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(54) LONG-LIFE ABRASIVE PAD ASSEMBLY

(57) An abrasive pad assembly (10), comprising having an abrasive layer (12) having first and second surfaces with the first surface being coated with material particles having predetermined hardness characteristics, a substrate (14) having first and second surfaces with the first surface attached to the second surface of the abrasive layer, the substrate being composed of a material having stiff and resilient characteristics, and a fastening layer (16) having first and second surfaces with the first surface being attached to the second surface of the substrate and the first surface having fastening material disposed thereon.

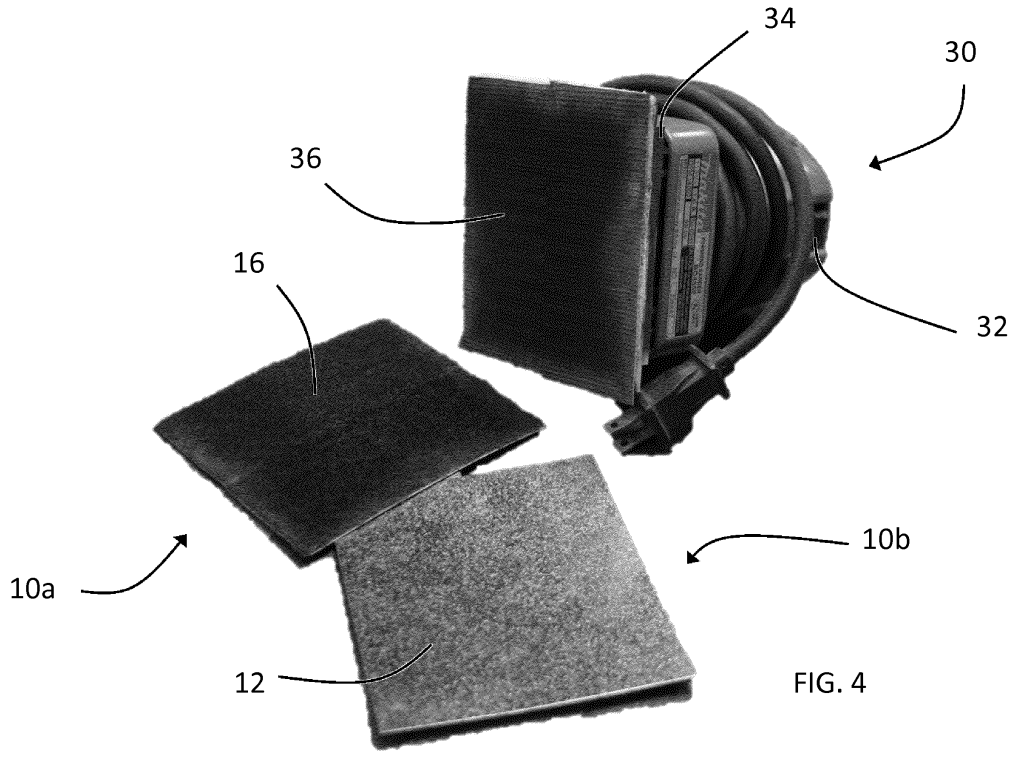

FIG. 4

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Description

Cross-Reference to Related Application

[0001] This application claims priority to U.S. Provisional Patent Application Ser. No. 62/587,238, filed on November 16, 2017, and entitled "LONG-LIFE ABRASIVE PAD," the entire disclosure of which is incorporated herein by reference.

Background

[0002] Sandpaper and other abrasive pads are generally known and used in a variety of industries for removing material from surfaces of various materials, e.g., wood, in order to smooth the surfaces, roughen the surfaces, and/or prepare them for subsequent treatment after one or more top layers of material are removed. These products are consumable and generally have a short work life due to the high degree of wear and tear caused during the abrasion process. As such, these products rapidly deteriorate, which results in a quickly diminishing service life and performance. Frequently changing out worn out pads in order to maintain a sufficient level of performance is generally a tedious and costly process.

Summary

[0003] The present disclosure is directed to a long-life abrasive pad assembly.

[0004] According to an aspect is an abrasive pad assembly, comprising: an abrasive layer having first and second surfaces with the first surface being coated with material particles having predetermined hardness characteristics; a substrate having first and second surfaces with the first surface attached to the second surface of the abrasive layer, the substrate being composed of a material having stiff and resilient characteristics; and a fastening layer having first and second surfaces with the first surface being attached to the second surface of the substrate and the first surface having fastening material disposed thereon.

