

**[54] ROTARY ABRASIVE TOOL AND COATED
ABRASIVE DISC AND BACKING
ASSEMBLY THEREFOR**

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[51] Int. Cl..... B24d 17/00

[58] **Field of Search**..... 51/356, 358, 376-379,
51/389, 390, 401

[56] **References Cited**

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Primary Examiner—Othell M. Simpson

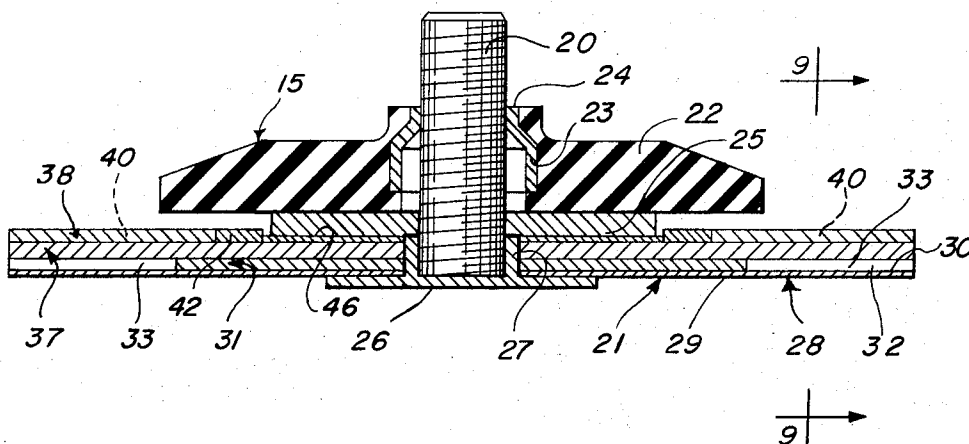
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[57] **ABSTRACT**

A rotary abrasive tool and a flexible coated adhesive disc and backing assembly therefor. The flexible

coated abrasive disc is mounted in the assembly outwardly of a slotted flexible backing disc or pad member which is provided with radially arranged circumferentially spaced slots which extend only partially through the body of the slotted flexible backing disc in the outer peripheral or marginal portion thereof. The slotted, flexible backing disc or pad member is adhesively attached to a second solid or unslotted backing disc or pad member. In one form of the invention, a second slotted backing disc or pad member, similar to the first slotted backing disc or pad member, is attached to the solid unslotted backing disc at the rear thereof, and the radially arranged slots in the two flexible slotted backing discs or pad members are staggered circumferentially relative to each other. In another form of the invention only a single slotted flexible backing disc is provided between the flexible coated abrasive disc and the solid unslotted backing disc and holes are provided in the solid unslotted backing disc within and in registry with the slotted areas of the slotted flexible backing disc so that air will circulate through the radially arranged flexible slotted disc or pad member and the holes in the solid, unslotted backing disc as the coated abrasive disc and backing assembly therefor are rotated.

