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(54) **Combined system of abrasive disc and related support or rotary backup pad for direct radial suction of the dust**

Kombiniertes System aus einer Schleifscheibe und einem zugehörigen Halter oder einem rotierenden Sitzpolster für direkte radiale Staubabsaugung

Système combiné d'une disque abrasive et d'un support connexe ou d'un coussin d'appui rotatif pour une extraction radiale directe de la poussière

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Description

[0001] The present invention relates to devices for surface smoothing by means of flexible abrasives, mounted on a support or backup pad rotationally driven around the axis thereof, means provided for suction of dust produced by the abrasive action, and particularly a combined system of abrasive disc and backup pad for direct radial dust suction.

[0002] It is known that nowadays several types of flexible abrasive products are available from the market, generally consisting of a support layer, which can be paper, fabric or film of various kind of plastic material, an abrasive material layer, a binding material layer, generally any kind of glue or resin, as well as an anti-clogging material layer, such as a stearate, normally calcium or zinc stearate, the function of which is to prevent or to minimize the dust clots formation on the disc surface, resulting from the action of the abrasive itself. The so-composed abrasive disc is fastened to a backup pad either directly with an adhesive layer applied on the free abrasive side, or through a fabric interface (or even jersey or fine velvet) fastened on the disc side free from the abrasive, that in turn is hooked to a Velcro® layer placed on the backup pad.

[0003] As it is known the diameters of the more commercially common abrasive discs are in the range between 28 and 250 mm, whereas the most common sizes are 125 and 150 mm. At present the action of abrasive discs is coupled, also for protecting the operator health, with a dust sucking action, able to generate an air flow that, passing through the backup pad itself, can convey the produced dust toward a collecting system without polluting the environment. Clearly the action of the anti-clogging material is not enough for this purpose and actually the abrasive discs show holes for dust suction, holes that can be arranged in different ways on the disc surface. Figs 1-3 show three different ways for conveying sucked air flow through the backup pad. In particular, Figs 1 and 2 show cross-sectional views of two backup pads manufactured according to US patent 4,616,449 and US patent 4,058,936 respectively.

[0004] As to the arrangement and the number of holes on the disc surface, these are preferably placed in correspondence of the suction holes of the backup pad, as Figs 1-3 show, and normally are in number of 4, 5, 6 or 8 in discs having diameter of 125 mm, whereas in those having diameter of 150 mm there is no upper limit in their number.

[0005] Furthermore there are solutions providing for a high number of suction holes, having various shapes, uniformly arranged on the disc surface, such as disclosed in EP 0781629 or more recently in the closest prior art WO 02/102550, where instead of holes, cuts are provided for. The working principle is substantially the same, since in both cases holes and cuts may be not coincident with the passages generated on the backup pad by suction, thanks to a known effect consisting in that the sucked dust circulates among the hook-shaped Velcro® single threads thus conveying into suction holes of the backup pad. Nevertheless, when the holes do not match, the suction, although not null, will be anyway reduced. Furthermore in WO 02/102550 the flaps corresponding to the holes of the backup pad, rising inward owing to suction, will prevent the abrasive from working, while those directly opposed to the Velcro® hooks, pushed by these, will open outward, thus damaging the working surface. However, in both cases there is no provision for a direct suction between holes or cuts pierced on the disc and corresponding holes or apertures on the backup pad.

[0006] In any case, traditional suction systems, wherein generally holes are provided on the disc (and of course on the backup pad), are characterized by three fundamental drawbacks:

1) the increase of the disc suction capability, and consequently the holes number, corresponds to a decrease of the working abrasive surface, as resulting from the following table:

Disc and holes Ø	Total disc surface	Perforated surface	Working surface	% working surface
125 mm, 5 holes Ø 10 mm	12,265.625 mm ²	392.5 mm ²	11,873.125 mm ²	96.8%
125 mm, 8 holes Ø 10 mm	12,265.625 mm ²	628 mm ²	11,637.625 mm ²	94.9%
150 mm, 6 holes Ø 10 mm	17,662.5 mm ²	471 mm ²	17,191.5 mm ²	97.4%
150 mm, 14 holes Ø 10 mm + 1 hole Ø 18 mm	17,662.5 mm ²	1,353.34 mm ²	16,309.16 mm ²	92.4%
150 mm, 8 holes Ø 10 mm + 1 hole Ø 18 mm	17,662.5 mm ²	882.34 mm ²	16,780.160 mm ²	95.1%

2) the non uniform holes arrangement on the abrasive disc leaves areas on which the formation of dust clots is more likely, which, on contact with the worked surface, generate deep scratches or scores.

