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Description

The present invention relates to a rotary polishing tool according to the preamble of claim 1 (see DE-A-34 16 186), which is driven by an electric motor for polishing a workpiece.

Rotary polishing tools conventionally used include one comprising a disk-shaped polishing portion corresponding to a workpiece and a disk-shaped substrate made of resin for supporting the polishing portion with the polishing portion being bonded thereto. The polishing work using such a rotary polishing tool is performed by mounting this tool on a driving shaft of an electric motor and rotating the same to press the above polishing portion against the workpiece.

Meanwhile, during the above described work, the tool is rotated at high peripheral speed of, for example, a maximum of approximately 80 m/s. Consequently, a substantially large centrifugal force is developed in this tool. In addition, a large reaction force is applied to this tool from the workpiece. Accordingly, it is particularly desired that the above substrate has sufficient strength.

Therefore, it is considered that the above substrate is made of metal to improve the strength thereof. If this substrate is merely a metal plate, however, such problems arise that the tool becomes heavy and the centrifugal force becomes the larger.

Furthermore, if the above metal plate is merely flat, there is a possibility that a part of the polishing portion is stripped off from the substrate by an impact force applied to the polishing portion from the workpiece during the work resulting in insufficient strength to support the polishing portion by the substrate.

A first object of the present invention is for a tool to have sufficient strength to oppose a centrifugal force and a reaction force which is applied from a workpiece.

A second object of the present invention is to prevent a tool from being heavy even if the tool has the above described strength.

A third object of the present invention is for a polishing portion constituting a tool to be supported by a substrate while holding sufficient strength.

According to the present invention there is provided a rotary polishing tool as set out in claim 1.

Further preferred embodiments are subject of claims 2 to 11.

The foregoing and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figs. 1 is showing a first embodiment;

Fig. 2 is a sectional side elevation view showing a second embodiment; and

Fig. 3 is a sectional side elevation view showing another embodiment.

Figs. 1 shows a first embodiment.

In Fig. 1, reference numeral 1 denotes a rotary polishing tool. This rotary polishing tool 1 has a disk-shaped polishing portion 3 corresponding to a workpiece 2 and a substrate 4 for supporting the polishing portion 3. This substrate 4 is positioned on a rotary center 3a of the above polishing portion 3, and has a disk shape and an approximately circular truncated conical shape.

The above polishing portion 3 is made of a rubber material having abrasive grains included therein. On the other hand, tile above substrate 4 is a metal plate made of iron and is provided with a lot of circular holes 5. Although the holes 5 are formed almost uniformly throughout the substrate 4, they are illustrated only in a part of the substrate 4 in Fig. 1.

A rubber layer 6 is interposed between the polishing portion 3 and the substrate 4. This rubber layer 6 is vulcanized and bonded to the polishing portion 3 and the substrate 4, to fix the polishing portion 3 and the substrate 4 to each other.

In Fig. 1, reference numeral 6a denotes a boundary surface of the above rubber layer 6 and the above polishing portion 3. Since the above polishing portion 3 is also made of a rubber material as described above, however, the polishing portion 3 and the rubber layer 6 are simultaneously vulcanized and bonded to the substrate 4, to be integrated with each other. Therefore, the above boundary surface 6a does not, in fact, clearly exist.

A glass fiber 7 is embedded in the above rubber layer 6 so that they are integrated with each other, thereby to strengthen the rubber layer 6.

The above substrate 4 is provided (with a circular mounting hole 8 on the above rotary center 3a. In addition, the polishing portion 3 is also provided with another mounting hole 8a connected to the above mounting hole 8. The above described holes 5 are formed in a portion other than the outer periphery of the substrate 4 and the periphery of the mounting hole 6. More specifically, both the outer and inner peripheries of the substrate 4 have a continuously circular shape, so that the decrease in strength of the substrate 4 due to the formation of the holes 5 is effectively restrained.

At the time of the polishing work, a driving shaft 10 of a handy electric motor 9 is first passed through the above mounting hole 8 and the other mounting hole 8a and a flanged nut 11 is screwed

into the driving shaft 10, thereby to mount the rotary polishing tool 1 on the above driving shaft 10. The rotary polishing tool 1 is then rotated by driving off the electric motor 9. If the polishing portion 3 is pressed against the above workpiece 2, this workpiece 2 is polished.

Meanwhile, for convenience of forming, the above rubber layer 6 may be made of exactly the same material as that of the polishing portion 3, that is, the polishing portion 3 and the rubber layer 6 may be integrally formed using a rubber material having abrasive grains included therein. In this case, the above boundary surface 6a does not exist.

