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## Description

The present invention relates to a disc holder assembly of a rotary finishing device suitable for use in finishing surfaces of, for example, metallic members. More particularly, the invention is concerned with an improvement in a disc holder having a double-sided sheet fastener supplied by mating hook and loop fastening members.

### Background of The Invention

In a typical conventional surface finishing disc holder assembly, a surface finishing disc such as an abrasive disc is fixed to a holder by means of screws. Also known is a disc holder assembly in which, as shown in Fig. 3 of the drawing, a disc holder 30 and an abrasive disc 40 are detachably secured to each other by means of sheet fasteners 31 and 34 attached to the disc holder 30 and abrasive sheet 41, respectively. Examples of related devices are disclosed in U.S. Pat. Nos. 3,346,904, 3,522,681, 3,703,739 and 4,910,826. Sheet fasteners of the mating sheets of hook and loop fasteners such as that sold under the trade designation "Velcro" have been used US-A-3,883,998 discloses a disc holder assembly comprising a disc holder including means for attachment to a rotary tool, and a disc member which has a central opening, a surface finishing member on a first surface and a pressure sensitive adhesive coating on a second surface opposite to the said first surface. The disc holder has a lower surface which includes a concave portion coaxially within a flat annular surface portion, and a mounting projection extending downwardly from a centre portion of the concave portion, the mounting projection having a shaft portion and a distal head portion having a head portion diameter somewhat larger than the diameter of the shaft portion. The disc member central opening is temporarily expanded by a shoulder on the mounting projection whereby the disc member may be mounted with the central opening aligned round the shaft portion of the mounting projection and with the distal head portion protruding through the disc central opening. The distal head portion of the mounting projection is recessed with respect to the plane of the working surface of the disc member. This document is used to form the preamble to the appended claim 1.

Also known is a surface finishing disc holder assembly which employs bolts and nuts for securing an abrasive disc to the disc holder. Such a prior art disc holder assembly requires a tool for attaching and detaching the abrasive disc to and from the disc holder. The work of attaching and detaching the abrasive disc is quite laborious and time-consuming. On the other hand, the known disc

holder assembly relying upon sheet fasteners alone suffers from a problem in that the center of the abrasive disc tends to be offset from the center of the disc holder or the abrasive disc comes off the disc holder during high-speed rotation due to inadequate attachment between the fastener sheets. Even though this type of disc holder assembly permits easy attaching and detaching of the abrasive disc, it does not provide an easy way to correctly center the abrasive disc with respect to the disc holder during the assembly.

### Brief Description of the Drawings

Fig. 1 is an exploded view of an embodiment of a surface finishing disc holder assembly of the present invention;

Fig. 2 is a vertical sectional view of the embodiment of the assembly depicted in Fig. 1 but in the assembled state; and

Fig. 3 is an exploded illustration of a prior art surface finishing assembly.

### Summary of The Invention

The present invention provides a surface finishing disc holder assembly which permits easy attaching and detaching of a surface finishing disc, easily centers the disc and exhibits a holding force high enough to prevent displacement or unintentional removal of the surface finishing disc during high-speed rotation.

According to the present invention there is provided a disc holder assembly comprising: a disc holder including means for attachment to a rotary tool, and a disc member, said disc member including a surface finishing member on a first surface, a fastening means on a second surface opposite to said first surface and a central opening extending through said disc member, said disc holder having a lower surface which includes a concave portion coaxially within a flat annular surface portion, a mounting projection extending downwards from a center portion of said concave portion and having a shaft portion having a shaft portion diameter and a distal head portion having a head portion diameter which is somewhat larger than said shaft diameter, said disc member central opening having a diameter which is substantially the same as said shaft portion diameter but which will elastically expand to permit the forced entry of said distal head portion, whereby said disc member may be mounted with said central opening aligned around said shaft portion of said mounting projection with said surface finishing member deployed in a plane for use, and said distal head portion protruding through said disc central opening and with the mounting projection distal head extending to a point which is lo-

cated inwards from said plane, characterised in that said fastening means of said disc member is a first sheet fastener;

said disc holder has fixed to said annular surface a second sheet fastener adapted to be detachably secured to said first sheet fastener;

said opening of said disc member having at least one slit which extends outwardly from the edge of said opening; and

one of said sheet fasteners being a hook fastener sheet and the other of said sheet fasteners is a loop fastener sheet, whereby said hook and loop fastener sheets are detachably secured to securely hold said disc member to said disc holder.