10 Claims, 13 Drawing Figures



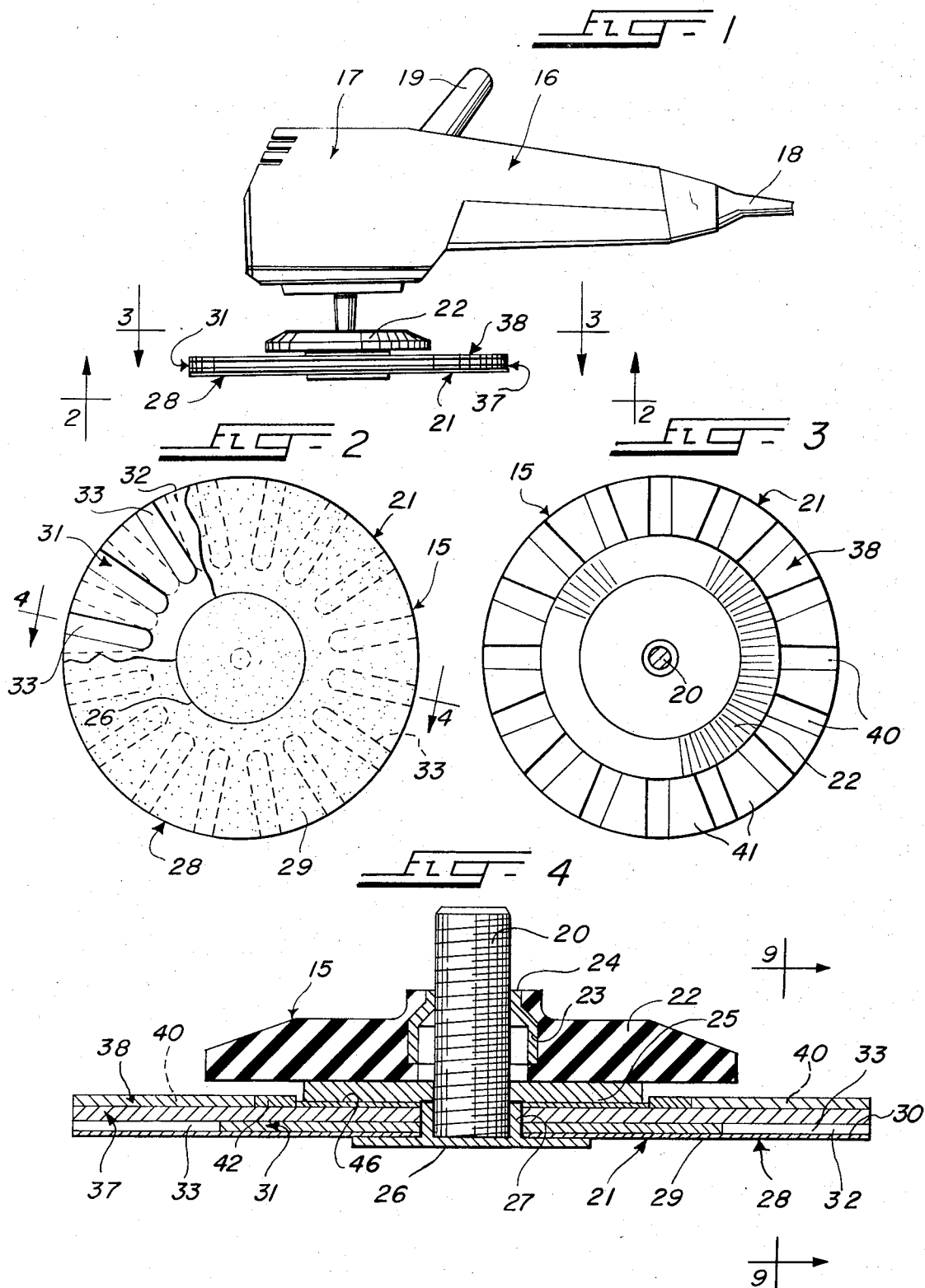


FIG-5

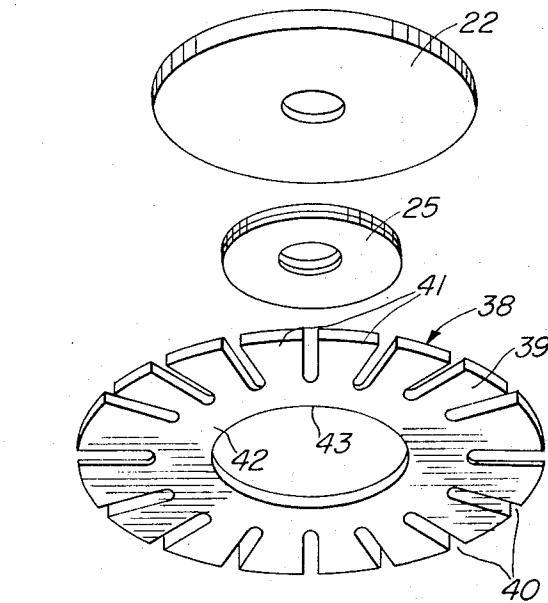


FIG-6

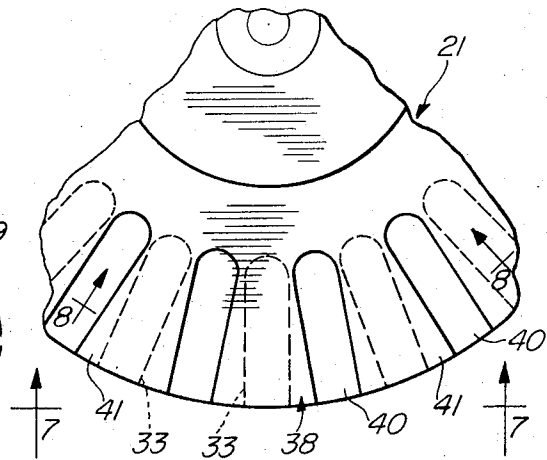


FIG-7

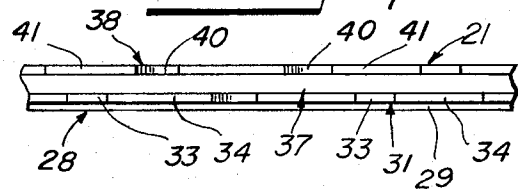