[0005] According to an embodiment, the fastening material comprises loop fabric.

[0006] According to an embodiment, the material articles are composed of at least one of diamond, cubic boron nitride, aluminum oxide, silicon carbide, and garnet.

[0007] According to an embodiment, the substrate is composed of any of steel, brass, and aluminum.

[0008] According to an aspect is a handheld tool assembly, comprising: (a) a motor; (b) a fastening surface operably connected to the motor; and (c) an abrasive pad assembly, comprising: (i) an abrasive layer having first and second surfaces with the first surface being coated with material particles having predetermined hardness characteristics; (ii) a substrate having first and second surfaces with the first surface attached to the second surface of the abrasive layer, the substrate being composed of a material having stiff and resilient characteristics; and (iii) a fastening layer having first and second surfaces with the first surface being attached to the second surface of the substrate and the first surface having fastening material disposed thereon; wherein the fastening layer is removably connected to the fastening surface.

[0009] These and other aspects of the invention will be apparent from the embodiments described below.

Brief Description of the Drawings

[0010] In the drawings, like reference characters generally refer to the same parts throughout the different views. Also, the drawings are not necessarily to scale, emphasis instead generally being placed upon illustrating the principles of the invention.

FIG. 1 is a top view of an abrasive pad according to one embodiment disclosed herein.

FIG. 2 is a side view of the abrasive pad of FIG. 1.

FIG. 3 is a side view of a system that includes a handheld device configured to receive the abrasive pad of FIG. 1.

FIG. 4 is a photograph of two abrasive pads and a handheld device configured to receive the abrasive pads according to one embodiment disclosed herein.

Detailed Description of Embodiments

[0011] Referring to FIG. 1, in one embodiment, an abrasive pad 10 includes an abrasive surface 12. The abrasive surface 12 may be formed from or include any material with a high hardness that is capable of scratching or abrading other materials. Examples of materials that can be used for the abrasive surface 12 include diamond, cubic boron nitride, aluminum oxide, silicon carbide, garnet, and other materials that have hardnesses similar to these materials, e.g., according to the Mohrs, Vickers, or other hardness scale. The abrasive surface 12 may comprise grit, chunks, particles, flakes, shaving, chips, grains, or other fragments of any of the aforementioned materials. The diameter or dimensions of these fragments may range in size depending on the desired smoothness desired to be achieved by the abrasive surface 12, i.e., with smoother finishes typically corresponding to smaller sized fragments.

[0012] As shown in FIG. 2, the abrasive surface 12 of the abrasive pad 10 is secured to a substrate 14, which is provided to provide structurally integrity to the abrasive pad 10. For example, the substrate 14 may take the form of a sheet or plate of durable and generally stiff but resilient material, such as steel, brass, aluminum, or other metals. In one embodiment, the abrasive surface 12 is made from a composite of the aforementioned abrasive

material and a bonding material to secure the abrasive material to the substrate 14. The process to bond said abrasive to the substrate may alternately and/or additionally include, but is not limited to, electroplating, brazing, soldering, epoxy, or any other adhesive or bonding processes known or discovered.

[0013] Opposite to the abrasive surface 12, the abrasive pad 10 includes a fastening surface 16 secured to the substrate 14 that enables the abrasive pad 10 to be detachably secured to a handheld abrading device. In one embodiment, the fastening surface 16 comprises a hook material or a loop material that corresponds to complementary hook or loop material of an abrading device, e.g., a handheld powered or unpowered device configured to receive and attach to the abrasive pad 10.

[0014] In FIG. 3, a handheld device 18 is illustrated having a fastening surface 20, which is complementarily formed with respect to the fastening surface 16 such that the surfaces 16 and 20 together form a hook and loop type fastener or other detachable attachment means 22. In this way, the abrasive pad 10 is capable of detachably securing to a rotating, member 24 of the device 18. For example, the device 18 may be an electrically or pneumatically powered sanding tool having a handle 25 arranged to be held by a user, a trigger 26 to be pulled to initiate movement of the member 24, and a motor 28 coupled to the member 24, e.g., via a shaft, to provide the aforementioned movement in response to input from the trigger 26. Advantageously, the attachment means 22 facilitates the abrasive pad 10 to be quickly and easily changed, e.g., to a variety of different abrasive grit sizes of the material of the abrasive surface 12 for multiple different abrading procedures or applications.