Such fastener materials are available under the trade designation "Velcro" or "Scotchmate".

In the surface finishing disc holder assembly having the described construction, when the surface finishing disc member is attached to the disc holder, the head portion of the projection on the disc holder member is inserted into the opening in the surface finishing disc member. Since the head portion has a greater diameter than the opening, the surface finishing disc member is elastically deformed to expand the opening to allow the head portion to pass through the opening. The sheet fastener on the surface finishing disc member and the sheet fastener on the disc holder engage with each other to couple these members and, simultaneously, the head portion is firmly gripped by the edge of the opening in the surface finishing disc member.

For detaching the surface finishing disc member from the disc holder, the user simply pulls the disc member to separate the sheet fasteners on the disc holder and the disc member, so that both sheet fasteners are disengaged from each other. At the same time, the opening in the disc member is elastically spread so as to release the head portion, whereby the disc member is detached from the disc holder.

#### Detailed Description of The Presently Preferred Embodiment

As shown in Figs. 1 and 2, a disc-shaped disc holder 10, which may be made of hard molded plastic, is provided on the upper side thereof with a mounting hub 15 for receiving and fixing a drive shaft (not shown). A female screw member 17 made, for example, of a metallic material is fixed in the mounting hub 15. A removable cap 16 may be mounted in such a manner as to surround and protect the mounting hub 15. Removing cap 16 enables the disc holder to be attached to the shaft of the rotary device (not shown) such as a sander or grinder.

The disc holder 10 includes a substantially hemispherical recess or concave portion 11 on its lower surface which is concentric within the lower surface of holder 10. Flat annular portion 18 surrounds concave portion 11 in the lower surface of disc holder 10. A mounting projection 12 is secured to the center of concave portion 11 so as to project downwards therefrom. Mounting projection 12 has a distal head portion 13 of a diameter slightly greater than the diameter of shaft portion 13a on which distal head portion 13 is mounted.

A hook sheet 14 of a sheet fastener is fixed to flat annular portion 18 of the lower surface of the disc holder 10 around hemispherical concave portion 11. The head portion 13 projects slightly downwards to a point which does not extend as far as the abrasive face of abrasive sheet 21 of disc 20 when it is secured on disc holder 10.

Disc member 20 has a lower surface which may be provided by a flexible abrasive sheet 21 and an upper surface provided by a loop sheet 22 engageable with the hook sheet 14 on the disc holder. The hook sheet 14 and the loop sheet 22 in cooperation provide a sheet fastener. An opening 23 of a diameter substantially the same as the diameter of shaft portion 13a of mounting projection 12 but smaller than the diameter of head portion 13 is formed in the center of disc member 20. In order to facilitate insertion of the head portion 13 into the opening 23, comparatively short radial slits 24 are preferably formed so as to extend radially outwardly from the edge of opening 23.

One example employs a disc member which has an outside diameter of about 100 mm, a thickness ranging between 5 and 10 mm, and an opening 23 diameter of about 15 mm. The arrangement may be modified such that the loop sheet and the hook sheet of the sheet fastener may be provided on the disc holder and the disc member, respectively.

Fig. 2 shows disc member 20 attached to disc holder 10. The attaching of disc member 20 to the disc holder 10 is conducted in the following procedure. As the first step, the disc member 20 is placed such that both sheets of the sheet fasteners face each other, with the opening 23 in the disc member 20 aligned with the head portion 13 on mounting projection 12 of the disc holder 12. Then, the user presses, by his finger(s), the portion of the disc member around the opening. Since the diameter of the opening 23 is slightly smaller than the diameter of the head portion 13, the edge of the opening 23 is slightly elastically deformed to increase the diameter of the opening 23, whereby the head portion 13 is forcibly inserted into the opening 23 so as to be firmly gripped by the edge of the opening 23. Instead of pressing the disc

member directly by the user's finger(s), the open end of the cap 16 shown in Fig. 1 may be pressed against disc 20 to apply a force to a region around the opening. The inside diameter of the open end of the cap 16 is dimensioned to be slightly greater than the outside diameter of the head portion of the disc holder, so that it can fully drive the head portion 13 into the opening 23.

In the state after attaching of the disc member to the disc holder, since the diameter of the opening 23 in the disc member is substantially the same as the diameter of shaft 13a of the projection 12 on the disc holder 10, the portion of the disc holder around the opening 23 is firmly clamped between the projection 12 and the lower surface of the disc holder 10 and is retained by the head portion 13 of the projection. The projection 12 and the head portion 13 are so sized that the head portion 13 does not project beyond the working face (e.g. abrasive face) of the disc member.

