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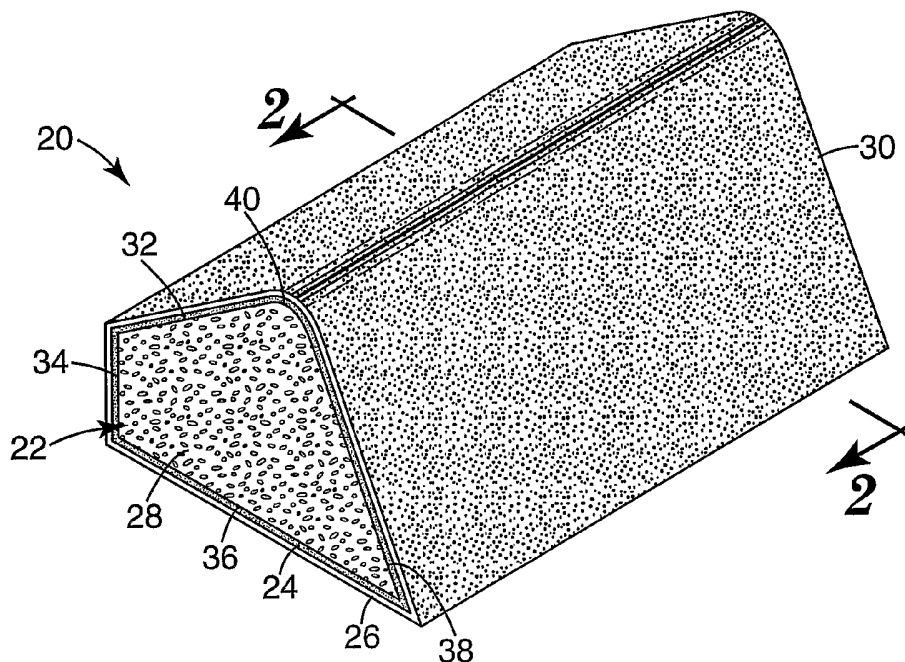
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[Continued on next page]

(54) Title: MILLWORK SANDING SPONGE



(57) **Abstract:** The present invention relates to a hand-held abrasive article. In one embodiment, the hand-held abrasive article includes an elongated resilient body having a perpendicular cross-sectional surface. The cross-sectional surface of the resilient body includes at least one internal right angle, at least one internal acute angle, at least one internal obtuse angle, and at least one curved portion. At least a portion of the resilient body is coated with abrasive.

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ning of each regular issue of the PCT Gazette.*

MILLWORK SANDING SPONGE

Background

The present invention relates to resilient flexible abrasive devices typically referred to as sanding sponges, and more particularly, to a hand-held, disposable abrasive article for sanding a variety of surface shapes and configurations.

Common sanding tasks calling for considerable detail work or access to small confined areas, or for sanding contoured surfaces, often require that the surfaces be hand sanded. Hand-held sanding devices for this purpose have essentially consisted of a sanding block for holding conventional sandpaper wrapped over the block. By using a sanding block as a sandpaper holder, hand-applied sanding forces on the sandpaper can be increased and more evenly distributed.

The difficulty with the above-mentioned prior sanding devices is the necessity of installing or wrapping a separate piece of sandpaper around the device. This installation or wrapping process presents some inconvenience to the user. For example, if the paper is improperly installed, it is susceptible to falling off. Also, the device requires the purchase of separate sheets of sandpaper that is a further inconvenience in terms of the amount of supplies needed.

U.S. Patent No. 4,887,396 (Lukianoff) discloses a hand-sized sanding device that eliminates the need for a separate sheet of sandpaper. The sanding device is provided with its own integral abrasive surfaces that can be manufactured at a sufficiently low cost to be disposable. The sanding device of Lukianoff can be conveniently used to hand sand a variety of standard, contoured, or shaped surfaces, such as trim or molding surfaces, and for projecting into exactly defined areas.