[0015] As another example, a handheld device 30 is illustrated in FIG. 4. The handheld device 30 includes a main body 32 (e.g., which may house a motor or other actuator or movement generator) to which a vibrating or oscillating member 34 is attached. The member 34 includes a fastening surface 36 which may include hook and/or loop material as described above with respect to the surfaces 16 and 20 and the attachment means 22 in order to detachably secure the abrasive pad 10 thereto. Two of the abrasive pads 10, designated with reference numerals 10a and 10b, are illustrated in FIG. 4. More specifically, the fastening surface 16 of the abrasive pad 10a and the abrasive surface 12 of the abrasive pad 10b are shown face up, respectively, in FIG. 4.

[0016] While several inventive embodiments have been described and illustrated herein, those of ordinary skill in the art will readily envision a variety of other means and/or structures for performing the function and/or obtaining the results and/or one or more of the advantages described herein, and each of such variations and/or modifications is deemed to be within the scope of the inventive embodiments described herein. More generally, those skilled in the art will readily appreciate that all parameters, dimensions, materials, and configurations described herein are meant to be exemplary and that the actual parameters, dimensions, materials, and/or configurations will depend upon the specific application or applications for which the inventive teachings is/are used. Those skilled in the art will recognize, or be able to ascertain using no more than routine experimentation, many equivalents to the specific inventive embodiments described herein. It is, therefore, to be understood that the foregoing embodiments are presented by way of example only and that, within the scope of the appended claims and equivalents thereto, inventive embodiments may be practiced otherwise than as specifically described and claimed. Inventive embodiments of the present disclosure are directed to each individual feature, system, article, material, kit, and/or method described herein. In addition, any combination of two or more such features, systems, articles, materials, kits, and/or methods, if such features, systems, articles, materials, kits, and/or methods are not mutually inconsistent, is included within the inventive scope of the present disclosure.

[0017] All definitions, as defined and used herein, should be understood to control over dictionary definitions, definitions in documents incorporated by reference, and/or ordinary meanings of the defined terms.

[0018] The indefinite articles "a" and "an," as used herein in the specification and in the claims, unless clearly indicated to the contrary, should be understood to mean "at least one."

[0019] The phrase "and/or," as used herein in the specification and in the claims, should be understood to mean "either or both" of the elements so conjoined, i.e., elements that are conjunctively present in some cases and disjunctively present in other cases. Multiple elements listed with "and/or" should be construed in the same fashion, i.e., "one or more" of the elements so conjoined. Other elements may optionally be present other than the elements specifically identified by the "and/or" clause, whether related or unrelated to those elements specifically identified. Thus, as a non-limiting example, a reference to "A and/or B", when used in conjunction with open-ended language such as "comprising" can refer, in one embodiment, to A only (optionally including elements other than B); in another embodiment, to B only (optionally including elements other than A); in yet another embodiment, to both A and B (optionally including other elements); etc.

[0020] As used herein in the specification and in the claims, "or" should be understood to have the same meaning as "and/or" as defined above. For example, when separating items in a list, "or" or "and/or" shall be interpreted as being inclusive, i.e., the inclusion of at least one, but also including more than one, of a number or list of elements, and, optionally, additional unlisted items. Only terms clearly indicated to the contrary, such as "only one of' or "exactly one of," or, when used in the claims, "consisting of," will refer to the inclusion of exactly one element of a number or list of elements. In general, the term "or" as used herein shall only be interpreted as indicating exclusive alternatives (i.e. "one or the other

but not both") when preceded by terms of exclusivity, such as "either," "one of," "only one of," or "exactly one of." "Consisting essentially of," when used in the claims, shall have its ordinary meaning as used in the field of patent law.

