sectional view of the surfacing pack of Fig. 9.

For purposes of disclosure the invention is illustrated in Figs. 1 and 2 as a single unit assembly **10** comprising a body **12** of wheel or pulley-like form having a relatively thick peripheral rim **12R** with a plurality of packs **11** of abrasive surfaced sheets anchored in spaced relation about the rim **12R** and projecting outwardly therefrom.

This tool, comprising the body **12** and tufts **11**, is adapted to be rotated to perform the surfacing function and for this purpose the body **12** has a central mounting hub **12H** which is connected to the rim **12R** by a web **12W** and adapted to engage on a rotatable shaft for rotation therewith.

It may, for example, be mounted on the shaft of a conventional grinder, as shown in Fig. 2, in which the end portion of such shaft is shown at **14** and provided as customary with a shoulder **14S** and reduced tool receiving portion **14R** which is threaded at the outer end to accommodate a nut **14N** by which the surfacing tool **10** is clamped thereon in conventional manner.

The rim **12R** of the wheel has a plurality of equally spaced undercut slots **15** formed therein and extended parallel to the wheel axis, and such slots, as shown particularly in Figs. 1 and 2, have a narrow neck opening **15N** inwardly of which the undercut portion **15U** is provided which is generally circular in form. The several packs **11** of abrasive material are anchored on the wheel **12** by means of an enlarged anchoring head or bead **16** formed along the inner end edge thereof so as to be complemental to the undercut slot portion **15U**, and the packs **11** are of such thickness that they will extend relatively snugly through the narrow neck **15N** of the undercut slot **15U**. The particular way in which the packs **11** and the anchoring ribs **16** are formed will be described in detail hereinafter.

After abrasive packs **11** have been inserted into all of the undercut slots **15**, these packs are held in position endwise of the slots **15** by clamping means applied to opposite sides or ends of the wheel **12**. Such clamping means as herein shown are provided by a pair of end plates **18** that may be secured against opposite ends of the wheel and in a desired manner, and under the present invention the end plates **18** are also utilized to hold a pair of somewhat larger discs **20** in position so that these discs extend outwardly to points located relatively close to the outer ends of the abrasive packs **11** as shown in Figs. 1 and 2. The discs thus serve to cover substantial radial portions of the abrasive packs **11** at opposite sides of the wheel **12** and this serves to materially reduce the amount of blowing or induced air movement which would otherwise occur in the use of the abrasive tool. These discs **20** are made from cardboard or other relatively soft material so that inadvertent contact of the discs **20** with the work will not cause damage to the work.

The abrasive packs **11** are made up from a plurality of abrasive sheets **11S** such as sand paper or emery cloth having such flexibility that it bends rearwardly in the reverse direction of rotation as it is engaged against the work and thus adjusts itself to the surface thereof, and these sheets are disposed in a face-to-face relation and

are joined together only along the inner edges thereof where they become a part of the mounting or anchoring bead 16.

The abrasive surfaces of the sheets 11S are preferably arranged so that the abrasive coated surfaces thereof are all faced in the same direction although they may be arranged if desired so that some of the sheets face in one direction and others face in the opposite direction.

Under the present invention, the anchoring bead 16 is formed in such a way that the individual sheets 11S are held firmly in place by reason of the way in which these sheets are associated with the anchoring bead 16. Preferably in preparing a pack 11 of abrasive sheets, the sheets 11S have glue applied to each thereof in the border portions thereof where the bead 16 is to be formed, and the enlarged cross sectional form of the bead is attained by inserting the thus glued ends into a cavity of the form of the wheel 15 and driving a center pin 22 between the thus inserted ends of sheets 11S so that the pin is located about midway between opposite faces of the pack 11 as indicated particularly in Fig. 2 of the drawings. The center pin 22 thus expands or enlarges the base or inner end portion of the pack 11 to conform to the groove shape and form the anchoring bead 16, as will be described in further detail hereinafter.