Another type of sanding device is the resilient flexible sanding sponge. Sanding sponges generally include a layer of abrasive particles adhered to a foam body by a flexible adhesive. One such sanding sponge is the 3M Small Area Sanding Sponge available from 3M, St. Paul, Minn. Typically, a user places the body against the palm of his or her hand and rubs the abrasive over a surface to be abraded. The flexible adhesive layer and the foam body permit the layer of abrasive to conform to the surface being abraded.

While such sanding sponges work well to abrade objects having flat surfaces these sponges are not well suited to sand a variety of contoured surfaces because the foam body and/or the layer of flexible adhesive is too stiff to conform to the contoured surface being abraded. A sanding sponge with high tear strength body layer is disclosed in U.S. Patent
5 No. 6,419,573 (Lise et al.).

Sanding sponges often only have a projecting right angle to sand perpendicular corners, and typically do not have a variety of projecting angles and curves. It may be necessary to sand surfaces that have contours other than a perpendicular corner. Especially when sanding millwork, it is often necessary to sand a variety of contoured surfaces.

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Summary

The present invention relates to a hand-held abrasive article. In one embodiment, the hand-held abrasive article includes an elongated resilient body having a perpendicular cross-sectional surface. The cross-sectional surface of the resilient body includes at least
15 one internal right angle, at least one internal acute angle, at least one internal obtuse angle, and at least one curved portion. At least a portion of the resilient body is coated with an abrasive.

In another embodiment, the hand-held abrasive article includes an elongated resilient body having a first end surface and a second end surface. The hand-held abrasive
20 article further includes a first planar major surface, a second planar major surface contiguous with the first planar major surface, a third planar major surface contiguous with the second planar major surface, a fourth planar major surface contiguous with the third planar major surface, and a curved surface contiguous with the fourth planar major surface and the first planar major surface. Each major surface and the curved surface extend
25 between the first end surface and second end surface. At least one of the first planar major surface, second planar major surface, third planar major surface, fourth planar major surface, or curved surface is abrasive.

In another embodiment, the hand-held abrasive article includes a resilient body having a first end surface and a second end surface. The hand-held abrasive article further
30 includes a first planar major surface, a second planar major surface, a third planar major surface, a fourth planar major surface, and a curved surface. Each major surface and the

curved surface extend between the first end surface and second end surface. The intersection of two of the planar major surfaces form an acute angle, the intersection of two of the planar major surfaces form an obtuse angle, and the intersection of two of the planar major surfaces form a right angle. At least one of the first planar major surface, second planar major surface, third planar major surface, fourth planar major surface, or curved surface is covered with an abrasive material.

Brief Description of the Drawings

FIG. 1 is a perspective view of a first embodiment of an abrasive article according to the present invention.

FIG. 2 is a sectional view through line 2-2 of the abrasive article of FIG. 1.

FIG. 3 is a sectional view of a second embodiment of an abrasive article according to the present invention.

FIG. 4 is a sectional view of a third embodiment of an abrasive article according to the present invention.

While the above-identified drawings and figures set forth one embodiment of the invention, other embodiments are also contemplated, as noted in the discussion. In all cases, this disclosure presents the invention by way of representation and not limitation. It should be understood that numerous other modifications and embodiments can be devised by those skilled in the art, which fall within the scope and spirit of this invention. The figures may not be drawn to scale. Like reference numbers, incremented by 100, have been used to denote like parts.

Detailed Description

FIGS. 1 and 2 illustrate the first embodiment of a resilient flexible sanding sponge according to the present invention. The sanding sponge 20 includes a resilient body 22. The body 22 may be an open celled foam material.

The body 22 is generally elongated along a longitudinal axis with a first end surface 28 and a second end surface 30. As shown in FIG. 1, the first and second end surfaces 28, 30 are generally planar and parallel to one another. However, the first and

second end surface 28, 30 may be non-planar and formed at any angle relative to the body 22.