[0021] As used herein in the specification and in the claims, the phrase "at least one," in reference to a list of one or more elements, should be understood to mean at least one element selected from any one or more of the elements in the list of elements, but not necessarily including at least one of each and every element specifically listed within the list of elements and not excluding any combinations of elements in the list of elements. This definition also allows that elements may optionally be present other than the elements specifically identified within the list of elements to which the phrase "at least one" refers, whether related or unrelated to those elements specifically identified. Thus, as a non-limiting example, "at least one of A and B" (or, equivalently, "at least one of A or B," or, equivalently "at least one of A and/or B") can refer, in one embodiment, to at least one, optionally including more than one, A, with no B present (and optionally including elements other than B); in another embodiment, to at least one, optionally including more than one, B, with no A present (and optionally including elements other than A); in yet another embodiment, to at least one, optionally including more than one, A, and at least one, optionally including more than one, B (and optionally including other elements); etc.

[0022] It should also be understood that, unless clearly indicated to the contrary, in any methods claimed herein that include more than one step or act, the order of the steps or acts of the method is not necessarily limited to the order in which the steps or acts of the method are recited.

[0023] In the claims, as well as in the specification above, all transitional phrases such as "comprising," "including," "carrying," "having," "containing," "involving," "holding," "composed of," and the like are to be understood to be open-ended, i.e., to mean including but not limited to. Only the transitional phrases "consisting of' and "consisting essentially of' shall be closed or semi-closed transitional phrases, respectively, as set forth in the United States Patent Office Manual of Patent Examining Procedures, Section 2111.03.

Claims

1. An abrasive pad assembly, comprising:

a. An abrasive layer having first and second surfaces with the first surface being coated with material particles having predetermined hardness characteristics;
b. A substrate having first and second surfaces with the first surface attached to the second surface of the abrasive layer, the substrate being composed of a material having stiff and resilient characteristics; and
c. A fastening layer having first and second surfaces with the first surface being attached to the second surface of the substrate and the first surface having fastening material disposed thereon.

2. The abrasive pad assembly according to claim 1, wherein the fastening material comprises loop fabric.

3. The abrasive pad assembly according to claim 1, wherein the material articles are composed of at least one of diamond, cubic boron nitride, aluminum oxide, silicon carbide, and garnet.

4. The abrasive pad assembly according to claim 1, wherein the substrate is composed of any of steel, brass, and aluminum.

5. A handheld tool assembly, comprising:

a. a motor
b. a fastening surface operably connected to the motor; and
c. an abrasive pad assembly, comprising:

i. an abrasive layer having first and second surfaces with the first surface being coated with material particles having predetermined hardness characteristics;
ii. a substrate having first and second surfaces with the first surface attached to the second surface of the abrasive layer, the substrate being composed of a material having stiff and resilient characteristics; and
iii. a fastening layer having first and second surfaces with the first surface being attached to the second surface of the substrate and the first surface having fastening material disposed thereon;

d. wherein the fastening layer is removably connected to the fastening surface.

6. The handheld tool assembly according to claim 5, wherein the fastening surface comprises one of hook and loop material, and he fastening layer comprising the other of hook and loop material.

7. The handheld tool assembly according to claim 5, wherein the fastening material comprises loop fabric.

8. The handheld tool assembly according to claim 5, wherein the material articles are composed of at least one of diamond, cubic boron nitride, aluminum oxide, silicon carbide, and garnet.

9. The handheld tool assembly according to claim 5, wherein the substrate is composed of any of steel, brass, and aluminum.