FIG-8

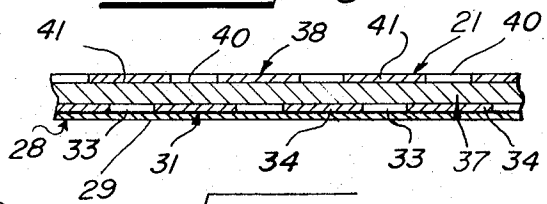
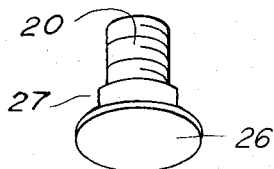
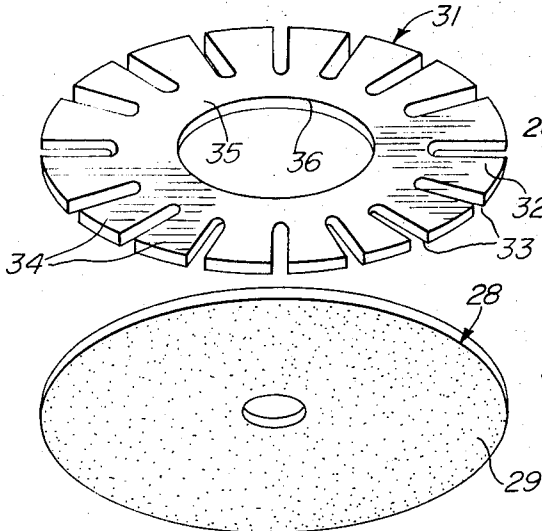
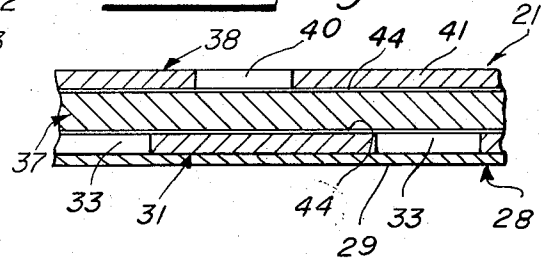
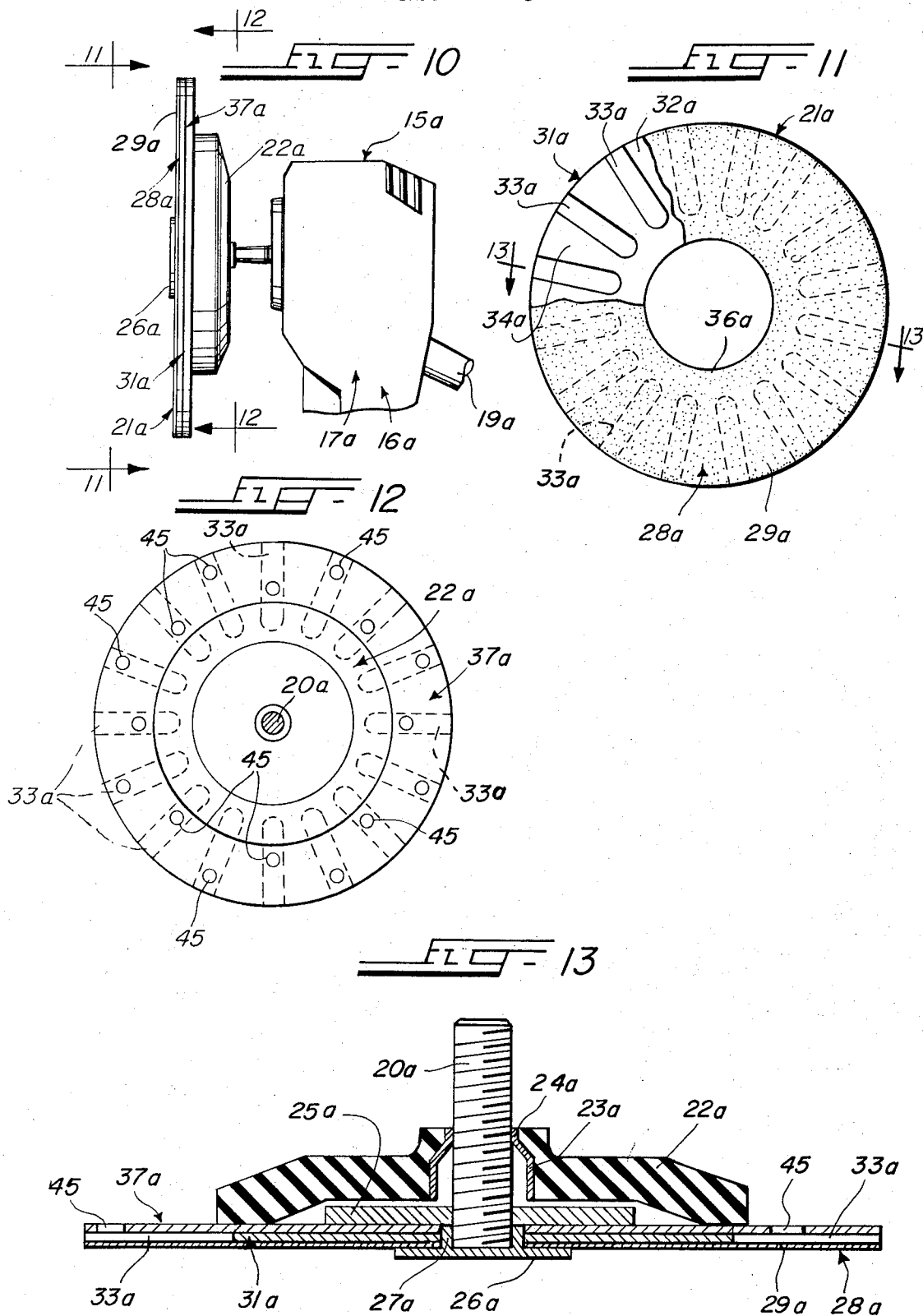


