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SCOURING BALL

This invention relates to scouring articles formed of lofty, low-density, nonwoven abrasive product, and, more specifically, to a novel scouring ball formed of slit segments of such nonwoven abrasive product fastened together under compression at their centers.

The use of lofty, fibrous, nonwoven abrasive products for scouring pots and pans is well known. These products are typically lofty, nonwoven mats formed from randomly disposed crimped staple fibers which are bonded at points where they intersect and contact each other with a binder which contains abrasive. One highly commercially successful embodiment of such a pad is sold under the registered trademark "Scotch-Brite" by the 3M Company of St. Paul, Minnesota.

Lofty, nonwoven abrasive pads can be prepared by the method disclosed by Hoover et al (Great Britain Patent No. 884,204). These pads are especially suited for pot and pan scouring because of their ability under normal conditions to be used for relatively long periods of time without clogging or filling. After use, they can be readily cleaned upon simple flushing with water, dried and left for substantial periods of time, and then reused.

While these pads are available in any of a variety of shapes, e.g., rectangular, circular, dumb-bell and trapezoidal, they are generally planar, i.e., of uniform thickness. There has been expressed a desire by the consumer for a more bulky nonwoven abrasive product that would substantially completely fill the hand of the

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user.

The present invention is directed at the provision of a scouring pad substantially in the shape of a highly conformable ball, forming a desirably bulky pad which may be grasped by the user to scour kitchen utensils and for other uses. The pad of the invention is comprised of a plurality of radially slit, regular-shaped, planar segments of conformable, lofty, low-density, nonwoven abrasive product fastened together under compression at centre points. Slitting is such that lobes in the same segment are capable of being alternatively positioned at least temporarily above and below the plane of the segment. The total array of lobes in the pad defines the ball shape.

More specifically, a scouring pad according to the invention is substantially in the shape of a highly conformable ball and comprises a plurality of radially slit, regular-shaped, planar segments of conformable, lofty, low-density, nonwoven abrasive product arranged in a stack and fastened together under compression at their centres with fastening means, the stack having in the uncompressed state a thickness to average diameter ratio in the range of 1:1 to 1:3, each segment being slit along lines extending from the outer edge toward its centre in the average range of 10% to 80% of the length of a said line to provide 5 to 12 radially disposed equally spaced slits which define a plurality of radially aligned lobes having a width of at least 3/16 inch (about

4.8 mm) at the narrowest point, lobes in the same segment being capable of being alternatively at least temporarily positioned above and below the plane of such segment, whereby the total array of lobes in said pad defines said ball shape.

The invention will now be described by way of example and with reference to the accompanying drawing, wherein like reference numerals refer to like parts in the various views, and in which:

Figure 1 is a plan view of the scouring pad of the present invention;

Figure 2 is a cross-sectional view of the scouring pad shown in Figure 1 taken through the centre of the pad;

Figure 3 is a plan view of one slit segment of lofty, nonwoven abrasive product employed to make the scouring pad depicted in Figures 1 and 2;

Figure 4 is a plan view of a slit segment of lofty, nonwoven abrasive material showing an alternative pattern of slitting;

Figure 5 is a plan view of a slit segment of lofty nonwoven abrasive material showing an alternative pattern of slitting; and

Figure 6 is a sectional view of the scouring pad shown in Figure 1 including an elongate handle (not shown in section).

Referring now to the drawings, ball-shaped scouring pad 10 according to the present invention is provided by a stack of radially slit, regular-shaped, planar segments 11 fastened together under compression at their centres 12 by mechanical fastening device 13 which holds the centre portions of the segments 11 in a compressed state, thereby permitting lobes 14 defined by slits 15 to

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expand and assume a generally spherical shape.

The method of making scouring pad 10 involves first cutting segments 11 from sheet stock of lofty, nonwoven abrasive material. The segments may be simultaneously slit or slitting may be done in a separate operation. Slitting provides a pattern of radially aligned slits extending from outer edge 16 of segment 11 and extending from about 10% to 80% (preferably 30% to 70%) of the average radius of the segment. Slits 15 define therebetween fingers or lobes 14 in a radial array around the segment center 12. The number of slits may vary between about 5 to about 12 to provide a like number of lobes 14. The slits in each segment preferably extend to a point on an imaginary circle having a center at the segment center, but the slits may also terminate at various distances on either side of such circle. Each of lobes 14 will be fastened to the central portion of segment 11 by its narrowest part because of the manner of slitting. The narrowest part should therefore provide adequate attachment for the lobes to provide for long term scouring use. Preferably, the narrowest part which forms the point of attachment should be at least about 3/16 of an inch (about 4.8 mm).

