(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 549 719 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
09.10.2019 Bulletin 2019/41

(21) Application number: **19164011.9**

(22) Date of filing: **20.03.2019**

(51) Int Cl.:
B24D 3/00 *(2006.01)* ***B24D 11/00*** *(2006.01)*
B24B 37/22 *(2012.01)* ***B24D 3/34*** *(2006.01)*
B24D 13/14 *(2006.01)*

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **20.03.2018 EP 18162909**

(71) Applicant: **Dong Guan Golden Sun Abrasives Co., Ltd.**
Dongguan 523821 (CN)

(72) Inventor: **Fang, Hong**
DONGGUAN, 523821 (CN)

(74) Representative: **RGTH**
Patentanwälte PartGmbB
Neuer Wall 10
20354 Hamburg (DE)

(54) AN ELASTIC POLISHING COMPOSITE TOOL

(57) For achieving an optimal polishing result process it is suggested to provide an elastic polishing composite tool (100) in such a way that it comprises an adhesive layer (10) comprising thermoplastic polyurethane and a release paper, wherein the elastic polishing composite tool (100) further comprises an abrasive layer (11), wherein the abrasive layer (11) is adhered to the adhesive layer (10) by means of an adhesive (12), said adhesive (12) comprising polyurethane resin, a curing agent, a modifying agent and a leveling agent, and wherein the weight ratio of the polyurethane resin, the curing agent, the modifying agent and the leveling agent is 100:(10 - 20):(10-12):(0.5 - 1.5).

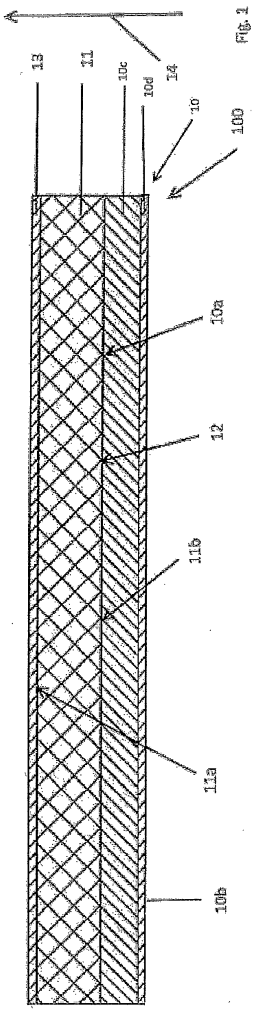

Fig. 1

EP 3 549 719 A1

Description

Field of the invention

[0001] The invention relates to an elastic polishing composite tool according claim 1. Furthermore, the invention concerns an abrasive tool pursuant to claim 8 and a method of producing a polishing composite tool according to claim 10.

Description of Related Art

[0002] For some products with high surface accuracy requirement, the products must be correspondingly subjected to a polishing and/or abrasive treatment, such as abrasive machining. However, the existing traditional coated polishing and/or abrasive tools are difficult to apply to out-of-shape or curved-surface products, such as electronic products in the electronics, computer and/or communication field. Furthermore, the polishing tools known from prior art have the disadvantage of a relatively short service life. Furthermore, they can be responsible for small surface scratches.

Summary of the Invention

[0003] It is therefore an objective of the present invention to improve an elastic polishing composite tool in such a way that the polishing quality is improved as well as the service life is prolonged.

[0004] The above objective is solved by providing elastic polishing composite tool for polishing surfaces which comprises an adhesive layer and an abrasive layer. The adhesive layer comprises thermoplastic polyurethane and a release paper. In particular, the adhesive layer consists of a layer of thermoplastic polyurethane and a release paper which are compounded. Especially, the release paper sticks to the thermoplastic polyurethane due to its adhesive character. Together, the thermoplastic polyurethane and the release paper form a composite base material of the elastic composite polishing tool. The release paper functions as a backing material, in other words as a stabilizing material, allowing the highly flexible layer of thermoplastic polyurethane not to be deformed, especially during production of the composite tool.