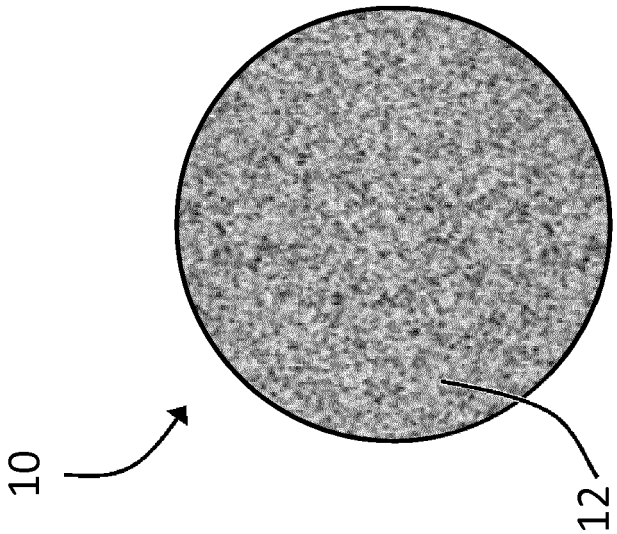

FIG. 1

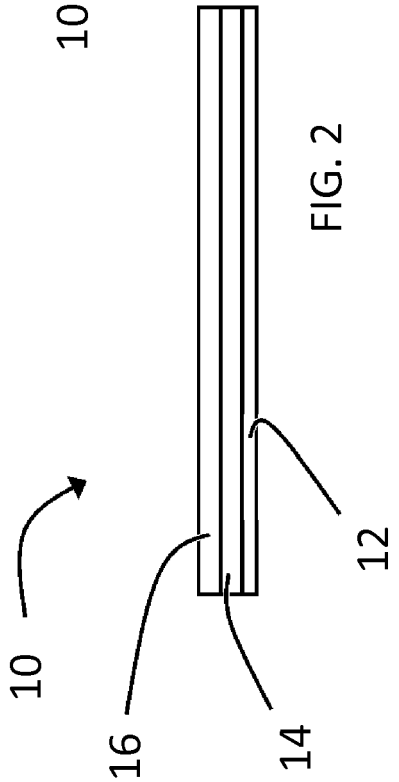

FIG. 2

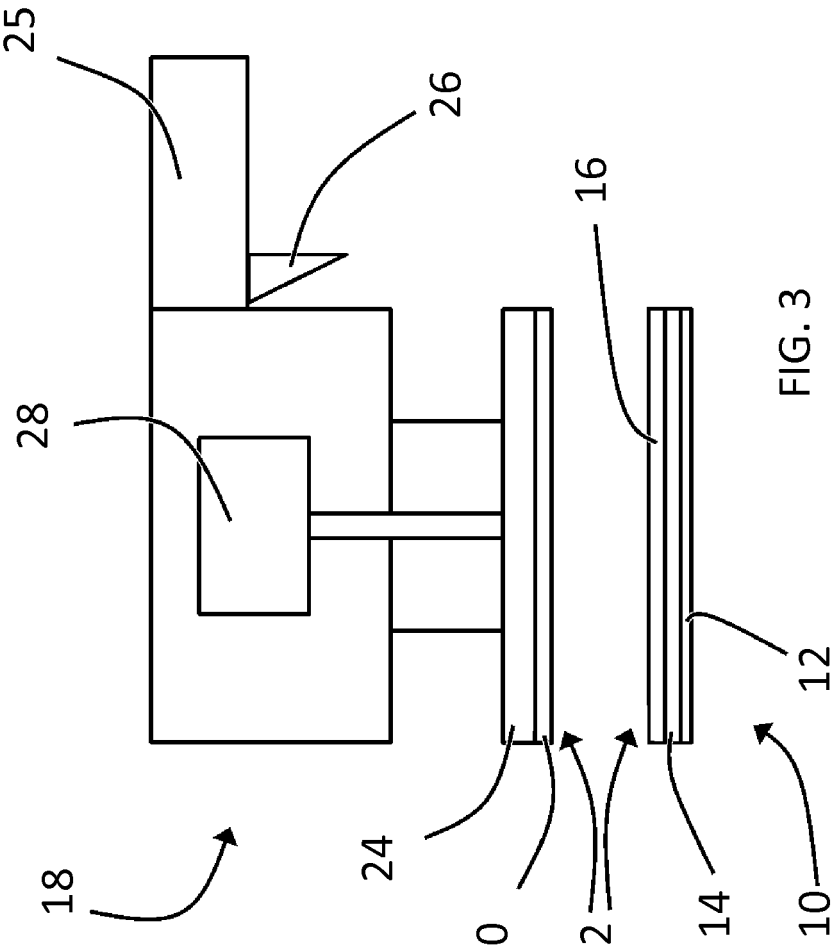

FIG. 3

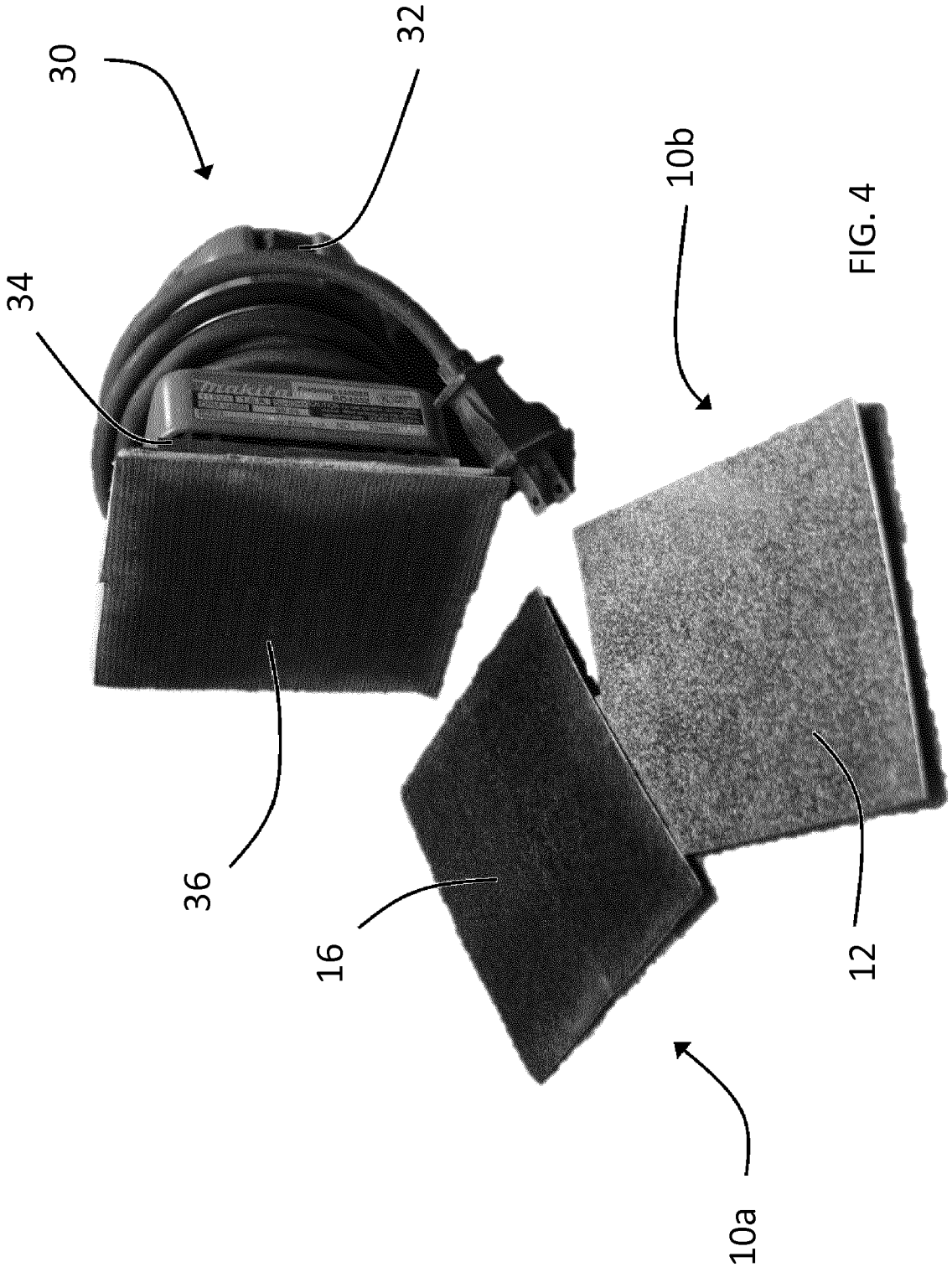

FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 18 20 6848

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X	US 6 190 246 B1 (PARROTT BRIAN H [CA] ET AL) 20 February 2001 (2001-02-20) * figures 13,14,1c,2c * * column 7, lines 7-18 * * abstract * -----	1-9	INV. B24B7/18 B24D9/08 B24D11/02
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X	WO 01/04227 A2 (3M INNOVATIVE PROPERTIES CO [US]) 18 January 2001 (2001-01-18) * page 2, line 25 - page 3, line 30 * * page 8 * * hook and loop attachment; page 21, line 3 - page 22, line 1 * * rigid (bronze) support with diamond abrasives coated on it; hook and loop attachment to a tool support pad; page 19, lines 19-25 * -----	1-9	TECHNICAL FIELDS SEARCHED (IPC) B24B B24D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	1 April 2019	Arhire, Irina

CATEGORY OF CITED DOCUMENTS

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

REFERENCES CITED IN THE DESCRIPTION

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