FIG-9





ROTARY ABRASIVE TOOL AND COATED ABRASIVE DISC AND BACKING ASSEMBLY THEREFOR

BACKGROUND OF THE INVENTION

Rotary flexible coated abrasive discs and backing assemblies therefor have been used for many years for buffing, polishing and grinding of metal parts in manufacturing operations and otherwise. Such coated abrasive discs wear rapidly in use and require frequent replacement.

OBJECTS

An object of the present invention is to provide a new and improved rotary abrasive tool and a flexible coated abrasive disc and backing assembly therefor for use in the buffing, polishing and grinding of metal parts and for like purposes.

An additional object of the invention is to provide a flexible coated abrasive disc and backing assembly therefor which in use prolongs the useful working life of the flexible coated abrasive disc and increases its efficiency while, at the same time, the new coated abrasive disc and backing assembly minimizes the noise and heat created in the use of the tool assembly, and tends to cool itself in operation and thereby further enhances the useful working life of the flexible abrasive coated disc.

A further object of the invention is to provide a new and improved rotary abrasive tool and flexible abrasive coated disc and backing assembly therefor which is use effectively removes the scarfings or metallic residue from the buffing, polishing or grinding operation while, at the same time, minimizing the bonding and glazing action of the scarfings on the abrasive coated surface of the flexible abrasive coated disc.

Other objects will appear hereinafter.

DESCRIPTION OF FIGURES IN THE DRAWINGS

FIG. 1 is an elevational view of a preferred embodiment of the new rotary abrasive coated disc and backing assembly therefor;

FIG. 2 is a bottom plan view on line 2—2 in FIG. 1, with a part of the flexible abrasive coated disc broken away to show part of the construction of the flexible slotted backing disc or pad member;

FIG. 3 is a view on line 3—3 in FIG. 1, partly in section and partly in top plan;

FIG. 4 is an enlarged transverse sectional view on line 4—4 in FIG. 2;

FIG. 5 is an exploded perspective view of the parts embodied in the form of the invention illustrated in FIGS. 1 to 4, inclusive;

FIG. 6 is a fragmentary top plan view with the flexible coated abrasive disc removed to illustrate the staggered arrangement of the radial slots in the radially slotted flexible backing discs or pad members which are embodied in the form of the invention illustrated in FIGS. 1 to 9, inclusive;

FIG. 7 is a fragmentary edge elevational view on line 7—7 in FIG. 6;

FIG. 8 is a fragmentary sectional view on line 8—8 in FIG. 6;

FIG. 9 is an enlarged fragmentary sectional view on line 9—9 in FIG. 4;

FIG. 10 is a fragmentary elevational view illustrating a modified form of the invention;

FIG. 11 is an end elevational view on line 11—11 in FIG. 10 with part of the flexible abrasive coated disc broken away to reveal the radially slotted flexible backing disc or pad member;

FIG. 12 is a view on line 12—12 in FIG. 10 partly in section and partly in elevation; and