3) in the case of a disc with Velcro®, if the disc holes are not caused to match exactly those of the backup pad, the male Velcro® hooks will protrude through the disc holes, thus damaging the surface during the working and partially limiting the suction efficiency. On the other hand, in the case of a disc with self-sticking adhesive, if the matching is not perfect the suction will result limited and the working dust, sticking to the adhesive on the disc could cause its detachment from the backup pad, involving all the negative consequences that can derive therefrom concerning the operator safety.

[0007] Consequently it is an object of the present invention to provide an effective dust suction system able to keep unchanged the abrasive amount on the disc, while distributing at the same time uniformly suction and avoiding the drawbacks raising from the imperfect holes matching between disc and backup pad.

[0008] These and other objects of the invention are achieved by a suction system having the features mentioned in Claim 1, possibly in combination with optional characteristics, some of them being preferred, as recited in the dependent claims.

[0009] These and other objects and advantages of the invention will be clearer from the following description of a preferred embodiment thereof, given by way of non limiting example, with reference to the annexed drawings wherein:

Figures 1-3 are cross-sectional views of backup pads with holed abrasive discs showing different sucked air flow ways, according to the prior art;

Figure 4 shows a plan view of an abrasive disc with cuts according to the present invention;

Figures 5 and 5b show a plan view and a side elevation view respectively, of a backup pad suitable for use with the disc of Fig.4 to form a system according to the present invention; and

Figure 6 shows a cross-sectional partial view at a cut of a system according to the invention, wherein disc and backup pad are assembled.

[0010] Referring to Figs 4-6, the suction system according to the present invention consists of an abrasive disc 1 with cuts 3 made without removing material and a possible central hole 5, as well as a backup pad 2 with apertures 4, substantially coinciding with the cuts 3 and a possible central hole 6.

[0011] A preferred example of arrangement of the cuts 3 is represented in Fig.4, wherein they are disposed on circumference arcs concentric with the disc itself. However said cuts 3 can also be arranged in a different way, such as along the disc radii. Furthermore, both disc and backup pad are represented in Figures as circular-shaped, which is the preferred shape, but not the only one possible; in case of polygonal disc, the cuts 3 can be arranged parallel to the sides. On the other hand, disc and backup pad could also have shape and size different from each other.

[0012] Cuts 3 can be easily made by means of the same tools used for traditional discs, i.e. punches, wherein however instead of cylinder-shaped blades for obtaining holes on the disc, open, possibly shaped, blades will be used, which will generate simple slits on the disc, without removal of material, thus leaving two contiguous edges 3', 3".

[0013] As to the backup pad, it can be manufactured in such a way as to convey the suction into an upper air chamber directly connected to the sander suction system, as represented in Figs. 1 and 2, relating to two different embodiments of the prior art, or alternatively by connecting the suction holes to each other, through inner passages of the backup pad itself, according to a technique well known to those skilled in the art, as shown in Fig. 3, also relating to the prior art.

[0014] It will be advantageous that every disc cut 3 corresponds, at least approximately, to a median axis of a backup pad aperture 4 and anyway extends to the inside of the correspondent aperture. Referring to Fig. 6, the two edges 3', 3" of a cut 3 rise inward owing to the suction air flow thrust generated by rotation of the backup pad itself, in combination with the suction therein, consequently allowing the working dust to pass.

[0015] The possible central hole 5 of the abrasive disc 1 will preferably be polygonal-shaped (in Fig. 4 a square-shaped one is represented), equal to the central hole 6 formed on the backup pad. In such a way, by superimposing the two holes 5 and 6, so that they match to each other, it is obtained a perfect disc centring on the backup pad and the correspondence between the backup pad apertures 4 and the disc cuts 3. Furthermore, such a polygonal hole can also be connected to the suction inside the backup pad.

[0016] Possible changes can be made by those skilled in the art to the above disclosed and illustrated embodiment of the present invention without departing from the scope thereof, as specified in the following claims.

Claims

1. A suction system for dust produced by flexible abrasives, comprising one abrasive disc (1) with cuts (3) made without removing material, and one rotary backup pad (2) with apertures (4) for suction, being said abrasive disc (1) fastened to said backup pad (2) **characterised in that** the cuts (3) match to the corresponding apertures (4) of the backup pad (2).

2. A suction system according to claim 1, wherein the disc (1) shows a hole (5) in a substantially central location

corresponding to a hole (6) of the backup pad (2) having same shape and size.

3. A system according to claim 2, wherein said holes (5, 6) are identical and polygonal-shaped.

4. A system according to claim 2 or 3, wherein said holes (5, 6) are connected to the suction inside the backup pad (2).

5. A system according to claim 1, wherein said abrasive disc (1) is fastened to the backup pad (2) by means of Velcro® or self-sticking adhesive.