The body 22 includes a first major surface 32, second major surface 34, third major surface 36, fourth major surface 38, and curved surface 40. As shown in FIG. 1, the first major surface 32, second major surface 34, third major surface 36, fourth major surface 38 are all generally planar and extend from the first end surface 28 to the second end surface 30. The first end surface 28 and second end surface 30 are generally perpendicular to the major surfaces. The first major surface 32 is contiguous with the second major surface 34. The second major surface 34 is contiguous with the third major surface 36. The third major surface 36 is contiguous with the fourth major surface 38.

The curved surface 40 is contiguous with both the fourth major surface 38 and the first major surface 32. The curved surface 40 also extends from the first end surface 28 to the second end surface 30.

FIG. 2 is a sectional view through line 2-2 of the sanding sponge 20 of FIG. 1. At the cross-section of the body 22, the sanding sponge 20 includes an obtuse angle 42, a right angle 44, an acute angle 46, and a curved portion 48. As shown in this embodiment, the sanding sponge 20 includes only one, or a single obtuse angle 42, a single right angle 44, and a single acute angle 46. Each internal angle 42, 44, and 46 is a measurement of the angle through the internal structure of the body 22, between the meeting of two generally planar major surfaces.

In the embodiment shown in FIGS. 1 and 2, the first major surface 32 and second major surface 34 meet to form the obtuse angle 42. The second major surface 34 and third major surface 36 meet to form the right angle 44. The third major surface 36 and fourth major surface 38 meet to form the acute angle 46.

The curved portion 48 corresponds to the curved surface 40 and is therefore adjacent and continuous with the first major surface 32 and fourth major surface 38. The curved portion 48 includes a radius of curvature 50.

A flexible adhesive 24 is used to adhere a layer of abrasive particles 26 to at least a portion of the body 22. The layer of abrasive particles 26 is shown in FIG. 1 as being adhered to the first major surface 32, second major surface 34, third major surface 36, fourth major surface 38, and curved surface 40. As shown in FIG. 1, the abrasive particles

26 are not adhered to the first end surface 28 and second end surface 30. The abrasive particles 26 may be adhered to only a portion of the body 22, or the abrasive particles 26 may be adhered to the entire body 22.

The flexible adhesive 24 bonds the layer of abrasive particles 26 to the body 22 and adheres the abrasive particles 26 together while being sufficiently flexible to conform with the body 22 to the contour of the surface to be abraded by the sanding sponge 20. A flexible adhesive formulation and method of applying it is described in U.S. Pat. No. 6,059,850, herein incorporated by reference, which can be used to form the layer of flexible adhesive 24.

A layer of hard anti-loading size coating can optionally extend over the flexible adhesive 24 and the abrasive particles 26 opposite the body 22. A hard anti-loading size coating formulated and applied using the method described in U.S. Pat. No. 6,059,850, herein incorporated by reference, is suitable for this purpose.

The body 22 may be constructed of open-cell polyurethane foam. One suitable open-cell polyurethane foam is OH58K Foam available from Carpenter Co. of Richmond, Virginia. In some embodiments, the body 22 may be constructed from high tear strength felted urethane foam. Further description of suitable body materials can be found in U.S. Pat. Application Publication 20040038634, herein incorporated by reference.

The abrasive particles 26 may be any of the abrasive particles described in U.S. Pat. No. 6,059,850, herein incorporated by reference, particularly including particles of aluminum oxide, ceramic, or silicon carbide in the range of about 36 to 400 grit.

Sanding sponges are typically made by coating a liquid adhesive over one or more surfaces of the body 22, depositing a layer of the abrasive particles 26 on the adhesive coated surface of the body 22, and then drying the flexible adhesive 24. Further description of the flexible adhesive and coating process is described in U.S. Patent Application 20040038634, which is herein incorporated by reference.

The user can hold any portion of the sanding sponge 20 that allows for using the necessary exterior projecting portion of the sanding sponge 20 to contact the work surface. The body 22 preferably has a cross section of such a size that fits comfortably into the palm of a user's hand. The cross sectional dimensions of the body 22 preferably are such that the fingers of the user's hand will not reach around or beyond the body 22 and thereby

greatly reduce the chances of the user experiencing discomfort in moving the sanding sponge 20 back and forth in use.