In the above described construction, the substrate 4 for supporting the polishing portion 3 is made of metal and is further formed in an approximately circular truncated conical shape. Accordingly, the strength of the rotary polishing tool 1 can be considerably improved, as compared with the conventional case where the substrate 4 is made of resin. Consequently, this rotary polishing tool 1 has sufficient strength to oppose a centrifugal force and a reaction force which is applied from the workpiece 2.

Furthermore, since the holes 5 are formed in the above substrate 4, the substrate 4 can be prevented from being heavy uselessly. Accordingly, the rotary polishing tool 1 can be lightweight while sufficiently holding the strength.

Additionally, there is provided the rubber layer 6 which is interposed between the polishing portion 3 and the substrate 4 and vulcanized and bonded to the polishing portion 3 and the substrate 4 to fix the polishing portion 3 and the substrate 4 to each other. Accordingly, when the polishing portion 3 is brought into contact with the workpiece 2 so that an impact force is applied to the polishing portion 3 from the workpiece 2, this impact force is absorbed by the above rubber layer 6. Consequently, a part of the polishing portion 3 can be prevented from being stripped off from the substrate 4 by the above impact force. That is, the polishing portion 3 is supported by the substrate 4 while holding sufficient strength.

Moreover, the above polishing portion 3 is firmly bonded to the lower surface of the substrate 4 through the rubber layer 6 strengthened by the glass fiber 7. In addition, the rubber layer 6 enters the above holes 5 at the time of vulcanization, thereby to sufficiently strength the above bonding. Consequently, also in this point, the polishing portion 3 is supported by the substrate 4 while holding sufficient strength.

Meanwhile, it is not necessary that the nut 11 is flanged.

The following drawings show other embodiments. Common reference numerals are assigned to constituent elements which are common to the embodiments and the above described first embodiment. The description of the common constituent elements and the functions concerning the constituent elements are omitted and hence, only different constituent elements and functions will be described.

The substrate 4 can be embedded in the rubber layer 6 (not shown) so that they are integrated with each other. By doing so, the adhesive strength of a polishing portion 3 to the substrate 4 is further improved.

Fig. 2 shows a second embodiment.

According to Fig. 2, a reinforcing pipe 13 made of metal is fitted in the inner peripheral surface of another mounting hole 8a. This pipe 13 is formed by squeezing a substrate 4 using a press. This pipe 13 may be welded to the substrate 4. In addition, a nut 14 is welded to the lower end of the above pipe 13.

The nut 14 is screwed into a driving shaft 10 of an electric motor 9 to screw the pipe 13 on the driving shaft 10, thereby to mount a rotary polishing tool 1 on the electric motor 9. In this case, the above pipe 13 prevents a polishing portion 3 and a rubber layer 6 from being deformed. In addition, the tool 1 is firmly mounted on the electric motor 9 by screwing the above pipe 13 on the driving shaft 10, to reliably prevent the vibration caused when a centrifugal force is developed.

Furthermore, the polishing portion 3 and the rubber layer 6 are sandwiched between the substrate 4 and the nut 14 in the periphery of the other mounting hole 8a. Consequently, the polishing portion 3 is supported by the substrate 4 more reliably. Meanwhile, the nut 14 and the pipe 13 may be separately formed.

According to Fig. 1, annulus ring portions 15 are respectively formed in opening edges of holes 5 and the mounting hole 8 by press working of the opening edges. The annulus ring portions 15 are respectively projected into the rubber layer 6 from the substrate 4. Consequently, the strength of the substrate 4 is improved, and bonding of the rubber layer 6 to the substrate 4 is further strengthened. Meanwhile, the amount of projection of each of the above annulus ring portions 15 is approximately 0.5 to 1 mm.

Fig. 3 shows another embodiment.

According to Fig. 3, a nut 17 is fitted in the inner peripheral surface of each of the mounting hole 8 and another mounting hole 8a and is welded to a substrate 4, to reinforce a rotary polishing tool 1.

Furthermore, the polishing portion 3 is constituted by a lot of pieces of abrasive paper or abrasive felt which are radially disposed around the rotary center 3a. A part of the polishing portion 3 is

embedded in the rubber layer 6 so that the polishing portion 3 is bonded to the rubber layer 6.