6. A suction system according to claim 1, wherein said disc (1) and backup pad (2) are circular-shaped and the disc cuts (3) and the backup pad apertures (4) are arc of circumference-shaped, concentric with the disc itself.

7. A system according to claim 1, wherein said cuts (3) on the abrasive disc (1) and said apertures (4) on the backup pad (2) are arranged radially.

8. A system according to claim 1, wherein said disc (1) and backup pad (2) are polygonal-shaped and the respective cuts (3) and apertures (4) are arranged parallel to the respective sides.

Patentansprüche

1. Absaugsystem für Staub, der durch flexible Schleifmittel erzeugt wird, mit einer Schleifscheibe (1) mit Vertiefungen (3), die ohne Materialentfernung hergestellt wurden und mit einem rotierenden Stützpolster (2) mit Öffnungen (4) für den Absaugvorgang, wobei die Schleifscheibe (1) am Stützpolster (2) befestigt ist, **dadurch gekennzeichnet, dass** die Vertiefungen (3) zu den entsprechenden Öffnungen (4) im Stützpolster (2) passen.

2. Absaugsystem nach Anspruch 1, bei dem die Scheibe (1) an einer im Wesentlichen zentralen Stelle über ein Loch (5) verfügt, das einem Loch (6) im Stützpolster (2) mit derselben Form und Größe entspricht.

3. System nach Anspruch 2, bei dem die Löcher (5, 6) gleich und polygonförmig sind.

4. System nach Anspruch 2 oder 3, bei dem die Löcher (5, 6) mit der Absaugung innerhalb des Stützpolsters (2) verbunden sind.

5. System nach Anspruch 1, bei dem die Schleifscheibe (1) durch Velcro® oder selbsthaftenden Kleber am Stützpolster (2) befestigt ist.

6. Absaugsystem nach Anspruch 1, bei dem die Scheibe (1) und das Stützpolster (2) kreisförmig sind und die Scheibenvertiefungen (3) und die Stützpolsteröffnungen (4) am Umfang bogenförmig, konzentrisch zur Scheibe selbst, sind.

7. System nach Anspruch 1, bei dem die Vertiefungen (3) in der Schleifscheibe (1) und die Öffnungen (4) im Stützpolster (2) radial angeordnet sind.

8. System nach Anspruch 1, bei dem die Scheibe (1) und das Stützpolster (2) polygonförmig sind und die jeweiligen Vertiefungen (3) und Öffnungen (4) parallel zu den jeweiligen Seiten angeordnet sind.

Revendications

1. Système d'aspiration de poussière produite par des abrasifs flexibles comprenant un disque abrasif (1) avec des découpes (3) réalisées sans éliminer de matériaux et une plaque d'appui rotative (2) avec des ouvertures (4) pour l'aspiration, ledit disque abrasif (1) étant fixé à ladite plaque d'appui (2) **caractérisé en ce que** les découpes (3) sont en regard avec les ouvertures correspondantes (4) de la plaque d'appui (2).

2. Système d'aspiration selon la revendication 1, dans lequel le disque (1) comporte un trou (5) dans un emplacement sensiblement central correspondant à un trou (6) de la plaque d'appui (2) ayant une même forme et une même dimension.

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3. Système selon la revendication 2, dans lequel lesdits trous (5, 6) sont identiques et de forme polygonale.
4. Système selon la revendication 2 ou 3, dans lequel lesdits trous (5, 6) sont connectés à l'aspiration à l'intérieur de la plaque d'appui (2).
5. Système selon la revendication 1, dans lequel ledit disque abrasif (1) est fixé à la plaque d'appui (2) au moyen de velcro® ou d'adhésif autocollant.
6. Système d'aspiration selon la revendication 1, dans lequel ledit disque (1) et ladite plaque d'appui (2) sont de forme circulaire et les découpes de disque (3) et les ouvertures de plaque d'appui (4) sont en forme d'arc de circonférence concentrique au disque lui-même.
7. Système selon la revendication 1, dans lequel lesdites découpes (3) sur le disque abrasif (1) et lesdites ouvertures (4) sur ladite plaque d'appui (2) sont arrangées de façon radiale.
8. Système selon la revendication 1, dans lequel ledit disque (1) et ladite plaque d'appui (2) sont de forme polygonale et les découpes (3) et ouvertures (4) respectives sont arrangées parallèles aux côtés respectifs.

