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(54) **ABRASIVE ARTICLE**

SCHLEIFMITTEL

ARTICLE ABRASIF

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- **PATENT ABSTRACTS OF JAPAN vol. 8, no. 112**
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Description

The present invention relates generally to an abrasive article in which abrasive grains are bonded to a backing.

On an abrasive article, indicia in the form of printed information are placed on the back side, which is the side opposite from the front side. The front side contains the abrasive grains or grit. The indicia typically includes a grade number, a product name or other identification. The grade number refers to the average particle size or the particle size distribution of the abrasive grain. Printing on the back side of some prior art abrasive articles is incidentally viewable from the front side due to the substrate being translucent. However, the information is not readable since it is in a mirror image. Such a product has been sold under the trademark IMPERIAL MICRO FINISHING FILM by Minnesota Mining and Manufacturing Company of St. Paul, Minnesota.

Abrasive articles are typically converted into a wide variety of forms such as sheets, discs, or belts. It is well known to attach the discs or sheets to a backup pad or support pad during use such as with a pressure sensitive adhesive.

When the indicia is disposed on the back side of the abrasive article, the information cannot be seen if the abrasive article is opaque. If the abrasive article is translucent, only a mirror image of the indicia is seen and it is difficult to discern the indicia. Information which cannot be read by viewing the front of the abrasive article has several disadvantages. First, an operator may want to check the particular grade of an abrasive article if the operator forgets which grade of abrasive article is being used when the abrasive article is attached to a back-up pad or support pad. Secondly, if a second operator or new operator uses the same abrasive article, the second or new operator may not know the particular grade of the abrasive article. In both instances, the operator has to remove the abrasive article from the pad in order to check the grade, the product identification, or the manufacturer. Then, if possible, the abrasive article is remounted on the back of the pad. If not, then a new abrasive article has to be attached to the pad. Another disadvantage relates to packaging of the abrasive article. Generally, in order to check the grade of the abrasive article, an abrasive article has to be removed from the package in order to view the indicia containing the grade designation.

The Steinhäuser et al. U.S. Patent 3,849,949 discloses a concatenation of coated abrasive discs in which the non-abrasive side of the disc contains a pressure sensitive adhesive.

The Shaw U.S. Patent 4,437,269 discloses an abrasive sheet having indicia carried on its rear face overlaid by a translucent textile material providing a surface engagable by hooks. The material being adhered to the indicia and information content remain discernible through the textile material.

The Ott U.S. Patent 4,609,581 discloses a coated

abrasive sheeting that is adhered to a backup pad by means of a loop material on the rear surface of the coated abrasive sheet. The loop material comprises a carrier web with a multiplicity of multi-filament yarns stitched into the coated abrasive backing with portions of the yarns providing the loops.

JP-A-59-19678 is directed to a method of producing a soft offset grinding wheel wherein letters and patterns appear on a surface of a substrate while grains are attached to the back of the substrate.

The present invention includes an abrasive sheet having a substrate with a front and back side. A layer of abrasive material is adhered to the front side of the substrate. Indicia are disposed on the substrate and are viewable from the front side of the substrate through the layer of abrasive material in a non-mirror image readable from left to right.

In one preferred embodiment, the indicia are disposed on the back side of a substrate that is light transmissive. In another preferred embodiment, the indicia are disposed on the front side of a substrate which may or may not be light transmissive.

Figure 1 is a cross-sectional view of an abrasive article of the present invention.

Figure 2 is a perspective view of an abrasive article of the present invention with indicia being disposed on the front surface thereof.

Figure 3 is a perspective view of the abrasive article of the present invention with indicia being disposed on a back surface thereof and readable from the front surface.

An abrasive article of the present invention is generally indicated at 20 in Figure 1. Abrasive article 20 includes a backing or substrate 22 which has a front side 24 and a back side 26. An abrasive material 28 is bonded to the front side 24 using a suitable adhesive 25 or other bonding means now known or later developed. Indicia 30 are positioned either on the front side 24 as illustrated in Figure 2 or on the back side 26 and viewable on the front side 24 as illustrated in Figure 3. In both instances, the indicia are viewable in a non-mirror image readable from left to right from the front side of the abrasive article.

As illustrated in Figure 2, the indicia 30 are applied to the front side 24 of the substrate 22. The indicia are preferably applied to the substrate 22 prior to adherence of the abrasive material 28. The indicia 30 are readable in a non-mirror image from left to right when viewed from the front side of the substrate 22.