Claims

1. A rotary polishing tool (1) comprising a disk-shaped polishing portion (3) and a disk-shaped substrate (4) having a plurality of holes (5) therethrough which is positioned on the rotary center (3a) of the polishing portion (3) for supporting the polishing portion (3) being fixed to said substrate (4), the substrate (4) being provided with a first mounting hole (8) adapted to receive a driving shaft (10) passed therethrough on the rotary center, wherein a rubber layer (6) containing a glass fiber (7) embedded therein to strengthen said layer (6) is interposed between said polishing portion (3) and said substrate (4) and said rubber layer (6) is vulcanized and bonded to the polishing portion (3) and to the substrate (4); said plurality of holes (5) being entered by the vulcanized rubber of said rubber layer (6) whereby one surface of said substrate (4) and said holes (5) are substantially embedded in said rubber,
characterized in that:
said substrate (4) is made of metal and
annulus ring portions (15) are formed in at least some of said plurality of holes (5) and in said mounting hole (8), whereby said annulus ring portions (15) project from the substrate (4) into said rubber layer (6).

2. The rotary polishing tool according to claim 1, wherein the polishing portion (3) is made of a rubber material having abrasive grains included therein and wherein the rubber of said polishing portion (3) and the rubber layer (6) are the same material.

3. The rotary polishing tool according to claim 1, wherein said substrate (4) has a truncated, approximately circular conical shape.

4. The rotary polishing tool according to any one of claims 1, 2 or 3, wherein the holes (5) are formed in a circular shape.

5. The rotary polishing tool according to claim 1, wherein the substrate (4) is embedded in the rubber layer (6).

6. The rotary polishing tool according to claim 1, wherein the polishing portion (3) is provided with a second mounting hole (8a) connected to and concentric with said first mounting hole (8), and a reinforcing pipe (13) is fitted in the inner peripheral surface of said second mounting hole (8a).

7. The rotary polishing tool according to claim 1, wherein the circumferential edges of the first mounting hole (8) in said substrate (4) are also annular and are also futher embedded in the rubber layer (6).

8. The rotary polishing tool according to claim 1, wherein the polishing portion (3) is made of abrasive paper.

9. The rotary polishing tool according to claim 1, wherein the polishing portion (3) is made of abrasive felt.

10. The rotary polishing tool according to claim 1, wherein the holes (5) are disposed between the first mounting hole (8) and the periphery of the substrate (4).

11. The rotary polishing tool according to claim 1, wherein said portion of said substrate (4) extends about 0.5 to 1 mm into said rubber.

Patentansprüche

1. Rotierendes Schleifwerkzeug (1), welches ein scheibenförmiges Schleifteil (3) und ein scheibenförmiges Trägerteil (4) aufweist, welches eine Mehrzahl von durch dasselbe gehenden Öffnungen (5) hat, und das auf dem Drehmittelpunkt (3a) des Schleifteils (3) zum Tragen des Schleifteils (3) angeordnet ist, welches fest mit dem Trägerteil (4) verbunden ist, wobei das Trägerteil (4) mit einer ersten Befestigungsöffnung (8) versehen ist, welche derart ausgelegt ist, daß sie eine Antriebswelle (10) aufnimmt, welche durch dieselbe an dem Drehmittelpunkt geht, wobei eine Kautschukschicht (6), welche eine darin eingebettete Glasfaser (7) zur Verstärkung der Schicht (6) enthält, zwischen dem Schleifteil (3) und dem Trägerteil (4) angeordnet ist, und die Kautschukschicht (6) an dem Schleifteil (3) und an dem Trägerteil (4) anvulkanisiert und haftend mit diesem verbunden ist, bei dem der vulkanisierte Kautschuk der Kautschukschicht (6) in die Mehrzahl von Öffnungen (5) eintritt, wodurch eine Fläche des Trägerteils (4) und die Öffnungen (5) im wesentlichen in dem Kautschuk eingebettet sind,
dadurch gekennzeichnet, daß
das Substrat (4) aus Metall hergestellt ist und kreisringförmige Teile (15) an wenigstens einigen der Mehrzahl von Öffnungen (5) und an der Befestigungsöffnung (8) ausgebildet sind, wodurch die kreisringförmigen Teile (15) aus-

gehend von dem Trägerteil (9) in die Kautschukschicht (6) ragen.

2. Rotierendes Schleifwerkzeug nach Anspruch 1, bei dem das Schleifteil (3) aus einem Kautschukmaterial hergestellt ist, welches darin eingeschlossene Schleifkörner hat, und bei dem der Kautschuk des Schleifteils (3) und der Kautschukschicht (6) von ein und demselben Material gebildet werden.