The formation of the anchoring bead or rib 16 on the inner edge of the pack 11 may, if desired, be performed by the user in the manner that is generally illustrated in Fig. 2 of the drawings. Thus, after dipping the inner ends of the sheets 11S in an adhesive such as animal glue, these ends may be inserted into one of the undercut slots 15U as shown in respect to the central slot 15 that is illustrated in Fig. 2. Then, while holding the sheets of the pack in position in slot 15, a center pin 22 may be driven endwise into the pack at about the center of the undercut 15U of the slot 15. This causes the sheets 11S on opposite sides of the pin 22 to be bent to a curved or arcuate form about opposite sides of the pin 22, and the portions of the sheets 11S that are thus bent and separated by the pin 22 assume a form that defines a bead or rib 16 that is substantially complemental to the undercut groove 15. The excess glue in such forming operation tends to collect beneath the inner ends of the sheets 11S, as indicated at 16G in Fig. 3, thus to fill out the lower surfaces of the rib 16 to a form that is complemental to the slot 15.

After the glue has dried, such glue and the arcuately bent portions of the sheets 11S become a solid or integral mass, and if an effort is made to withdraw one of the sheets 11S in an edgewise relation outwardly from its anchored position, this withdrawing movement is not only resisted by the glued connection with the other elements of the rib 16, but also by the physical form of the portions of the sheet that form part of the rib 16. In other words, the end portions of the sheet 11S are mechanically interlocked one with the other, due to the bent formation thereof, and hence the sheets 11S are permanently anchored as parts of the rib 16. Thus the packs are incorporated in place in the wheel slots ready for use therein and replacements may be made in like manner.

The abrasive packs may, of course, be made and sold for use by the purchaser of the tool, and such packs may be made through the use of a sectional mold 25, Fig. 4, that has an undercut slot 115 therein of the same size and proportion as the slots 15 of the wheel 12. The same assembly and molding procedure is used with the mold 25 as was hereinbefore described in respect to the forming of the packs in place on the wheel.

The packs 11 as hereinbefore described have been of a width corresponding to the width of the wheel 12 but such packs may, of course, be made and sold in long lengths so that they may be cut to the desired size by the user. Moreover, such long packs may be utilized in making larger abrasive tools as for example in the manner illustrated in Fig. 5 of the drawings where a

plurality of mounting wheels 12 are illustrated with the rims 12S thereof in edge to edge engagement and with the undercut slots 15 thereof aligned with each other. Thus, elongated packs 111 may be extended through the aligned slots of all of such wheels, and thus an abrasive tool that is drum-like in character may be produced.

Under the present invention, other forms of drum-like abrasive tools may be produced as for example, the drum-like abrasive tool 110 of Fig. 6. In this abrasive tool 110, a plurality of mounting wheels 12 are arranged in an edge to edge relationship, but the slots 15 are offset one from the other so that the slots of any one of the wheels 12 are offset with respect to the slots of the next adjacent wheel in an amount equal to one-half the lateral space or distance between the adjacent slots. With this angularly offset relationship of the slots 15, a modified form of abrasive pack is used so that there is an overlapping relationship at the adjacent edges of the packs carried by adjacent wheels 12. At the ends of the drum-like tool 110, disc members 120 and end plates 118 are employed as in the tool 10 hereinbefore described. As shown in Figs. 6 and 7, the left-hand one of the wheels 12 utilizes packs 11 of the same size and form as the packs hereinbefore described, but in all of the mounting wheels 12, a modified form of pack 111 is utilized, such modified packs 111 being of the same basic form and having the same type of anchoring means, but with the left-hand edges of such packs being provided with laterally extending tabs 111T that project laterally to the left into the spaces between the packs of the mounting wheel located just to the left in the tool. With this arrangement, all of the packs 11 and 111 that are utilized in making up the tool 110 may be flexed independently, and yet there is an overlapping relationship at the adjacent edges thereof so that a uniform abrasive action will be attained throughout the length of the tool 110.