FIG. 13 is an enlarged sectional view on line 13—13 in FIG. 11;

DETAILED DESCRIPTION OF THE FORM OF THE INVENTION ILLUSTRATED IN FIGS. 1 TO 9, INCLUSIVE

A typical and preferred embodiment of the invention is illustrated in FIGS. 1 to 9, inclusive, of the drawings wherein it is generally indicated at 15 and comprises an electrically driven grinder tool, generally indicated at 16, and which includes power means in the form of a motor and housing unit 17 on which handle members 18 and 19 are mounted. The electrically driven grinder tool 17 includes power transmission means in the form of an externally threaded drive shaft 20. The new grinder tool 16 also includes an abrasive flexible coated disc and backing assembly, which is generally indicated at 21, and which is detachably mounted on the drive shaft 20.

As best shown in FIGS. 4 and 5, the mounting assembly includes a flexible, resilient rubber or like disc-shaped member 22 which has embedded therein a metallic hub portion 23 having an internally threaded central portion 24 which is detachably and threadedly mounted on the externally threaded shaft member 20. A mounting disc 25 is mounted on the externally threaded shaft member 20 forwardly or outwardly of the flexible rubber mounting member 22 (FIG. 4). A pad nut 26 has a centrally arranged internally threaded central or hub portion 27 which is detachably mounted on the externally threaded shaft member 20 at the front side of the coated abrasive disc and backing assembly 21 and retains the coated abrasive disc and backing assembly 21 in position of use on the externally threaded shaft member 20 (FIG. 4); all of the parts of the coated abrasive disc and backing assembly 21 being centrally apertured, as shown in FIG. 5, for the reception or passage of the externally threaded shaft member 20.

The new abrasive disc and backing assembly 21 comprises a flexible abrasive coated fabric or like flexible disc member 28, of conventional construction and composition, and which in use is arranged immediately in back of the pad nut 26—27 and this flexible coated abrasive disc member 28 has an abrasive coated outer or front surface 29 and an uncoated rear or back surface 30 (FIGS. 4 and 5). In the form of the invention illustrated in FIGS. 1 to 9, inclusive, the flexible abrasive coated disc and backing assembly 21 includes a first flexible backing disc or pad member 31, which is substantially coextensive in area with the area of the flexible coated abrasive disc 28, and which is mounted on the externally threaded shaft member 20 immediately behind and in contact with the uncoated rear surface 30 of the flexible coated abrasive disc 28. The first flexible backing disc or pad member 31 includes an outer marginal or peripheral edge portion 32 which has formed therein a series of radially extending and circumferentially spaced slots 33 which extend only partially radially through the body of the flexible backing disc or pad member 31, (FIGS. 2, 4 and 5). The flexible backing disc or pad member 21 may be made of any

suitable material, as by stamping it from a sheet of cork, rubber or flexible synthetic plastic resinous or like material. The flexible slotted backing disc or pad member 31 has thus formed therein flexible finger-like portions 34 which extend between the radially extending and circumferentially spaced slots and, in addition, the flexible slotted backing disc or pad member 31 has a central unslotted hub portion 35 which is provided with a relatively large central opening 36 (FIGS. 4 and 5).

The new flexible coated abrasive disc and backing assembly 21 includes an intermediate solid and unslotted generally rigid but somewhat flexible supporting backing disc member 37 which is generally coextensive in area with the area of the first or outer flexible backing disc or pad member 31 and with the area of the flexible coated abrasive disc 28 and is preferably formed of a molded synthetic plastic resinous material such, for example, as a phenol-formaldehyde, or like resin, and is mounted on the threaded shaft member 20 rearwardly of and in contact with the rear surface of the first flexible, slotted backing disc or pad member 31 (FIG. 4).

The flexible abrasive coated disc and backing assembly 21 also includes a second and rear flexible slotted backing disc or pad member 38 which is similar to the first and outer flexible slotted backing disc 31, and may be made of the same or similar flexible material and has radially arranged and circumferentially spaced slots 40 formed therein which are similar to the slots 33 in the first or outer flexible slotted backing disc or pad member 31 (FIG. 5). The radially arranged and circumferentially spaced slots 40, thereby provided flexible, finger-like portions 41 in the outer marginal edge portion 39 of the flexible slotted backing disc or pad member 38 (FIG. 5).

The second or rear flexible slotted backing disc or pad 38 has a solid or unslotted hub portion 42 which is provided with a relatively large central opening 43 (FIG. 5).