In one embodiment, at the cross-sectional dimension, the first major surface 32 has a length of approximately 2.0 to 2.5 inches, preferably about 2.2 inches, the second major surface 34 has a length of approximately 0.5 to 1.5 inches, preferably about 1.0 inches, the third major surface 36 has a length of approximately 3 to 4 inches, preferably about 3.5 inches, and the fourth major surface 38 has a length of approximately 2.0 to 2.5 inches, preferably about 2.2 inches.

In one embodiment, the obtuse angle is approximately 120 degrees, the acute angle is approximately 60 degrees, and the curved portion 48 has a radius of curvature of approximately 0.25 to 0.5 inches, preferably 0.375 inches.

The body 22 is preferably resiliently deformable (i.e., indentable) when squeezed by the thumb and fingers of the user's hand and thus is not likely to slip from the hand even if the fingers are wet or greasy. The body 22 is somewhat resiliently axially compressible and acts as a cushion between the user's hand and the work surface as the sanding sponge 20 is being pushed back and forth to perform the abrading function.

In one embodiment, at least one of the first major surface 32, second major surface 34, third major surface 36, fourth major surface 38, and curved surface 40 may be a structured surface. Structured surfaces are disclosed and described in U.S. Pat. Application "Resilient Structured Sanding Article," which is 3M file number 59662US002, filed on even dated, the disclosure of which is herein incorporated by reference.

FIG. 3 illustrates a cross sectional view of a second embodiment of a resilient flexible sanding sponge 120 according to the present invention. The sanding sponge 120 includes a body 122. The body 122 may be an open-celled foam material.

The body 122 is generally an elongated along a longitudinal axis, similar to that shown in FIG. 1, with a first end surface and a second end surface. The first and second end surfaces are generally planar and parallel to one another.

The body 122 includes a first major surface 132, second major surface 134, third major surface 136, fourth major surface 138, and curved surface 140. The first major surface 132, second major surface 134, third major surface 136, fourth major surface 138 are all generally planar and extend from the first end surface to the second end surface.

The first end surface and second end surface are generally perpendicular to the major surfaces. The first major surface 132 is contiguous with the second major surface 134. The second major surface 134 is contiguous with the third major surface 136. The third major surface 136 is contiguous with the fourth major surface 138. The curved surface 140 is
5 contiguous with both the fourth major surface 138 and the first major surface 132.

At the cross-section of the body 122, the sanding sponge 120 includes an obtuse angle 142, a right angle 144, an acute angle 146, and a curved portion 148. Each internal angle 142, 144, and 146 is a measurement of the angle through the internal structure of the body 122 between the meeting of two generally planar major surfaces.

10 In the embodiment shown in FIG. 3, the first major surface 132 and second major surface 134 meet to form the right angle 144. The second major surface 134 and third major surface 136 meet to form the acute angle 146. The third major surface 136 and fourth major surface 138 meet to form the obtuse angle 142. The curved portion 148 corresponds to the curved surface 140 and is therefore adjacent and continuous with the
15 first major surface 132 and fourth major surface 138. The curved portion 148 includes a radius of curvature 150.

A flexible adhesive 124 is used to adhere a layer of abrasive particles 126 to at least a portion of the body 122. The layer of abrasive particles 126 is shown in FIG. 3 as being adhered to the first major surface 132, second major surface 134, third major surface
20 136, fourth major surface 138, and curved surface 140. In one embodiment, at least one of the first major surface 132, second major surface 134, third major surface 136, fourth major surface 138, and curved surface 140 may be a structured surface.

FIG. 4 illustrates a cross sectional view of a third embodiment of a resilient flexible sanding sponge 220 according to the present invention. The sanding sponge 220 includes a
25 body 222. The body 222 may be an open-celled foam material.

The body 222 is generally an elongated along a longitudinal axis, similar to that shown in FIG. 1, with a first end surface and a second end surface. The first and second end surfaces are generally planar and parallel to one another.