As illustrated in Figure 3, the indicia 30 are positioned on the back side 26 of the substrate 22. The substrate 22 is light transmissive. By light transmissive is meant that the substrate is sufficiently transparent so that the indicia are viewable from the front side 24. Light transmissive substrates may be translucent, clear, transparent, or lucid. The indicia are applied to the back surface 26 in a mirror image, and therefore when viewed from the front side, the indicia are viewable in a non-mirror image readable from left to right. A layer of

colorant may also then be applied to the back side of the substrate over the indicia with the colorant layer being in a contrasting color to the indicia to enhance readability.

The indicia that are applied may include standard information that is typically found on an abrasive sheet. Such information includes the thickness of the sheet, the grit size, a product designation number, and manufacturer.

If the indicia are disposed on the front side 24, the substrate 22 may include either light transmissive or opaque materials such as paper, fiber, cloth, polymeric film, non-woven webs and combinations and treated versions thereof. If, however, the indicia are disposed on the back side 26, then the substrate must be at least translucent. Examples of such substrates include polymeric films such as polyester film, polyethylene film, and polypropylene film.

It is preferred that the front and/or back surface of the polymeric film contain a primer to increase the adhesion to the adhesive. The primer can be a surface alteration or chemical type primer. Examples of surface alterations include corona treatment and scuffing to increase the surface area. Examples of chemical type primers include ethyl acrylic acid copolymer and aziridine type materials as disclosed in U.S. Patent 4,749,617.

Preferably, the abrasive grains should also be light transmissive. Examples of typical abrasive grains used for abrasive material 28 include silicon carbide, aluminum oxide, white aluminum oxide, ceramic aluminum oxide, cerium oxide, diamond, cubic boron nitride, boron carbide and mixtures thereof. Although typical abrasive grains are somewhat opaque, the particles as a layer on the substrate still have light transmissive properties such that the indicia of the present invention clearly show through the layer of abrasive grains. Furthermore, in abrasive articles in which the abrasive grains are spaced from each other (sometimes referred to as "open coat"), the opacity of the individual abrasive grains is even less of an obstruction to viewing the indicia. Translucent abrasive grains are preferable such as white aluminum oxide to aid in the readability of the indicia from the front side of substrate 22.

The adhesive used to adhere the abrasive material to the substrate is preferably also light transmissive to aid in the readability of the indicia from the front side of the substrate 22. Examples of typical adhesives include polyester resins, urethane resins, acrylate resins, phenolic resins, glue, urea-formaldehyde resins, melamine resin and mixtures thereof. Such adhesives are applied at a thickness normally used for adhering abrasive material to a substrate. In one preferred embodiment, polyester film substrate approximately 70 microns thick was primed with an ethylene acrylic acid copolymer primer. An abrasive white aluminum oxide in the range of 1 to 100 microns in particle size was bound with a resole phenolic resin.

The indicia can be applied using a wide variety of well-known methods, which apply an ink onto the sub-

strate. Such methods include letterpress printing, lithographic printing, gravure printing, and screen printing. Letterpress printing is preferably used. Letterpress printing involves a printing element that consists of a raised surface, wherein the surface can be a line, a word, a point or any type of figure. In letterpress printing, the printing ink is applied to the raised surface and then pressed onto the substrate 22 to cause the printing ink to transfer the specified pattern onto the substrate 22. In lithographic printing, an indirect image transfer is made where the inverse of the printing plate is transferred to the substrate 22. Lithographic printing is also known as offset printing or planographic printing. In gravure printing, a master tool or roll is engraved with minute wells. The printing ink fills these wells and the excess printing ink is removed by a doctor blade. The ink in the well is then transferred to the substrate 22. The size and the shape of the well determines the pattern on the substrate 22. In screen printing, the printing ink is brushed through a stencil image on a fine screen and then onto the substrate 22. The stencil image forms the pattern that is transferred to the substrate 22. More detailed information on printing techniques is found in Printing Inks, Kirth-Othmer Encyclopedia of Chemical Technology 19, 110-163 (3d ed. 1982) incorporated hereinafter by reference.

The abrasive article 20 is produced into a wide variety of forms such as sheets, discs, or belts. The discs or sheets are attached to a back-up pad 31 that drives abrasive article 20 to abrade a work piece (not shown) as illustrated in Figure 1. The back-up pad is used to support the abrasive article 20 during abrading. The back-up pad can be made from any material, although it is preferred that the material have at least some elasticity so that the material flexes during the abrading process. Examples of suitable materials include metal, rubber such as neoprene rubber, butyl nitrile rubber, plastics such as thermoplastics including nylon, polypropylene, acrylonitrile butadiene styrene copolymer, thermosetting plastics, and reinforced plastics, and polyurethane foam. The back-up pad is generally circular in nature and ranges in diameter from 1 to 40 cm and preferably in the range of 5 to 25 cm. Generally, the diameter of the abrasive article is slightly larger than the diameter of the back-up pad. By slightly larger is meant that the diameter of the abrasive article is between about 0.1 mm to about 2 mm larger than the back-up pad.