Both of the slotted flexible backing discs or pad members 31 and 38 are adhesively attached to the solid or unslotted generally rigid but somewhat flexible intermediate supporting backing disc 37 on opposite sides thereof; this being accomplished by applying a coating of any suitable pressure-sensitive adhesive 44 (FIG. 9) on the back of the sheet material or stock from which the flexible slotted backing disc or pad members 31 and 38 are stamped or, by applying a coating of a suitable pressure-sensitive adhesive 44 to the rear surface of the front flexible slotted backing disc or pad member 31 and to the front surface of the rear flexible slotted backing disc or pad member 38 after these parts have been cut and formed to the desired size and shape.

As best shown in FIGS. 6, 7 and 8, the radially extending slots 33 in the first or front flexible backing disc or pad member 31 are offset or staggered circumferentially with respect to the radially extending slots 40 in the second or rear flexible slotted backing disc or pad member 38 so that the radially extending slots 33 in the first or outer flexible slotted backing disc 31 allow the overlying portions of the flexible abrasive coated disc 28 to flex inwardly partially into the radially extending slots 33 and against the flexible finger-like portions 34 in the first or outer flexible slotted backing disc or pad member 21, as the parts are rotated in use. This flexing action of the flexible coated abrasive disc 28 effectively

removes the metal scarfings or metallic residue from the metal buffing, polishing or grinding operations while, at the same time, minimizes the bonding and glazing action of the metal scarfings with the abrasive coated surface 29 of the flexible abrasive coated disc 28, thereby enhancing the efficiency and wear life of the flexible coated abrasive disc 28-29.

At the same time, the radial slots 40 in the second or rear flexible slotted disc or pad member 38 allow the overlying portions of the solid and unslotted intermediate and generally rigid but slightly flexible backing disc 37 to flex slightly inwardly against the flexible finger-like portions 41 in the second or rear flexible slotted backing disc or pad member 38 as the parts are rotated in use.

As shown in FIG. 4, the rear flexible backing disc or pad member 38 is provided on its rear surface with a centrally arranged recess 46 and the mounting disc 25 fits into the recess 44.

OPERATION AND USE OF THE FORM OF THE INVENTION ILLUSTRATED IN FIGS. 1 TO 9, INCLUSIVE

In the use of the typical and preferred form of the invention illustrated in FIGS. 1 to 9, inclusive, and when the flexible coated abrasive disc 28 and the coated abrasive disc and backing assembly 21 are rotated by the power means 17 and power transmission means or shaft 20, in contact with the work, the outer marginal or peripheral edge portion of the coated abrasive disc 28 flexes somewhat and partially inwardly into the radially slotted portions 33 of the front or outer flexible backing disc or pad member 31 and against the flexible finger-like portions 34 thereof, which thus flex somewhat inwardly against the intermediate and generally rigid and solid, unslotted but somewhat flexible intermediate backing disc member 37. At the same time, the radially outer or peripheral edge portion of the solid or unslotted and generally rigid but somewhat flexible intermediate backing disc member 37 flexes somewhat inwardly against the flexible finger-like portions 41 of the radially slotted rear or inner flexible backing disc or pad member 38.

As pointed out hereinbefore, the flexing action of the outer peripheral or marginal edge portion of the flexible coated abrasive disc 28 into the radially extending slots 33 in the front flexible backing disc or pad member 31, and the flexing action of the solid and unslotted intermediate backing disc 37 and of the rear flexible backing disc or pad member 38 effectively removes the metal scarfings or metallic residue from the metal buffing, polishing or grinding operation while, at the same time, minimizing the bonding or glazing action of the metal scarfings on the flexible coated abrasive disc 28-29 when the latter is rotated in contact with the metal work and heat is generated to relatively high temperatures by the friction and engagement of the abrasive coated disc 28-29 with the metallic work during the buffing, polishing or grinding operation.

When the coated abrasive disc 28 has been spent or worn out in use, it may readily be removed from the threaded shaft member 20 by manually unscrewing the pad nut 26-27 from the threaded shaft member 20 and inserting a new flexible coated abrasive disc 28 on the threaded shaft member 20 and then replacing the pad nut 26-27 thereon.

In addition, the staggered arrangement of the radially extending slots 33 and 40 in the flexible backing disc or pad members 31 and 38, respectively, and the correspondingly staggered arrangement of the flexible finger-like portions 34 and 41 of the flexible backing discs or pad members 31 and 38, respectively, enhances the backing support of the flexible discs or pad members 31 and 38 and affords adequate protection and strength for the flexible coated abrasive disc 28.