The body 222 includes a first major surface 232, second major surface 234, third
30 major surface 236, fourth major surface 238, and curved surface 240. The first major surface 232, second major surface 234, third major surface 236, fourth major surface 238

are all generally planar and extend from the first end surface to the second end surface. The first end surface and second end surface are generally perpendicular to the major surfaces. The first major surface 232 is contiguous with the second major surface 234. The second major surface 234 is contiguous with the third major surface 236. The third major surface 236 is contiguous with the fourth major surface 238. The curved surface 240 is contiguous with both the fourth major surface 238 and the first major surface 232.

At the cross-section of the body 222, the sanding sponge 220 includes an obtuse angle 242, a right angle 244, an acute angle 246, and a curved portion 248. Each internal angle 242, 244, and 246 is a measurement of the angle through the internal structure of the body 222 and between the meeting of two generally planar major surface.

In the embodiment shown in FIG. 4, the first major surface 232 and second major surface 234 meet to form the right angle 244. The second major surface 234 and third major surface 236 meet to form the obtuse angle 242. The third major surface 236 and fourth major surface 238 meet to form the acute angle 246.

The curved portion 248 corresponds to the curved surface 240 and is therefore adjacent and continuous with the first major surface 232 and fourth major surface 238. The curved portion 248 includes a radius of curvature 250.

A flexible adhesive 224 is used to adhere a layer of abrasive particles 226 to at least a portion of the body 222. The layer of abrasive particles 226 is shown in FIG. 4 as being adhered to the first major surface 232, second major surface 234, third major surface 236, fourth major surface 238, and curved surface 240. The abrasive particles 226 are not adhered to the first end surface and second end surface. However, the abrasive particles may be adhered to the entire body 222 or only a portion of the body 222. In one embodiment, at least one of the first major surface 232, second major surface 234, third major surface 236, fourth major surface 238, and curved surface 240 may be a structured surface.

Although specific embodiments of this invention have been shown and described herein, it is understood that these embodiments are merely illustrative of the many possible specific arrangements that can be devised in application of the principles of the invention. Numerous and varied other arrangements can be devised in accordance with these principles by those of ordinary skill in the art without departing from the spirit and scope

of the invention. Thus, the scope of the present invention should not be limited to the structures described in this application, but only by the structures described by the language of the claims and the equivalents of those structures.

What is claimed is:

1. A hand-held abrasive article comprising:
an elongated resilient body having a perpendicular cross-sectional surface;
5 wherein the cross-sectional surface of the resilient body comprises:
at least one internal right angle;
at least one internal acute angle; and
at least one internal obtuse angle; and
at least one curved portion;
10 wherein at least a portion of the resilient body is coated with abrasive.
2. The hand-held abrasive article of claim 1, wherein the cross sectional surface comprises:
a single internal right angle.
- 15 3. The hand-held abrasive article of claim 1, wherein the cross sectional surface comprises:
a single internal acute angle.
4. The hand-held abrasive article of claim 1, wherein the cross sectional surface comprises:
a single internal obtuse angle.
20
5. The hand-held abrasive article of claim 1, wherein the cross sectional surface comprises:
a single internal right angle;
a single internal acute angle; and
a single internal obtuse angle.
25
6. The hand-held abrasive article of claim 5, wherein the single internal acute angle is
approximately 60 degrees and the single internal obtuse angle is approximately 120
degrees.
- 30 7. The hand-held abrasive article of claim 1, wherein the entire elongated resilient body is
coated with abrasive.

8. The hand-held abrasive article of claim 1, wherein the elongated resilient body further comprises:

a first end; and

5 a second end, spaced from the first end;

wherein the first end and second end are substantially planar and parallel to one another and perpendicular to the elongated resilient body.

10 9. The hand-held abrasive article of claim 1, wherein the elongated resilient body further comprises:

a first planar major surface;

a second planar major surface;

a third planar major surface;

a fourth planar major surface; and

15 a curved surface.

10. The hand held abrasive article of claim 9, wherein:

the second planar major surface is contiguous with the first planar major surface;

the third planar major surface is contiguous with the second planar major surface;

20 the fourth planar major surface is contiguous with the third planar major surface;

the curved surface is contiguous with the fourth planar major surface and the first planar major surface.