In one embodiment of the present invention, a pressure sensitive adhesive is applied to the back side 26 of the substrate 22 to allow the abrasive article 20 to be easily attached to the pad. The pressure sensitive adhesive must have sufficient adhesive strength to secure the coated abrasive to a support pad during use. Representative examples of pressure sensitive adhesives suitable for this invention include latex crepe, rosin, acrylic polymers and copolymers such as polybutylacrylate, polyacrylate ester, vinyl ethers such as polyvinyl n-butyl ether, alkyd adhesives, rubber adhesives such

as natural rubber, synthetic rubber, chlorinated rubber, and mixtures thereof. A preferred pressure sensitive adhesive is an isooctylacrylate:acrylic acid copolymer.

The abrasive article 20 can also be attached to the pad 31 by a hook and loop fastening system. A hook and loop fastening system typically includes a loop portion 32 and a hook portion 34. A suitable hook and loop fastening system is sold by Minnesota Mining and Manufacturing Company of St. Paul, Minnesota. Preferably, the loop portion is laminated to the back side 26 of the substrate 22. The hook portion is then attached to the pad 31. The hooks then engage between the loops to attach the abrasive article to the pad. Of course, the loop portion can be attached to the pad, and the hook portion can be attached to the substrate. The loop material can be any type of textile material which has loops projecting therefrom. Examples of suitable textile materials include cotton, polyester, nylon, rayon, and the like. The loop materials can be multifilament yarns which are described in detail in Ott U.S. Patent 4,609,581, incorporated hereinafter by reference. Other types of loop materials are woven or knitted yarns having filament loops or curls extending from the surface. In one embodiment, the loop material is an opaque color to improve the readability of the indicia viewed from the front side of the substrate 22.

To produce an abrasive sheet material that will withstand a large number of disengagements from and reengagements with the hooks on the support pad it is necessary to apply an adhesive coating 36 such as thickened or foamed latex, extruded polymer film, or hot melt adhesive to adhere the loops to the back side 26. The hot melt adhesive or other bonding material adhering the loops to the back side 26 may be colored prior to lamination of the loops to further improve the readability of the indicia from the front side of the substrate 22.

Claims

1. An abrasive article (20) comprising:
 - a substrate (22) having a front side (24) and a back side (26);
 - a layer of abrasive material (28) bonded to the front side of the substrate; and
 - indicia (30) disposed on the substrate, substantially all the indicia being viewable from the front side of the substrate through the layer of abrasive material in a non-mirror image readable from left to right.
2. The abrasive article (20) of claim 1 wherein the substrate (22) is light transmissive and the indicia (30) are disposed on the back side of the substrate.
3. The abrasive article (20) of claim 1 wherein the substrate (22) is opaque and the indicia (30) are disposed on the front side of the substrate.
4. The abrasive article (20) of any of claims 1 to 3 wherein the layer of abrasive material (28) is light transmissive.
5. The abrasive article (20) of any of claims 1 to 4 and further comprising:
 - an adhesive (25) adhering the abrasive material (28) to the front side (24) of the substrate, the adhesive being light transmissive.
6. The abrasive article (20) of any of claims 1 to 5 and further comprising:
 - means for releasably attaching the article to a support pad (31).
7. The abrasive article (20) of claim 6 wherein the means for releasably attaching includes a hook and loop fastener having a first portion (34) containing a plurality of hooks and a second portion containing a plurality of loops (32) and wherein either the first or the second portion is attached to the back side of the substrate and wherein then the other first or second portion is attached to the support pad (31).
8. The abrasive article (20) of claim 7 and wherein the portion of the hook and loop fastener attached to the substrate is opaque.
9. The abrasive article (20) of claim 7 or 8 and further including:
 - an adhesive (36) for adhering the portion of the hook and loop fastener to the back side of the substrate (22).
10. The abrasive article (20) of claim 9 wherein the adhesive is opaque.
11. The abrasive article (20) of any of claims 1, 2 and 4 to 10 wherein the substrate (22) is a light transmissive polymeric film and the indicia are disposed on the back side of the polymeric film.
12. The abrasive article (20) of any of the preceding claims and further including a layer of colorant disposed over the indicia (30), the colorant being in contrasting color to the indicia.
13. The abrasive article (20) of any of the preceedings claims, wherein the light transmissive layer of abrasive particles (28) comprises particles selected from the group consisting essentially of silicon carbide, aluminum oxide, cerium oxide, diamond, cubic boron nitride and boron carbide.
14. The abrasive article (20) of any of claims 5 to 13, wherein the adhesive (25) is selected from the

group consisting essentially of polyester resin, urethane resin, acrylate resin, phenolic resin, glue, urea-formaldehyde resins and melamine resin.