Likewise, the construction of the new coated abrasive disc and backing assembly 21, and the arrangement of the radially extending slots 33 and 40 in the flexible backing discs or pad members 31 and 38, respectively, reduces the heat generated by friction in the use of the flexible coated abrasive disc and backing assembly 21, relative to comparable prior devices, by reason of the fact that in the use thereof air is entrained in and by and circulated through the radially extending slotted portions 33 and 40 of the flexible backing discs or pad members 31 and 38, respectively, as the coated abrasive disc and backing assembly 21 and the flexible coated abrasive disc 28 are rotated against the work in use.

THE MODIFICATION SHOWN IN FIGS. 10 TO 13, INCLUSIVE

A modification of the invention is illustrated in FIGS. 10 to 13, inclusive, of the drawings and those parts thereof which are similar to or correspond to parts in the form of the invention illustrated in FIGS. 1 to 9, inclusive, have been given the same reference numerals followed by the additional and distinguishing reference character "a."

The modified form of the invention illustrated in FIGS. 10 to 13, inclusive, differs from the form of the invention illustrated in FIGS. 1 to 9, inclusive, in part, in that in this form of the invention only a single radially slotted flexible backing disc or pad member 31a is employed and it is provided with radially extending and circumferentially spaced slots 33a and a single solid or unslotted generally rigid but somewhat flexible backing disc 37a is provided, the parts being assembled as shown in FIG. 13.

The form of the invention illustrated in FIGS. 10 to 13, inclusive, further differs from that illustrated in FIGS. 1 to 9, inclusive, in that in the form of the invention illustrated in FIGS. 10 to 13, inclusive, transversely extending air vent holes 45 are provided in the relatively rigid but somewhat flexible backing disc member 37a. These air vent holes 45 extend transversely through the unslotted supporting backing disc member 37a from the rear surface to the front surface thereof and these air vent holes 45 are so arranged that they are aligned with and communicate with the radially extending slots 33a in the single flexible backing disc or pad member 31a; it being noted that the holes 45 are staggered radially with respect to each other, that is, the first hole 45 which communicates with the first slot 33a is located adjacent the radially outer end portion of the first slots 33a and the second hole 45 which communicates with the next or second slot 33a is located adjacent the radially inner end of that slot, and this pattern is followed through the remaining slots 33a and adjacent holes 45, as shown in FIGS. 12 and 13.

The form of the invention shown in FIGS. 10 to 13, inclusive, has the same desirable advantages and characteristics as the form of the invention illustrated in

FIGS. 1 to 9, inclusive, plus the additional advantage which resides in the fact that in the use of the form of the invention illustrated in FIGS. 9 to 13, inclusive, air is entrained by the slotted areas 33a of the single flexible backing disc or pad member 31 as the tool 16a and coated abrasive disc and backing assembly 21a are rotated against the work in use and the thus entrained air circulates through the radially arranged slots 33a and through the air vent holes 45 in the backing member 37a, thereby cooling the entire coated abrasive disc and backing assembly 21a in use.

It will thus be seen from the foregoing description, considered in conjunction with the accompanying drawings, that the present invention provides a new and improved rotary abrasive tool and coated abrasive disc and backing assembly therefor having the desirable advantages and characteristics and accomplishing its intended objects including those hereinbefore pointed out and others which are inherent in the invention.

I claim:

1. A rotary abrasive tool and coated disc and backing assembly therefor comprising:

- a. power means;
- b. power transmission means operated by the said power means;
- c. a coated abrasive disc and backing assembly therefor mounted on and adapted to be rotated by the said power transmission means and including
 1. a flexible coated abrasive disc member including

- a. an abrasive coated front or outer surface; and

- b. an uncoated rear or back surface;

2. a flexible backing disc or pad member generally coextensive in area with the area of the said flexible coated abrasive disc member and arranged against the said rear or back surface of the said coated flexible abrasive disc member but separate therefrom;

3. the said flexible backing disc or pad member including

- a. an outer marginal edge portion having
- b. radially extending and circumferentially spaced slots formed therein; and

4. a supporting backing disc member arranged inwardly or rearwardly of the said flexible backing disc or pad member and including

- a. a rear surface; and

- b. a front surface having

1. the said flexible backing disc or pad member attached thereto;

- d. a second flexible backing disc or pad member arranged rearwardly of the said supporting backing disc member and attached to the said rear surface thereof; and

- e. the said second flexible backing disc or pad member including

1. an outer marginal edge portion having

- a. radially extending and circumferentially spaced slots formed therein.