According to the invention, it is preferred that the following conditions (1) and (2) are met:

$$(1) \quad 2/3 \leq B/A \leq 4/5$$

$$(2) \quad 1/3 \leq D/C \leq 2/3$$

where,

A is the length of the mounting projection, i.e., the distance between the end of the head portion 13 and the bottom of the concave portion of the disc holder;

B is the vertical distance between the outer surface of the sheet fastener 14 and the bottom of the concave portion of the disc holder;

C is the distance between the central axis of the disc holder and the outer peripheral edge of the sheet fastener 14; and

D is the distance between the central axis of the disc holder and the inner peripheral edge of the sheet fastener 14.

The disc holder assembly of the present invention having the described feature permits an easy and prompt attaching and detaching of the disc member without requiring the troublesome work centering the abrasive. Furthermore, a high holding force is obtained for holding a surface finishing sheet such as an abrasive sheet, thus eliminating any risk for the disc to be offset or to come off the disc holder even when the device is operated at high speed.

In view of the foregoing description, it will be apparent that the invention is not limited to the specific details set forth herein for purposes of illustration.

## Claims

1. A disc holder assembly comprising: a disc holder (10) including means (15) for attachment to a rotary tool, and a disc member (20), said disc member including a surface finishing member (21) on a first surface, a fastening means (22) on a second surface opposite to said first surface and a central opening (25) extending through said disc member (20), said disc holder having a lower surface which includes a concave portion (11) coaxially within a flat annular surface portion (18), a mounting projection (13) extending downwards from a center portion of said concave portion (11) and having a shaft portion (12) having a shaft portion diameter and a distal head portion having a head portion diameter which is somewhat larger than said shaft diameter, said disc member central opening (25) having a diameter which is substantially the same as said shaft portion diameter but which will elastically expand to permit the forced entry of said distal head portion, whereby said disc member (20) may be mounted with said central opening aligned around said shaft portion of said mounting projection with said surface finishing member deployed in a plane for use, and with said distal head portion protruding through said disc central opening and with the mounting projection (13) distal head extending to a point which is located inwards from said plane, characterised in that said fastening means (22) of said disc member is a first sheet fastener;

said disc holder has fixed to said annular surface a second sheet fastener (14) adapted to be detachably secured to said first sheet fastener;

said opening of said disc member having at least one slit which extends outwardly from the edge of said opening; and

one of said sheet fasteners being a hook fastener sheet and the other of said sheet fasteners is a loop fastener sheet, whereby said hook and loop fastener sheets are detachably secured to securely hold said disc member (20) to said disc holder (10).

2. The disc holder assembly according to claim 1, further characterised by said surface finishing member being a sheet of coated abrasive.
3. The disc holder assembly of claim 1 or claim 2 wherein

$$\frac{2}{3} \leq B/A \leq 4/5$$

and

$$\frac{1}{3} \leq D/C \leq \frac{2}{3}$$

wherein

- |   |  |    |
|---|--|----|
| A | is the length of the mounting projection;  | 5  |
| B | is a vertical distance between an outer surface of the second sheet fastener and a bottom of the concave portion of the disc holder; | 10 |
| C | is the distance between the central axis of the disc holder and an outer peripheral edge of the second sheet fastener; and           | 15 |
| D | is the distance between the central axis of the disc holder and an inner peripheral edge of the second sheet fastener.               | 20 |