15. The abrasive article (20) of any of the preceding claims wherein the substrate comprises a film selected from the group consisting essentially of polyester film, polyethylene film and polypropylene film.
16. The abrasive article (20) of any of the preceding claims, wherein the abrasive grains (28) are adhered to the substrate (22) by a cured adhesive (25).

Patentansprüche

1. Schleifartikel (20) mit:

einem Substrat (22) mit einer Vorderseite (24) und einer Rückseite (26);
einer mit der Vorderseite des Substrats verbundenen Schleifmaterialschiicht (28); und
auf dem Substrat angeordneten Kennzeichen (30), wobei im wesentlichen alle Kennzeichen von der Vorderseite des Substrats durch die Schleifmaterialschiicht als Nicht-Spiegelbild sichtbar und von links nach rechts lesbar sind.

2. Schleifartikel (20) nach Anspruch 1, wobei das Substrat (22) lichtdurchlässig ist und die Kennzeichen (30) auf der Rückseite des Substrats angeordnet sind.

3. Schleifartikel (20) nach Anspruch 1, wobei das Substrat (22) opak ist und die Kennzeichen (30) auf der Vorderseite des Substrats angeordnet sind.

4. Schleifartikel (20) nach einem der Ansprüche 1 bis 3, wobei die Schleifmaterialschiicht (28) lichtdurchlässig ist.

5. Schleifartikel (20) nach einem der Ansprüche 1 bis 4, ferner mit:

einem Haftmittel (25) durch das das Schleifmaterial (28) an der Vorderseite (24) des Substrats haftet, wobei das Haftmittel lichtdurchlässig ist.

6. Schleifartikel (20) nach einem der Ansprüche 1 bis 5, ferner mit einer Einrichtung zum lösbaren Anbringen des Schleifartikels an einem Haltekissen (31).

7. Schleifartikel (20) nach Anspruch 6, wobei die Einrichtung zum lösbaren Anbringen aufweist: eine Haken- und Schlaufenbefestigungseinrichtung mit einem ersten Abschnitt (34), der mehrere Haken

aufweist, und einem zweiten Abschnitt, der mehrere Schlaufen (32) aufweist, und wobei der erste oder der zweite Abschnitt an der Rückseite des Substrats und der andere Abschnitt am Haltekissen (31) angebracht ist.

8. Schleifartikel (20) nach Anspruch 7, wobei der am Substrat angebrachte Abschnitt der Haken- und Schlaufenbefestigungseinrichtung opak ist.

9. Schleifartikel (20) nach Anspruch 7 oder 8, ferner mit:

einem Haftmittel (36) zum Anhaften des Abschnitts der Haken- und Schlaufenbefestigungseinrichtung an der Rückseite des Substrats (22).

10. Schleifartikel (20) nach Anspruch 9, wobei das Haftmittel opak ist.

11. Schleifartikel (20) nach einem der Ansprüche 1, 2 und 4 bis 10, wobei das Substrat (22) ein lichtdurchlässiger Polymerfilm ist und die Kennzeichen auf der Rückseite des Polymerfilms angeordnet sind.

12. Schleifartikel (20) nach einem der vorangehenden Ansprüche, ferner mit einer über den Kennzeichen (30) angeordneten Färbemittelschiicht, die in einer Kontrastfarbe bezüglich der Kennzeichen ausgebildet ist.

13. Schleifartikel (20) nach einem der vorangehenden Ansprüche, wobei die lichtdurchlässige Schleifmittelschiicht (28) Partikel aufweist, die aus einer Gruppe ausgewählt werden, die im wesentlichen Siliziumcarbid, Aluminiumoxid, Zeroxid, Diamant, kubischem Bornitrid und Borcarbid aufweist.

14. Schleifartikel (20) nach einem der Ansprüche 5 bis 13, wobei das Haftmittel (25) aus einer Gruppe ausgewählt wird, die im wesentlichen Polyesterharz, Urethanharz, Acrylatharz, Phenolharz, Leim, Harnstoff-Formaldehyd-Harz und Melaminharz aufweist.