Fig. 1

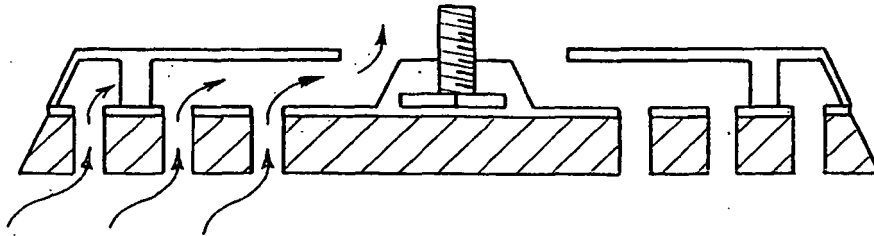


Fig. 2

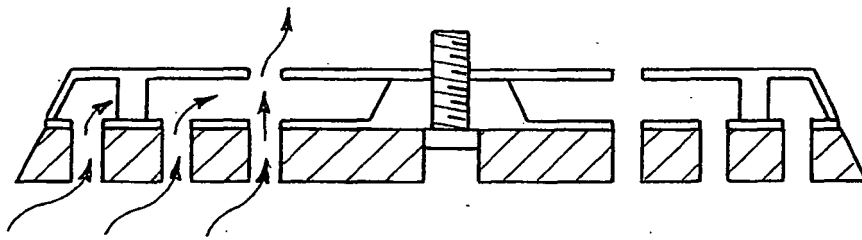


Fig. 3

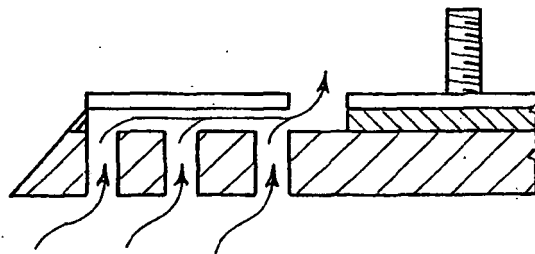


Fig. 4

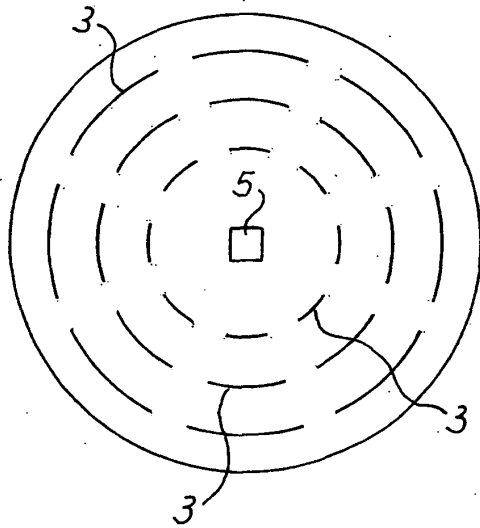


Fig. 5

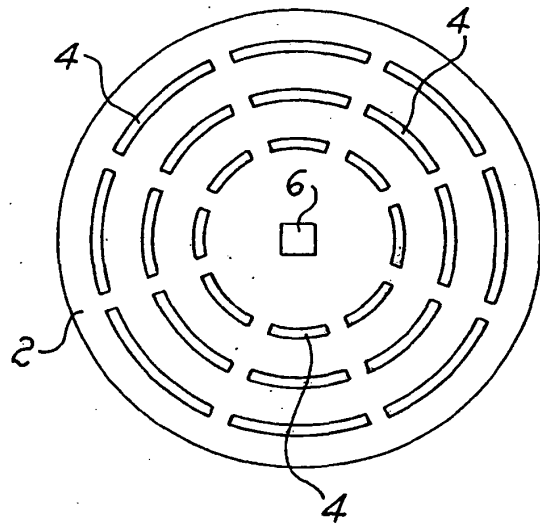


Fig. 5a

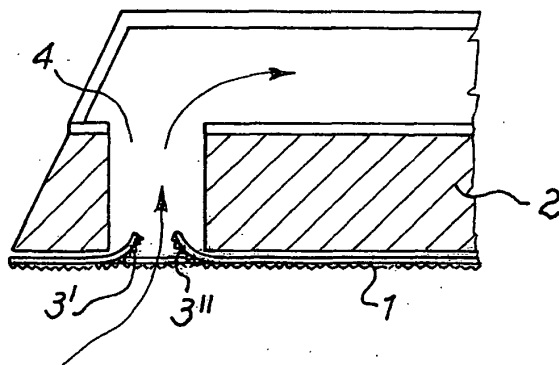
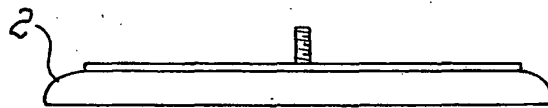


Fig. 6