3. Rotierendes Schleifwerkzeug nach Anspruch 1, bei dem das Trägerteil (4) eine kegelstumpfförmige, etwa kreisförmige, konische Gestalt hat.

4. Rotierendes Schleifwerkzeug nach einem der Ansprüche 1, 2 oder 3, bei dem die Öffnungen (5) mit einer kreisförmigen Gestalt ausgebildet sind.

5. Rotierendes Schleifwerkzeug nach Anspruch 1, bei dem das Trägerteil (4) in die Kautschukschicht (6) eingebettet ist.

6. Rotierendes Schleifwerkzeug nach Anspruch 1, bei dem das Schleifteil (3) mit einer zweiten Befestigungsöffnung (8a) versehen ist, welche mit der ersten Befestigungsöffnung (8) verbunden und konzentrisch zu dieser angeordnet ist, und bei dem ein Verstärkungsrohr (13) passend zu der inneren Umfangsfläche der zweiten Befestigungsöffnung (8a) vorgesehen ist.

7. Rotierendes Schleifwerkzeug nach Anspruch 1, bei dem die Umfangsränder der ersten Befestigungsöffnung (8) in dem Trägerteil (4) ebenfalls kreisförmig ausgebildet sind, und auch ferner in die Kautschukschicht (6) eingebettet sind.

8. Rotierendes Schleifwerkzeug nach Anspruch 1, bei dem das Schleifteil (3) aus einem Schleifpapier besteht.

9. Rotierendes Schleifwerkzeug nach Anspruch 1, bei dem das Schleifteil (3) aus einem Schleiffilzteil besteht.

10. Rotierendes Schleifwerkzeug nach Anspruch 1, bei dem die Öffnungen (5) zwischen der ersten Befestigungsöffnung (8) und dem Umfang des Trägersteils (4) angeordnet sind.

11. Rotierendes Schleifwerkzeug nach Anspruch 1, bei dem sich der Abschnitt des Trägerteils (4) etwa 0,5 bis 1 mm in den Kautschuk erstreckt.

Revendications

1. Outil de polissage rotatif (1) comportant une partie de polissage (3) en forme de disque et un substrat (4) en forme de disque ayant plusieurs trous traversants (5), qui est positionné sur l'axe de rotation (3a) de la partie de polissage (3) pour supporter la partie de polissage (3) fixée sur ledit substrat (4), le substrat (4) étant muni d'un premier trou de montage (8) adapté pour recevoir un arbre d'entraînement (10) passant à travers l'axe de rotation, dans lequel une couche de caoutchouc (6) contenant une fibre de verre (7) enrobée à l'intérieur de celle-ci pour raidir ladite couche (6) est interposée entre ladite partie de polissage (3) et ledit substrat (4) et ladite couche de caoutchouc (6) est vulcanisée et fixée sur la partie de polissage (3) et le substrat (4), lesdits plusieurs trous (5) étant pénétrés par le caoutchouc vulcanisé de ladite couche de caoutchouc (6) de sorte qu'une première surface dudit substrat (4) et lesdits trous (5) sont pratiquement enrobés dans ledit caoutchouc, caractérisé en ce que ledit substrat (4) est constitué de métal et des parties formant anneaux circulaires (15) sont formées dans au moins certains desdits plusieurs trous (5) et dans ledit trou de montage (8), de sorte que lesdites parties formant anneaux circulaires (15), font saillie à partir du substrat (4) jusqu'à l'intérieur de ladite couche de caoutchouc (6).

2. Outil de polissage rotatif selon la revendication 1, dans lequel la partie de polissage (3) est constituée d'un matériau en caoutchouc comportant des grains abrasifs qui y sont inclus et dans lequel le caoutchouc de ladite partie de polissage (3) et de la couche de caoutchouc (6) est le même matériau.

3. Outil de polissage rotatif selon la revendication 1, dans lequel ledit substrat (4) a une forme conique tronquée à-peu-près circulaire.

4. Outil de polissage rotatif selon l'une quelconque des revendications 1, 2 ou 3, dans lequel les trous (5) ont une forme circulaire.

5. Outil de polissage rotatif selon la revendication 1, dans lequel le substrat (4) est enrobé dan's la couche de caoutchouc (6).

6. Outil de polissage rotatif selon la revendication 1, dans lequel la partie de polissage (3) est munie d'un second trou de montage (8a) relié audit premier trou de montage (8) et concentrique à ce dernier, et un tuyau de renforcement

(13) est agencé à la surface périphérique intérieure dudit second trou de montage (8a).