2. A rotary abrasive tool and coated abrasive disc and backing assembly therefor as defined in claim 1 in which

- b. the said radially extending and circumferentially spaced slots formed in the said marginal edge portion of the said second flexible backing disc or pad member are staggered or offset circumferentially

from and with respect to the said radially extending and circumferentially spaced slots in the said first-named flexible backing disc or pad member.

3. A rotary abrasive tool and coated abrasive disc and backing assembly therefor as defined in claim 1 in which

- a. the said outer marginal edge portion of the said second flexible backing disc or pad member has
 - 1. flexible finger-like portions formed therein between the said radially extending and circumferentially spaced slots therein.

4. A rotary abrasive tool and flexible coated abrasive disc and backing assembly therefor as defined in claim 1 in which

- a. the said first flexible backing disc or pad member is adhesively attached to the said supporting disc member at the said front surface of the latter; and in which
- b. the said second flexible backing disc or pad member is adhesively attached to the said supporting disc member at the said rear surface thereof.

5. A rotatable flexible coated adhesive disc and backing assembly therefor adapted to be detachably mounted on and driven by an electrical power driven hand grinding tool comprising:

- a. a coated flexible abrasive disc member including
 - 1. an abrasive coated front or outer surface; and
 - 2. an uncoated rear or back surface;
- b. a flexible backing disc or pad member generally coextensive in area with the area of the said flexible coated abrasive disc and arranged against the said rear or back surface of the said coated flexible abrasive disc member but separate therefrom;
- c. the said flexible backing disc or pad member including
 - 1. an outer marginal edge portion having
 - 2. radially extending and circumferentially spaced slots formed therein;
- d. a supporting backing disc member arranged inwardly or rearwardly of the said flexible backing disc or pad member and including
 - 1. a rear surface; and
 - 2. a front surface having
 - a. the said flexible backing disc or pad member attached thereto;
- e. a second flexible backing disc or pad member arranged rearwardly of the said supporting backing disc member and attached to the said rear surface thereof; and
- f. the said second flexible backing disc or pad member including
 - 1. an outer marginal edge portion having
 - a. radially extending and circumferentially spaced slots formed therein.

6. A rotatable flexible abrasive coated disc and backing assembly therefor as defined in claim 5 in which

- a. the said radially extending and circumferentially spaced slots formed in the said marginal edge portion of the said second flexible backing disc or pad member are staggered or offset circumferentially from the said radially extending and circumferentially spaced slots in the said first backing disc or pad member.

7. A rotatable flexible coated abrasive disc and backing assembly therefor as defined in claim 5 in which the said outer marginal edge portion of the said second flexible backing disc or pad member has flexible finger-like portions formed therein between the said radially extending and circumferentially spaced slots therein.

8. A rotatable flexible coated abrasive disc and backing assembly therefor as defined in claim 5 in which

- a. the said first flexible backing disc or pad member is adhesively attached to the said supporting disc member at the said front surface of the latter; and in which
- b. the said flexible backing disc or pad member is adhesively attached to the said supporting disc member at the said rear surface thereof.

9. A rotatable flexible coated adhesive disc and backing assembly therefor adapted to be detachably mounted on and driven by an electrical power driven hand grinding tool comprising

- a. a coated flexible abrasive disc member including

- 1. an abrasive coated front or outer surface; and
- 2. an uncoated rear or back surface;

- b. a flexible backing disc or pad member generally coextensive in area with the area of the said flexible coated abrasive disc and arranged against the said rear or back surface of the said coated flexible abrasive disc member but separate therefrom;

- c. the said flexible backing disc or pad member including

- 1. an outer marginal edge portion having
- 2. radially extending and circumferentially spaced slots formed therein;

- d. a supporting backing disc member arranged inwardly or rearwardly of the said flexible backing disc or pad member and including

- 1. a rear surface; and
- 2. a front surface having

- a. the said flexible backing disc or pad member attached thereto;

- e. the said supporting backing disc member having
 - 1. a rear surface communicating with the atmosphere, and
 - 2. a front facing the said flexible backing disc or pad member at the rear surface of the latter; and

- f. the said supporting backing disc member having holes extending transversely therethrough from the said rear surface thereof to the said front surface thereof; and

- g. the said holes communicating with and opening at the front surface of the said supporting backing disc member into the said radially extending and circumferentially spaced slots in the said flexible backing disc or pad member.

10. A rotatable abrasive coated disc and backing assembly therefor as defined in claim 9 in which

- a. the said holes in the said supporting backing disc member are staggered radially with respect to the said radially extending and circumferentially spaced slots in the said flexible backing disc or pad member.

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