11. The hand-held abrasive article of claim 10, wherein:

25 the intersection of the second planar major surface with the first planar major surface forms the obtuse angle;

the intersection of the third planar major surface with the second planar major surface forms the right angle; and

30 the intersection of the fourth planar major surface with the third planar major surface forms the acute angle.

12. The hand-held abrasive article of claim 11, wherein:

a cross-sectional length of the first planar major surface is at least about 2 inches;

a cross-sectional length of the second planar major surface is at least about 0.5 inches;

5 a cross-sectional length of the third planar major surface is at least about 3 inches;

a cross-sectional length of the fourth planar major surface is at least about 2 inches;

the curved portion has a radius of curvature of at least about 0.25 inches; and

the elongated resilient body comprises an overall length from about 2 inches to about 10 inches.

10 13. The hand-held abrasive article of claim 1, wherein the resilient body comprises an open-celled foam material.

14. A hand-held abrasive article comprising:

15 an elongated resilient body having a first end surface and a second end surface;

a first planar major surface extending between the first end surface and second end surface;

a second planar major surface extending between the first end surface and second end surface and contiguous with the first planar major surface;

20 a third planar major surface extending between the first end surface and second end surface and contiguous with the second planar major surface;

a fourth planar major surface extending between the first end surface and second end surface and contiguous with the third planar major surface;

25 a curved surface extending between the first end surface and second end surface and contiguous with the fourth planar major surface and the first planar major surface;

wherein at least one of the first planar major surface, second planar major surface, third planar major surface, fourth planar major surface, or curved surface is abrasive.

15. The hand-held abrasive article of claim 14, wherein the elongated resilient body has a transverse cross-section comprising:

at least one internal right angle;

at least one internal acute angle; and

5 at least one internal obtuse angle.

16. The hand-held abrasive article of claim 15, wherein:

the intersection of the first planar major surface and the second planar major surface forms the obtuse angle;

10 the intersection of the second planar major surface and the third planar major surface forms the right angle;

the intersection of the third major planar surface and the fourth planar major surface forms the acute angle.

15 17. The hand-held abrasive article of claim 16, wherein:

the acute angle is approximately 60 degrees; and

the obtuse angle is approximately 120 degrees.

18. The hand-held abrasive article of claim 14, wherein the elongated resilient body
20 comprises an open-celled foam material.

19. The hand-held abrasive article of claim 14, wherein each of the first planar major surface, second planar major surface, third planar major surface, fourth planar major surface, and curved surface is abrasive.

25

20. A hand-held abrasive article comprising:

a resilient body having a first end surface and a second end surface;

a first planar major surface extending between the first end surface and second end surface;

30 a second planar major surface extending between the first end surface and second end surface;

a third planar major surface extending between the first end surface and second end surface;

a fourth planar major surface extending between the first end surface and second end surface;

5 a curved surface extending between the first end surface and second end surface;

wherein the intersection of two of the planar major surfaces form an acute angle, the intersection of two of the planar major surfaces form an obtuse angle, and the intersection of two of the planar major surfaces form a right angle;

10 wherein at least one of the first planar major surface, second planar major surface, third planar major surface, fourth planar major surface, and curved surface is covered with an abrasive material.

21. The hand-held abrasive article of claim 20, wherein:

15 the second planar major surface is contiguous with the first planar major surface;
the third planar major surface is contiguous with the second planar major surface;
the fourth planar major surface is contiguous with the third planar major surface;
the curved surface is contiguous with the fourth planar major surface and the first planar major surface.