7. Outil de polissage rotatif selon la revendication 1, dans lequel les bords circonférentiels du premier trou de montage (8) situé dans ledit substrat (4) sont aussi annulaires et sont aussi enrobés dans la couche de caoutchouc (6).

8. Outil de polissage rotatif selon la revendication 1, dans lequel la partie de polissage (3) est constituée de papier abrasif.

9. Outil de polissage rotatif selon la revendication 1, dans lequel la partie de polissage (3) est constituée d'un feutre abrasif.

10. Outil de polissage rotatif selon la revendication 1, dans lequel les trous (5) sont agencés entre le premier trou de montage (8) et la périphérie du substrat (4).

11. Outil de polissage rotatif selon la revendication 1, dans lequel ladite partie dudit substrat (4) s'étend sur environ 0,5 à 1 mm à l'intérieur dudit caoutchouc.

Fig. 1

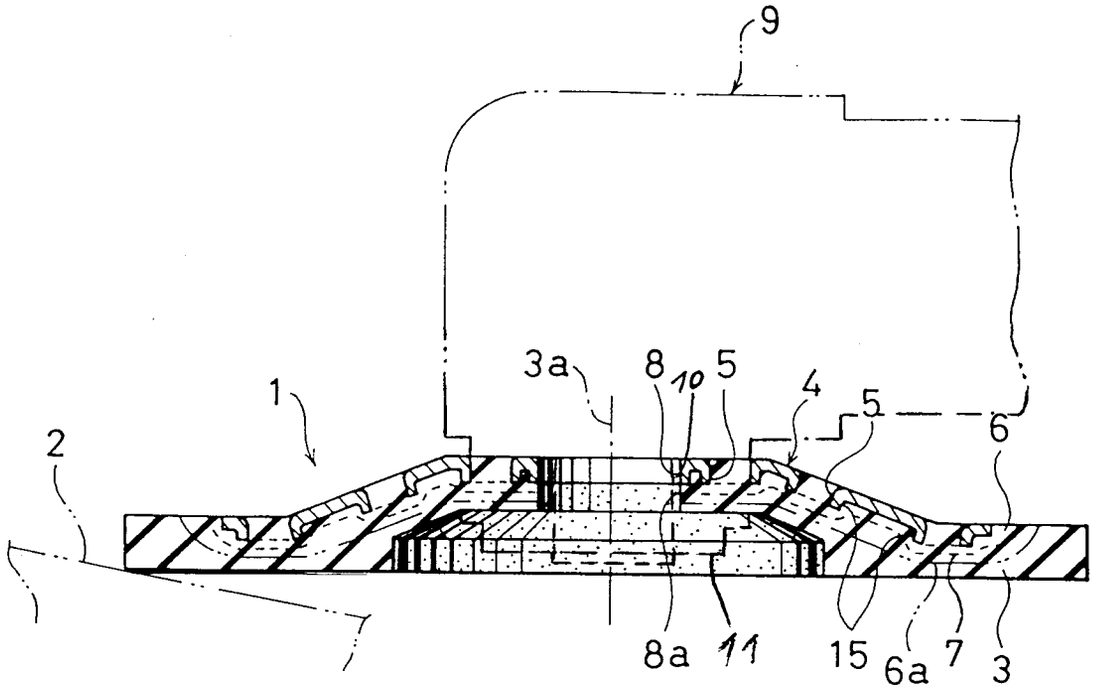

Fig. 2

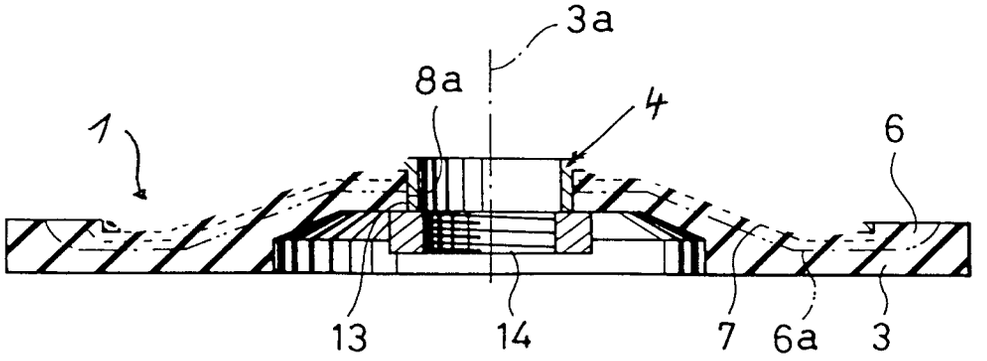

Fig. 3