#### Patentansprüche

1. Scheibenhalteranordnung mit: einem Scheibenhalter (10), der eine Einrichtung (15) zur Anbringung an einer Drehvorrichtung umfaßt sowie ein Scheibenelement (20), wobei das Scheibenelement auf einer ersten Oberfläche ein Oberflächenbehandlungselement (21) aufweist sowie eine Befestigungseinrichtung (22) auf einer zweiten Oberfläche, die gegenüber der ersten Oberfläche liegt und eine zentrale Öffnung (25), die sich durch das Scheibenelement (20) erstreckt, wobei der Scheibenhalter eine untere Oberfläche aufweist, die ein koaxiales konkaves Teilstück (11) in einem flachen, ringförmigen Oberflächenstück (18) umfaßt; einem Befestigungsvorsprung (13), der sich von einem Mittelstück des konkaven Teilstücks (11) nach unten erstreckt und mit einem Wellenteilstück (12) mit einem Wellenteilstücksdurchmesser und mit einem fernen Kopfstück mit einem Kopfstückdurchmesser, der etwas größer ist als der Wellendurchmesser, wobei die zentrale Öffnung (25) des Scheibenelements einen Durchmesser aufweist, der im wesentlichen dem Wellenteilstücksdurchmesser entspricht, der sich jedoch ausdehnt, so daß das ferne Kopfstück zwangsfläufig eingeführt werden kann, wodurch das Scheibenelement (20) so angebracht werden kann, daß die zentrale Öffnung um das Wellenteilstück des Befestigungsvorsprungs ausgerichtet ist, wobei das Oberflächenbehandlungselement zur Anwendung in einer Ebene entfaltet ist und wobei das ferne Kopfstück durch die zentrale Öffnung der Scheibe vorsteht und wobei sich der ferne Kopf des Befestigungsvorsprungs (13) zu einem Punkt erstreckt, der sich von der Ebene einwärts befindet, dadurch gekenn-

zeichnet, daß es sich bei der Befestigungseinrichtung (22) des Scheibenelements um ein erstes Lagenbefestigungselement handelt;

daß an die ringförmige Oberfläche des Scheibenhalters ein zweites Lagenbefestigungselement (14) befestigt ist, welches so adaptiert ist, daß es lösbar an dem ersten Lagenbefestigungselement angebracht ist;

daß die Öffnung des Scheibenelements mindestens einen Schlitz aufweist, der sich von der Kante der Öffnung nach außen erstreckt; und

daß eines der Lagenbefestigungselemente eine Hakenbefestigungslage darstellt, während es sich bei dem anderen Lagenbefestigungselement um eine Ösenbefestigungslage handelt, wodurch die Haken- und Ösenbefestigungslagen lösbar angebracht sind, um das Scheibenelement (20) fest an dem Scheibenhalter (10) zu halten.

2. Scheibenhalteranordnung nach Anspruch 1, ferner dadurch gekennzeichnet, daß es sich bei dem Oberflächenbehandlungselement um eine Schleifpapierlage handelt.

3. Scheibenhalteranordnung nach Anspruch 1 oder 2, wobei folgendes gilt:

$$2/3 \leq B/A \leq 4/5$$

und

$$1/3 \leq D/C \leq 2/3$$

wobei

- |   |  |
|---|--|
| A | gleich der Länge des Befestigungsvorsprungs ist;   |
| B | einen vertikalen Abstand zwischen einer äußeren Oberfläche des zweiten Lagenbefestigungselements und einer Unterseite des konkaven Teilstücks des Scheibenhalters darstellt; |
| C | den Abstand zwischen der Mittelachse des Scheibenhalters und einer äußeren Umfangskante des zweiten Lagenbefestigungselements darstellt; und                                 |
| D | den Abstand zwischen der Mittelachse des Scheibenhalters und einer inneren Umfangskante des zweiten Lagenbefestigungselements darstellt.                                     |

#### Revendications

1. Ensemble de support de disque comportant : un support de disque (10) comprenant des

moyens (15) pour la fixation à un outil rotatif, et un élément de disque (20), ledit élément de disque comprenant un élément de finition de surface (21) sur une première surface, un moyen de fixation (22) sur une deuxième surface opposée à ladite première surface et une ouverture centrale (25) traversant ledit élément de disque (20), ledit support de disque présentant une surface inférieure qui comprend une partie concave (11) disposée coaxialement à l'intérieur d'une partie de surface annulaire plane (18), une saillie de montage (13) s'étendant vers le bas à partir d'une partie de centre de ladite partie concave (11) et présentant une partie d'arbre (12) présentant un diamètre de partie d'arbre et une partie de tête distale présentant un diamètre de partie de tête qui est un peu plus grand que ledit diamètre d'arbre, ladite ouverture centrale d'élément de disque (25) ayant un diamètre qui est sensiblement le même que ledit diamètre de partie d'arbre mais qui va se dilater élastiquement pour permettre l'entrée à force de ladite partie de tête distale, ledit élément de disque (20) pouvant être monté avec ladite ouverture centrale alignée autour de ladite partie d'arbre de ladite saillie de montage tandis que ledit élément de finition de surface est déployé dans un plan pour l'utilisation, et ladite partie de tête distale dépassant à travers ladite ouverture centrale de disque et la tête distale de la saillie de montage (13) s'étendant jusqu'à un point situé vers l'intérieur dudit plan, caractérisé en ce que lesdits moyens de fixation (22) dudit élément de disque sont une première feuille de fixation ;