[0005] The abrasive layer can comprise or consist of abrasive particles. Especially, those particles have been selected such that they have a narrow size distribution. Especially, the particles have been selected such that they each have a size larger than D3 and/or smaller than D95 regarding an initial distribution of particles.

[0006] In addition, the particles have a highly similar or uniform shape. Furthermore, the abrasive particles can be square-shaped. In particular, particles with other shapes such as flat-shaped or sword-shaped particles have been discarded regarding an initial distribution of particles. Therefore, the diameter and the shape of the abrasive particles are more uniform.

[0007] The abrasive layer is adhered to the adhesive layer by means of an adhesive. The adhesive layer and/or the abrasive layer are preferably elastic. The term "elastic" refers to the function that a layer or a layered tool is reversibly deformed under the application of external forces. The term "layer" preferably means a film of an especially constant thickness.

[0008] The adhesive is a modified adhesive owed to its special composition. The adhesive comprises polyurethane resin, a curing agent, a modifying agent and a leveling agent, wherein the weight ratio of the polyurethane resin, the curing agent, the modifying agent and the leveling agent is 100: (10 - 20):(10-12):(0.5 - 1.5).

[0009] In particular, the adhesive consists of the above components in the above described way. In other words, the weight ratio of the polyurethane resin and the curing agent is between 100:10 and 100:20, wherein the weight ratio of the polyurethane resin and the modifying agent is between 100:10 and 100:12. The weight ratio of the polyurethane resin and the leveling agent is between 100:0,5 and 100:1,5.

[0010] The leveling agent can comprise acrylates copolymer. In particular, the leveling agent consists of acrylates copolymer. Especially, the function of the leveling agent is to make the surface adhesive flat.

[0011] In particular, the weight ratio of the polyurethane resin, the curing agent and the leveling agent in the adhesive is 100:15:1, so that the weight ratio of the polyurethane resin and the curing agent is 20:3 and the weight ratio of the curing agent and the leveling agent is 5:0,33.

[0012] Especially, the modifying agent comprises, preferably consist of, silicon dioxide, especially silicon dioxide nanoparticles. The silicon dioxide, especially the silicon dioxide nanoparticles, serves to enhance the mechanical strength as well as the anti-abrasive and heat resistance qualities of the adhesive. It has been found that the modifying agent in the weight ratio range (10-12) has the best modifying effect in terms of the before mentioned advantages. If the weight ratio of the modifying agent is higher than (10-12), the adhesive force between the adhesive and the adhesive layer comprising thermoplastic polyurethane will decrease. If the weight ratio is less than (10-12), there will be no modifying effect in terms of an improvement regarding the mechanical strength as well as the anti-abrasive and heat resistance qualities of the adhesive.

[0013] By this composition of the adhesive the abrasive layer and the adhesive layer can be stably and reliably adhered to each other ensuring an enhanced adhesive force.

[0014] Preferably, the adhesive layer and the abrasive layer are arranged in a laminated way. In other words, the adhesive layer comprises an upper surface and the abrasive layer a lower surface, wherein these surfaces face each other and the lower surface of the abrasive layer is adhered to the upper surface of the adhesive layer by means of the adhesive.

[0015] The adhesive layer has the excellent character-

istics of good elasticity, toughness, wear resistance, good cold resistance, environmental protection and non-toxicity. The lubricating antistatic coating has good anti-blocking and lubricating functions when in use, so that the service life can be prolonged, the polished surface quality can be improved and scratches can be reduced by means of the lubricating antistatic coating.

[0016] According to the present invention, the abrasive layer formed by the polishing abrasive is compounded onto the adhesive layer to form a composite material combining the characteristics of the abrasive layer and the adhesive layer and having an abrasive, in particular grinding, and/or polishing function. In particular, the abrasive layer adheres to the adhesive layer due to the adhesive character of the adhesive layer.

[0017] The functional characteristics of the abrasive layer and the adhesive layers are optimally and effectively combined to form an elastic polishing composite tool with excellent tension and elasticity. Therefore, the elastic polishing composite tool provided by the invention has the advantages of a novel design, a stable and reliable structure and a wide range of application. In particular, the elastic polishing composite tool can completely change the performances and application fields of the traditional coated abrasive tools.