In Figs. 6 to 7, the desired overlapping relationship of the adjacent packs is attained through the provision of tabs 111T, but overlapping relationship may also be attained in a somewhat different manner as illustrated in a modified form of abrasive drum 210 that is shown in Fig. 8 of the drawings. Thus, as shown in Fig. 8, a plurality of mounting wheels 12 are arranged on a common axis and in a slightly spaced relationship by means of spacer washers 27. These mounting wheels 12 are arranged with the slots thereof offset circumferentially, as hereinbefore described in respect to the abrasive drum 110, and with this relationship of the sveral mounting wheels 12, an overlapping relationship of the abrasive elements is afforded by employing abrasive elements 211 that are of a length somewhat greater than the width of the rims of the mounting wheels 12. Thus, as herein shown, the enlarged packs 211 have a length such that each pack 211 will extend across both of the spaces on opposite sides of its mounting wheel 12 and nearly to the rim 12R of the adjacent mounting wheel. In other words, the length of the abrasive packs 211 as to all of the intermediate mounting wheels 12 is equal to the width of the rim of the mounting wheel plus approximately twice the width of the spaces between adjacent mounting wheels. As to the end mounting wheels 12, of course, the packs will have a length equal to the width of the mounting wheel 12 plus the width of only one of the spaces between the wheels. Such an arrangement provides for an overlapping of the abrasive packs 211 which affords a continuous abrading action through the length of the abrasive drum 210, and yet the abrasive packs 11 may be individually flexed as may be required.

While the packs as above described and enlarged at the mounting end thereof by a pin 22 are preferred, satisfactory packs may be otherwise provided.

For example, as shown in Figs. 9 and 10 the packs may be formed with a molded bead 316 thereon with the inner edges of the sheets of the pack in compact side by side relation and conjointly embedded in the material of the

molded bead **316**. In this form the bead or rib **316** is preferably of a resilient plastic material, such for example as rubber, which is formed in a mold to the exterior shape to engage snugly in the groove of the wheel on which it is to be mounted, the resilient form of the bead or rib **316** being advantageous as the centrifugal force of the wheel when rapidly rotated in the use thereof, presses the bead **316** against the convergent walls of the groove at the grove entrance and tends to increase the gripping effect thereof on the opposite sides of the embedded ends of the sheets of the pack **311**.

The inner ends of the sheets of the pack **311** may be dipped in rubber cement before embedding thereof in the composition which forms the bead **316** and the entire rubber portion cured or vulcanized to acquire a permanent set or the inner ends of the sheets of the pack may be fastened together, as for example by staples **329** before the embedding thereof in the rubber compound which forms the bead or rib **316**.

The grooves **15** may be provided in any convenient manner but I have found that it is preferable to provide the body or wheel **12** with an initial outside diameter somewhat greater than the final outside diameter thereof, as for example with an initial outside diameter such as indicated by the dotted line at **12D** in Fig. 1, and then drill holes through the wheel rim at the places where the grooves are to be located and after the holes are thus drilled, the periphery of the body or wheel **12** may be faced off to a depth to provide the desired narrow entrance at the outer side of each bored opening and thus produce the groves **15**, and of course the opposite edges of each entrance may then be rounded and thereby dulled to avoid any possible cutting effect against the opposite sides of the pack.

From the foregoing description it will be apparent that the present invention provides an improved abrasive tool wherein the anchoring of the abrasive packs and the individual abrasive sheets of such packs has been accomplished in a novel manner such that inadvertent outward displacement of the abrasive sheets is avoided.

It will also be apparent that the present invention provides an abrasive tool that may be made up into drum-like form and may have overlapped abrasive packs capable of being independently flexed in the use of the tool.

Thus while I have illustrated and described preferred embodiments of my invention it is to be understood that changes and variations may be made by those skilled in the art without departing from the spirit and scope of the appending claims.