ledit support de disque comporte une deuxième feuille de fixation (14) fixée à ladite surface annulaire, prévue pour être fixée de façon détachable à ladite première feuille de fixation ;

ladite ouverture dudit élément de disque comportant au moins une incision qui s'étend vers l'extérieur à partir du bord de ladite ouverture ; et

une desdites feuilles de fixation étant une feuille de fixation à crochets et l'autre feuille de fixation étant une feuille de fixation à bouches, moyennant quoi lesdites feuilles de fixation à crochets et à boucles sont fixées de façon détachable pour maintenir solidement ledit élément de disque (20) sur ledit support (10).

2. Ensemble de support de disque selon la revendication 1, caractérisé en outre en ce que ledit élément de finition de surface est une feuille de revêtement abrasif.

3. Ensemble de support de disque selon la revendication 1 ou 2, dans lequel

$$2/3 \leq B/A \leq 4/5$$

$$1/3 \leq D/C \leq 2/3$$

où

- A est la longueur de la saillie de projection ;  
 B est une distance verticale entre une surface extérieure de la deuxième feuille de fixation et un fond de la partie concave du support de disque ;  
 C est la distance entre l'axe central du support de disque et un bord périphérique extérieur de la deuxième feuille de fixation ; et  
 D est la distance entre l'axe central du support de disque et un bord périphérique intérieur de la deuxième feuille de fixation.

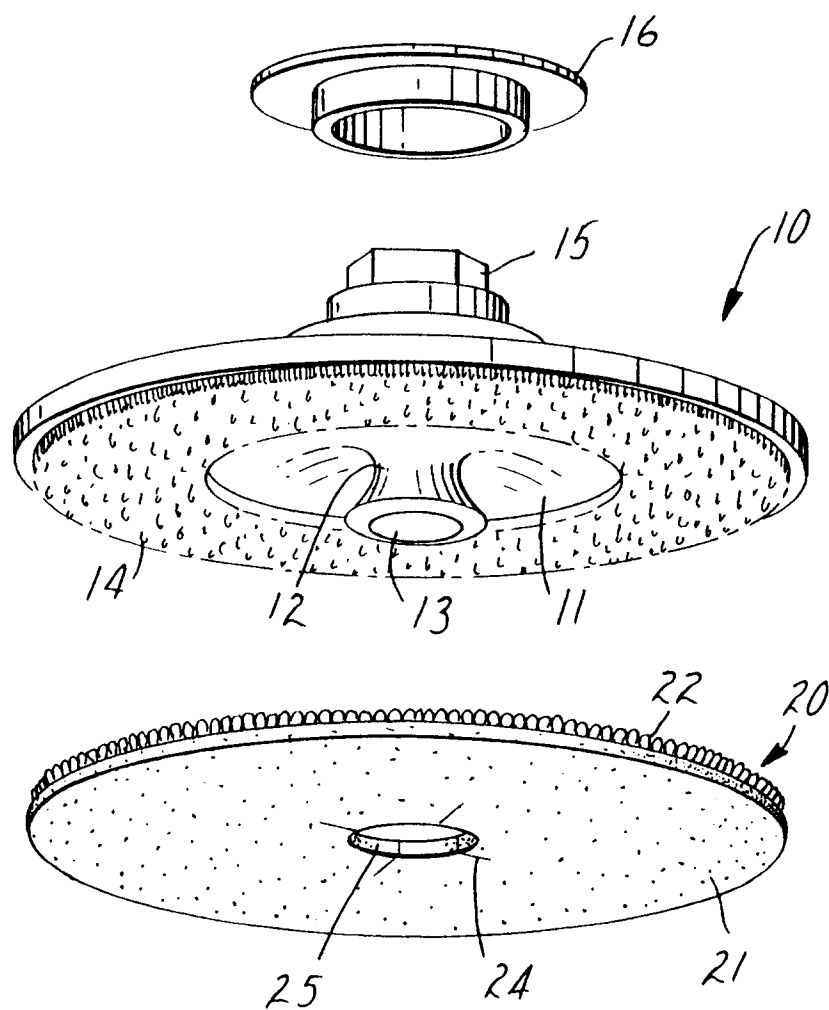


FIG. 1