[0018] Preferably, the abrasive layer of the elastic polishing composite tool comprises an upper surface, said upper surface facing away from the adhesive layer. The upper surface of the abrasive layer is particularly uniformly coated with a lubricating antistatic coating.

[0019] Advantageously, the lubricating antistatic coating comprises a stearate, an adhesive, an antistatic agent and a surfactant. Especially, the lubricating antistatic coating comprises a surfactant additionally to a stearate. In particular, the lubricating antistatic coating consists of these components. The weight ratio of the stearate, the adhesive, the antistatic agent and the surfactant is preferably 100:(8 - 10):(5 - 8):(5-7). In other words, the weight ratio of the stearate and the adhesive is between 100:8 and 100:10, while further preferred the weight ratio of the stearate and the antistatic agent is between 100:5 and 100:8. The weight ratio of the stearate and surfactant is between 100:5 and 100:7.

[0020] The adhesive of the lubricating antistatic coating can comprise or consist of Butylbenzene, especially in the form of an emulsion. The weight ratio of (8-10) for the adhesive is especially advantageous, since it present a perfect compromise between the natural adhesive effect of the lubricating antistatic coating and the effect that the coating dissipates faster, which enhances a heat dissipating effect.

[0021] The function of the stearate in the lubricating antistatic coating is to lubricate so that the abrasive dust produced during the abrasion process does not easily aggregate together. This prevents a production of heat during the abrasive process. The stearate thus has an anti-blocking effect.

[0022] The surfactant is preferably a nonionic surfactant. It advantageously has an anti-static function and thus prevents abrasive dust to adhere in the intermediate spaces between the abrasive particles. It hence also has an anti-blocking effect.

[0023] Using stearate instead of e.g paraffin wax has the advantage that it is environmentally friendly. Furthermore, it shows a better and non-toxic effect compared to other alternatives such as e.g. paraffin wax.

[0024] In particular, the invention relates to an abrasive tool for polishing and/or abrading comprising an elastic polishing composite tool.

[0025] As a further advantage, the elastic polishing composite tool, as well as an abrasive tool comprising such an elastic polishing composite tool, can be designed into structures of various shapes to be applied to polishing and/or abrasive machining of different objects.

[0026] In particular, an abrasive tool according to the invention can comprise a sponge layer, especially a sponge block, and/or a soft plastic layer, as an additional layer. The sponge layer can comprise or consist of a foamed polymer. The elastic polishing composite tool can be compounded with the sponge layer and/or a soft plastic layer to be made into an elastic sponge polishing block forming an abrasive tool. Especially, the sponge layer and/or the soft plastic layer is compounded with the elastic polishing composite tool by means of a, preferably additional, adhesive layer.

[0027] The invention is further concerned with a method for producing an elastic composite polishing tool, especially as described above, comprising the steps of producing an adhesive layer of the elastic composite polishing tool by combining a release paper and a layer of thermoplastic polyurethane and adhering an abrasive layer to the adhesive layer by means of an adhesive, said adhesive comprising polyurethane resin, a curing agent, a modifying agent and a leveling agent, wherein the weight ratio of the polyurethane resin, the curing agent, the modifying agent and the leveling agent is 100:(10 - 20):(10-12):(0.5 - 1.5).

[0028] Further, an upper surface of the abrasive layer can uniformly be coated with a lubricating antistatic coating, which is especially composed as described above.

[0029] In addition, a sponge layer and/or a soft plastic layer can be added to the elastic composite too, e.g. by adhesion, so that an abrasive tool is formed.

Brief Description of the Drawing

[0030] The invention will be described below with reference to figure 1 which shows in schematic representation a sectional view of an elastic polishing composite tool.

Detailed Description of the Invention

[0031] Figure 1 shows a sectional view of an elastic polishing composite tool (100) along the thickness direction (14) so that all the different layers of the elastic pol-

ishing composite tool (100) can be seen.