What is claimed is:

1. In an abrasive pack for use in a rotative abrasive tool, a plurality of abrasive sheets arranged in face to face relation in a stack with the border portions of said sheets along corresponding inner edges thereof adhesively secured together and arcuately bent from the planes of their respective sheets to form two opposed oppositely bowed groups of border portions, and means located between said opposed groups of border portions and adhesively held in such location to maintain the same in their arcuate form and resist endwise withdrawal of any one of the sheets.

2. In an abrasive pack for mounting in undercut grooves of a mounting member, a plurality of abrasive sheets arranged in a stack and having the border portions of said sheets along corresponding terminal edges thereof glued together and formed into a mounting rib complemental to the undercut grooves in which the pack is to be mounted, said border portions of said sheets being bent within said rib into positions wherein they project out of the plane of the other portions of the respective sheets, and said rib embodying means to physically maintain said bent portions of said sheets in their bent relationship.

3. In an abrasive pack for mounting in undercut grooves of an abrasive wheel, a plurality of abrasive sheets arranged in a stack and having the border portions of said sheets along corresponding terminal edges thereof glued together and formed into an enlarged mounting rib complemental to the undercut grooves in which the pack is to be mounted, said border portions of said sheets along said corresponding terminal edges thereof being bent within said rib into positions wherein they project out of the plane of the other portions of the respective sheets, and a spreader member extending longitudinally through said rib to maintain said bent end portions of said sheets in their bent relationship.

4. In an abrasive pack for use in an abrasive tool, a plurality of abrasive sheets arranged in face to face relation and having an anchoring rib formed along one edge of the pack, and said pack having a laterally extended tab portion along one edge spaced from said rib.

5. In a rotative abrasive tool, a plurality of similar mounting wheels having longitudinally extended undercut grooves formed in the peripheries thereof in circumferentially spaced relation, said wheels being mounted in axially spaced alignment but with the grooves of adjacent wheels in a staggered relation, and abrasive packs having anchoring ribs complemental to and disposed in said grooves and with the packs extended across the spaces between adjacent wheels.

6. In a rotative abrasive tool, a plurality of similar mounting wheels having longitudinally extended undercut grooves formed in the peripheries thereof in circumferentially spaced relation, said wheels being mounted in alignment but with the grooves of adjacent wheels in a staggered relation, and abrasive packs having anchoring ribs complemental to and disposed in said grooves at least certain of said packs being extended into the spaces between end planes of the adjacent wheels to overlap portions of the packs of adjoining wheels and provide for continuous abrading action throughout the length of the wheel.

7. In a rotative abrasive tool, a plurality of similar mounting wheels having longitudinally extended undercut grooves formed in the peripheries thereof in circumferentially spaced relation, said wheels being mounted in alignment but with the grooves of adjacent wheels in a staggered relation, and abrasive packs having anchoring ribs complemental to and disposed in said grooves with the packs of adjacent wheels in an overlapped relation.

8. In a rotative abrasive tool, a rotatable support having a cylindrical outer surface and having longitudinally extended undercut grooves formed in said surface in circumferentially spaced relation, abrasive packs having anchoring ribs complemental to and disposed in said grooves, discs of relatively soft material disposed on opposite sides respectively of said support and having outer circumferential portions beyond the periphery of the support and embracing the major portions of the exposed lengths of said packs therebetween to reduce the blowing action of the tool in use, and means holding said discs in place.

9. In a rotative abrasive tool, supporting wheel means having longitudinally extended undercut grooves formed in the periphery thereof in circumferentially spaced relation, abrasive packs having anchoring ribs complemental to and disposed in said grooves, and discs of relatively soft material disposed on opposite sides of said wheel means and extended outwardly beyond the periphery of the wheel means for a substantial distance along said packs toward the outer end edges thereof to reduce the blowing action of the tool in use.

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