20 22. The hand-held abrasive article of claim 22, wherein:

the intersection of the first planar major surface and the second planar major surface forms the obtuse angle;

the intersection of the second planar major surface and the third planar major surface forms the right angle;

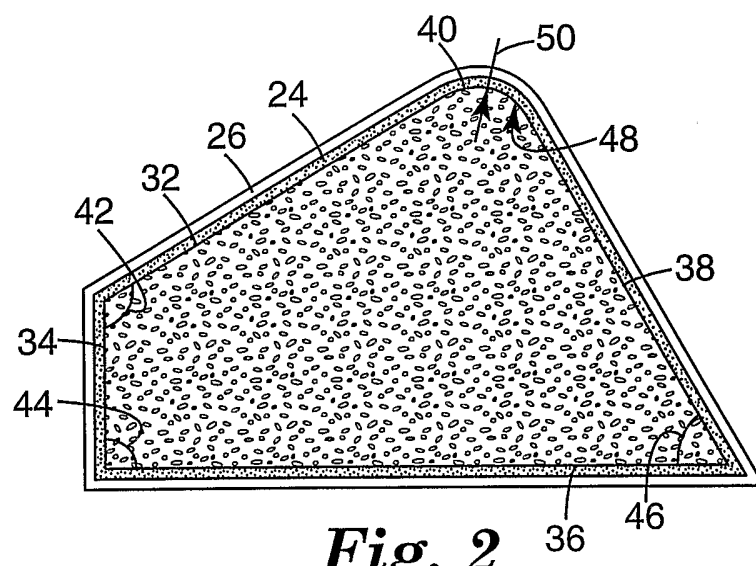
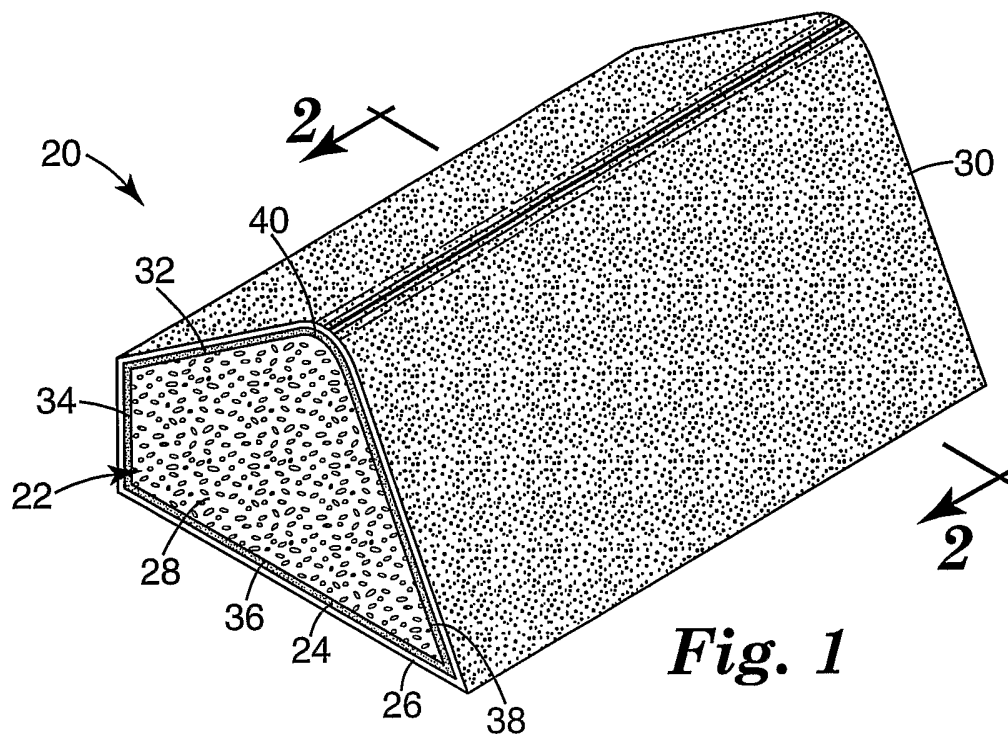
25 the intersection of the third major planar surface and the fourth planar major surface forms the acute angle.