[0032] The elastic polishing composite tool (100) comprises an adhesive layer (10) having an upper surface (10a) and a lower surface (10b). The adhesive layer (10) consists of a layer of thermoplastic polyurethane (10c) and a release paper (10d).

[0033] Furthermore, the elastic polishing composite tool (100) comprises an abrasive layer (11) with an upper surface (11a) and a lower surface (11b). The abrasive layer (11) is formed by a polishing abrasive.

[0034] The adhesive layer (10) and the abrasive layer (11) are arranged in a laminated way. The lower surface (11) of the abrasive layer (11) is adhered to the upper surface (10a) of the adhesive layer (10) by means of an adhesive (12) in order to give the adhesive layer (10) a new function, i.e. a polishing and/or grinding function.

[0035] On the upper surface (11a) of the abrasive layer (11) a lubricating antistatic coating is uniformly applied.

List of reference signs

[0036]

100	elastic polishing composite tool
10	adhesive layer
10a	upper surface of adhesive layer
10b	lower surface of adhesive layer
10c	layer of thermoplastic polyurethane
10d	release paper
11	abrasive layer
11a	upper surface of abrasive layer
11b	lower surface of abrasive layer
12	adhesive
13	lubricating antistatic coating
14	thickness direction

Claims

1. An elastic polishing composite tool (100),
characterized in that the elastic polishing composite tool (100) comprises an adhesive layer (10) comprising thermoplastic polyurethane and a release paper (10d),
wherein the elastic polishing composite tool (100) further comprises an abrasive layer (11),
wherein the abrasive layer (11) is adhered to the adhesive layer (10) by means of an adhesive (12),
said adhesive (12) comprising polyurethane resin, a curing agent, a modifying agent and a leveling agent, and
wherein the weight ratio of the polyurethane resin, the curing agent, the modifying agent and the leveling agent is 100:(10 - 20):(10-12):(0.5 - 1.5).

2. The elastic polishing composite tool (100) according to claim 1,
characterized in that the weight ratio of the polyurethane resin, the curing agent and the leveling agent in the adhesive is 100:15:1.

3. The elastic polishing composite tool (100) according to any of claims 1 or 2,
wherein the modifying agent comprises silicon dioxide.

4. The elastic polishing composite tool (100) according to any preceding claim,
wherein the abrasive layer (11) comprises an upper surface (11a),
and wherein said upper surface (11a) of the abrasive layer (11) is uniformly coated with a lubricating antistatic coating (13).

5. The elastic polishing composite tool (100) according to claim 4,
wherein the lubricating antistatic coating (13) comprises a stearate, an adhesive, an antistatic agent and a surfactant,
and wherein the weight ratio of the stearate, the adhesive, the antistatic agent and the surfactant is 100:(8 - 10):(5 - 8):(5-7).

6. The elastic polishing composite tool (100) according to claim 4 or 5,
wherein the lubricating antistatic coating (13) comprises or consists of Butylbenzene.

7. The elastic polishing composite tool (100) according to claim 5 or 6,
wherein the surfactant is nonionic.

8. An abrasive tool
characterized in that the abrasive tool comprises an elastic polishing composite tool (100) according to any of claims 1 to 7.

9. The abrasive tool according to claim 8,
wherein the abrasive tool comprises a sponge layer and/or a soft plastic layer.

10. Method for producing an elastic composite polishing tool (100), **characterized in**
producing an adhesive layer (10) of the elastic composite polishing tool (100) by combining a release paper (10d) and a layer of thermoplastic polyurethane (10c),
adhering an abrasive layer (11) to the adhesive layer (10) by means of an adhesive (12),
said adhesive (12) comprising polyurethane resin, a curing agent, a modifying agent and a leveling agent, and
wherein the weight ratio of the polyurethane resin, the curing agent, the modifying agent and the leveling agent is 100:(10 - 20):(10-12):(0.5 - 1.5).

11. Method according to claim 10,
characterized in
coating an upper surface (11a) of the abrasive layer (11) uniformly with a lubricating antistatic coating (13).