15. Schleifartikel (20) nach einem der vorangehenden Ansprüche, wobei das Substrat einen Film aufweist, der aus einer Gruppe ausgewählt wird, die im wesentlichen Polyesterfilm, Polyethylenfilm und Polypropylenfilm aufweist.

16. Schleifartikel (20) nach einem der vorangehenden Ansprüche, wobei das Schleifmaterial (28) durch ein aushärtendes Haftmittel (25) am Substrat (22) angebracht ist.

Revendications

1. Article abrasif (20) comprenant :

un substrat (22) possédant une face avant (24) 5
et une face arrière (26);
une couche d'un matériau abrasif (28) fixé à la
face avant du substrat; et
des indices (30) disposés sur le substrat, 10
essentiellement tous les indices pouvant être
vus à partir de la face avant du substrat à tra-
vers la couche de matériau abrasif, dans une
image non réfléchie pouvant être lue de gau-
che à droite.

2. Article abrasif (20) selon la revendication 1, dans
lequel le substrat (22) transmet la lumière et les
indices (30) sont disposés sur la face arrière du
substrat.

3. Article abrasif (20) selon la revendication 1, dans
lequel le substrat (22) est opaque et les indices (30)
sont disposés sur la face avant du substrat.

4. Article abrasif (20) selon l'une quelconque des
revendications 1 à 3, dans lequel la couche de
matériau abrasif (28) transmet la lumière.

5. Article abrasif (20) selon l'une quelconque des
revendications 1 à 4, comprenant en outre :

un adhésif (25) fixant par adhérence le maté-
riau abrasif (28) à la face avant (24) du subs-
trat, l'adhésif transmettant la lumière.

6. Article abrasif (20) selon l'une quelconque des
revendications 1 à 5 et comprenant en outre :

des moyens pour fixer de façon détachable
l'article à un bloc de support (31).

7. Article abrasif (20) selon la revendication 6, dans
lequel les moyens de fixation détachable compren-
nent un système de fixation à crochets et boucle-
ttes possédant une première partie (34) contenant 45
une pluralité de crochets, et une seconde partie
contenant une pluralité de bouclettes (32), et dans
lequel la première ou seconde partie est fixée à la
face arrière du substrat, et dans lequel l'autre de la
première ou seconde partie est alors fixée au bloc 50
de support (31).

8. Article abrasif (20) selon la revendication 7 et dans
lequel la partie du dispositif de fixation à crochets et
bouclettes, fixé au substrat, est opaque.

9. Article abrasif (20) selon la revendication 7 ou 8, et
comprenant en outre :

un adhésif (36) pour fixer la partie du dispositif
de fixation à crochets et bouclettes à la face
arrière du substrat (22).

10. Article abrasif (20) selon la revendication 9, dans
lequel l'adhésif est opaque.

11. Article abrasif (20) selon l'une quelconque des
revendications 1, 2 et 4 à 10, dans lequel le substrat
(22) est un film polymère transparent pour la
lumière et les indices sont disposés sur la face
arrière du film polymère.

12. Article abrasif (20) selon l'une quelconque des
revendications précédentes et comprenant en outre
une couche d'un colorant disposée au-dessus des
indices (30), le colorant ayant une couleur qui con-
traste avec les indices.

13. Article abrasif (20) selon l'une quelconque des
revendications précédentes, dans lequel la couche,
qui transmet la lumière, de particules abrasives
(28) comprend des particules sélectionnées dans
le groupe constitué essentiellement par du carbure
de silicium, de l'oxyde d'aluminium, de l'oxyde de
cérium, du diamant, du nitrure de bore cubique et
du carbure de bore.

14. Article abrasif (20) selon l'une quelconque des
revendications 5 à 13, dans lequel l'adhésif (25) est
choisi dans le groupe constitué essentiellement par
une résine polyester, une résine uréthane, une
résine acrylate et une résine phénolique, de la
colle, des résines urée - formaldéhyde et de la
résine mélamine.

15. Article abrasif (20) selon l'une quelconque des
revendications précédentes, dans lequel le substrat
comprend un film choisi dans le groupe compre-
nant essentiellement un film de polyester, un film de
polyéthylène et un film de polypropylène.

16. Article abrasif (20) selon l'une quelconque des
revendications précédentes, dans lequel les grains
abrasifs (28) sont fixés au substrat (22) au moyen
d'un adhésif durci (25).