23. The hand-held abrasive article of claim 22 wherein:

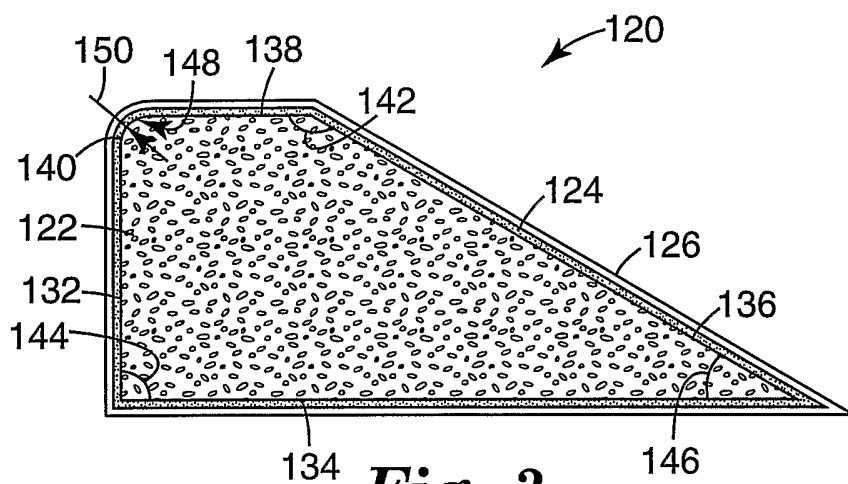
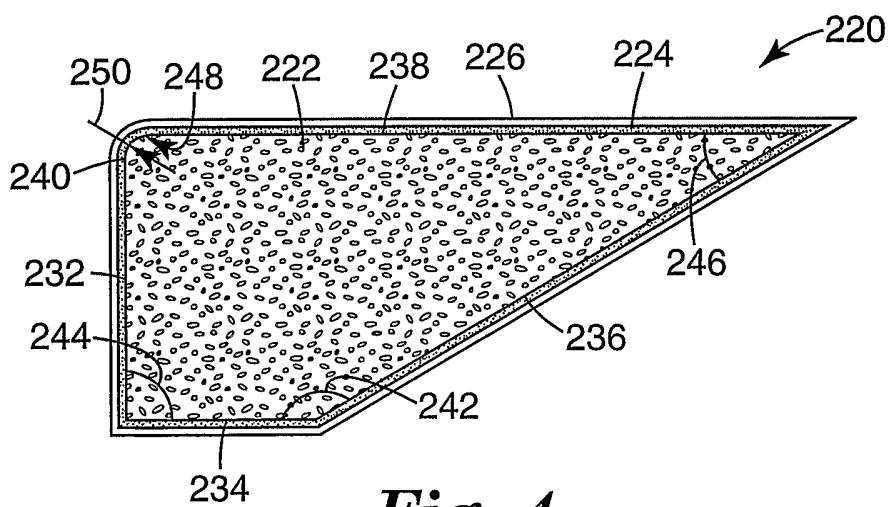
the acute angle is approximately 60 degrees.

30 the obtuse angle is approximately 120 degrees.

24. The hand-held abrasive article of claim 20, wherein the first planar major surface, second planar major surface, third planar major surface, fourth planar major surface, and curved surface is abrasive.
- 5 25. The hand-held abrasive article of claim 20, wherein the resilient body comprises an open-celled foam material.

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*Fig. 3**Fig. 4*

INTERNATIONAL SEARCH REPORT

International application No

US2005/040549

A. CLASSIFICATION OF SUBJECT MATTER

B24D15/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B24D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2004/038634 A1 (MCCARTHY KEVIN J) 26 February 2004 (2004-02-26) the whole document	1-25
Y	US 4 887 396 A (LUKIANOFF ET AL) 19 December 1989 (1989-12-19) cited in the application the whole document	1-25



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
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Date of the actual completion of the international search

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Date of mailing of the international search report

01/03/2006

Name and mailing address of the ISA/

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Zeckau, A

INTERNATIONAL SEARCH REPORT

information on patent family members

International application No

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2004038634 A1	26-02-2004	AU 2003243775 A1 EP 1536921 A1 JP 2005536367 T WO 2004018152 A1	11-03-2004 08-06-2005 02-12-2005 04-03-2004
US 4887396 A	19-12-1989	WO 9001398 A1	22-02-1990