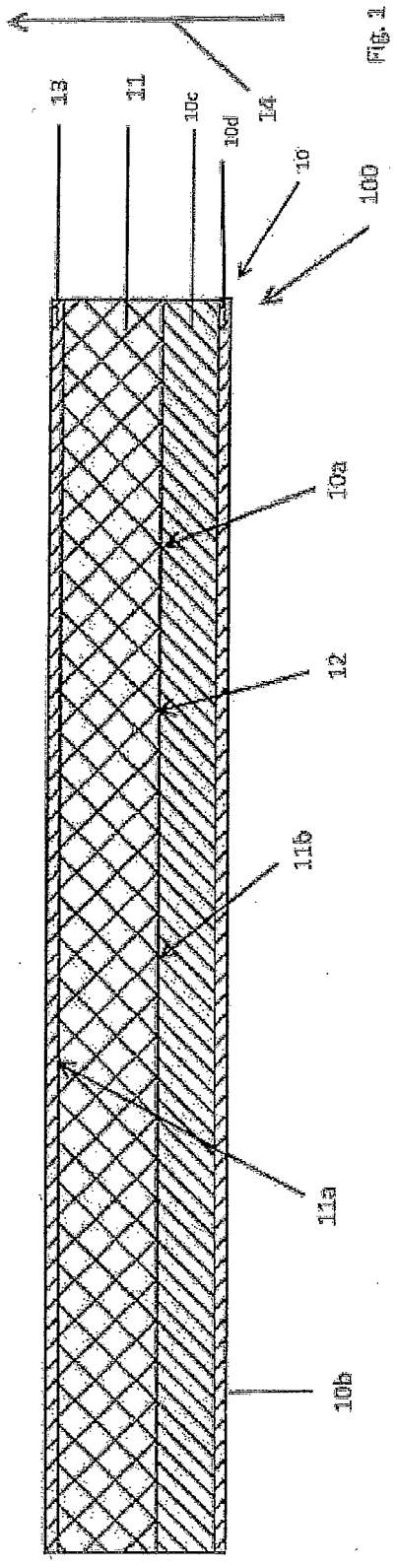

Fig. 1

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 19 16 4011

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	CN 105 313 033 A (DONGGUAN GOLDEN SUN ABRASIVES CO LTD) 10 February 2016 (2016-02-10) * the whole document *	1-11	INV. B24D3/00 B24D11/00 B24B37/22 B24D3/34
A	US 2010/210197 A1 (MATSUMURA YASUSHI [JP] ET AL) 19 August 2010 (2010-08-19) * the whole document *	1-11	B24D13/14
A	US 2011/053377 A1 (OGAWA KAZUYUKI [JP] ET AL) 3 March 2011 (2011-03-03) * the whole document *	1-11	
Y	JOSE ROBERTO VEGA BAUDRIT ET AL: "Basis and Applications of Silicon Reinforced Adhesives", ORGANIC & MEDICINAL CHEMISTRY INTERNATIONAL JOURNAL, vol. 5, no. 1, 17 January 2018 (2018-01-17), pages 1-12, XP055614999, DOI: 10.19080/omcij.2018.05.555654 * page 1, paragraph 3 - page 2, paragraph 3 *	1-11	TECHNICAL FIELDS SEARCHED (IPC) B24D B24B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	23 August 2019	Watson, Stephanie

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 19 16 4011

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

23-08-2019

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 105313033 A	10-02-2016	NONE	
US 2010210197 A1	19-08-2010	CN 101795817 A	04-08-2010
		JP 5078527 B2	21-11-2012
		JP 2009083014 A	23-04-2009
		KR 20100072193 A	30-06-2010
		MY 159345 A	30-12-2016
		TW 200918242 A	01-05-2009
		US 2010210197 A1	19-08-2010
		WO 2009041422 A1	02-04-2009
US 2011053377 A1	03-03-2011	CN 101636247 A	27-01-2010
		JP 4931133 B2	16-05-2012
		JP 2008221441 A	25-09-2008
		KR 20090120455 A	24-11-2009
		TW 200905739 A	01-02-2009
		US 2011053377 A1	03-03-2011
		WO 2008126578 A1	23-10-2008

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82