Several segments are stacked to form a stack or pile of segments 11 with centers 12 aligned. The stack is then compressed, at least at the center portion, and a suitable fastening means is inserted to permanently hold the center portion of the stack in a compressed state. Compression of from about 75% to about 95% is preferred to

obtain the optimum deployment of the lobes as a ball shape.

Some care is required in selecting the appropriate thickness and the average diameter to obtain the proper deployment of lobes 14 to form a ball shape. For this purpose, the stack of segments should preferably be selected to have a thickness to average diameter ratio in the range of 1:1 to about 1:3, most preferably 1:1.25 to 1:2.50. Upon slitting as herein specified, an appropriately compressed stack of segments will form lobes which in the same segment are capable of being alternatively positioned at least temporarily above and below the plane of such segment thereby to define the ball shape by the total array. This characteristic is obtained by the appropriate slitting of the segments which permits slight frictional engagement between adjacent lobes because no material has been removed from along the slit lines. If material were removed from the segment along the slit lines, deployment of the lobes as described would not be possible.

Segments 11 will be regular-shaped and planar. That is, segments 11 may have a circular, polyhedron (e.g., square, hectagon, hexagon, heptagon, octagon, etc. shape), or other regular shape. The preferred shape for segment 11 is a hexagon, as shown in the drawing.

The lofty, nonwoven abrasive material from which segments 11 are formed is well known in the art and readily commercially available. Suitable lofty, nonwoven abrasive material is that sold under the registered trademark "Scotch-Brite" by the 3M Company of St. Paul, Minnesota. Suitable lofty, nonwoven abrasive material will have a

thickness on the order of 1/8 inch (about 3 mm) to about 1 inch (about 25 mm) and may vary from mildly abrasive to coarsely abrasive, depending upon use. The thickness and the average diameter of the segment 11 will vary, of course, upon the particular use for which the pad will be put. Outer diameters of a segment on the order of 2 inches (about 5 cm) to about 6 inches (about 15 cm) will be typical.

The fastening means may be any mechanical fastening device which is capable of holding the segments together under compression in the particular environment of use. An adequate fastening means is provided by a metal or rigid plastic rivet or by bonding the segments together with a bonding material. Bonding materials which are adequate include liquid curable adhesive compositions, hot melt adhesives, ultrasonic bonding which causes the thermoplastic fibers forming the lofty, nonwoven abrasive product to soften and adhere to one another, and the like. Other conventional fastening means known in the art will also be suitable.

Various modifications may be made in the scouring ball of the present invention without departing from the scope of the claims. For example, the fastening means may be secured at one end of an elongate handle as depicted in FIGURE 6 to provide a scouring brush which may be employed to scour the insides of bottles, various appliances, and for other uses. Additionally, the segments may be interleaved with layers of foam material to provide for specific properties. For example, the lofty, nonwoven abrasive

segments may be interleaved with layers of hydrophilic foam material to provide a greater water retention since the non-woven abrasive material has limited water retention.

The invention is further illustrated with reference to the following examples, of which Example 14 is outside the scope of the invention, and demonstrates an inferior product.

Example 1

Five hexagonal segments 1-1/2 inch (about 38 mm) on a side and 1/4 inch (about 6.4 mm) thick were formed of lofty, nonwoven abrasive product (sold under the registered Trade Mark "Scotch-Brite" scouring pad by the 3M Company of St. Paul, Minnesota) were radially slit to provide a pattern of twelve equally spaced slits, as shown in Figure 3 of the drawing. Each slit extended approximately 54% of the average radius of the segment from the edge toward the centre. The slit segments were stacked, a rivet was inserted and the centre segment of the stack was simultaneously compressed to about 12% of the uncompressed stack height. The rivet was secured to hold the centre portion of the stack in the compressed state. Thereafter, the resultant lobes were deployed to form a ball-shaped scouring pad.

Examples 2-17

Examples 2-17 were prepared of the same lofty, nonwoven abrasive product as that described in Example 1 with variations in the number of slits, the length of each slit, the average diameter, and the ratio of total stack thickness to average diameter. The variations in each of the scouring balls is noted in the Table below, as are comments with respect to each example.

Examples 1-17

Ex. No.	% Average Slit Length of Average Radius	Ratio of Total Thickness Average Diameter	Number of Slits	Average Diameter (in)	Average Diameter (cm)	Comments
1	54	1/1	12	2.81	7.13	Excellent ball shape, extremely dense
2	54	1/1.25	12	2.81	7.13	Excellent ball
3	54	1/1.41	12	2.81	7.13	Excellent ball
4	54	1/1.87	12	2.81	7.13	Excellent ball
5	54	1/2.14	12	3.75	9.53	Good ball
6	56	1/2.25	12	3.09	7.85	Good ball
7	80	1/2.31	12	3.75	9.53	Good ball, lobes somewhat weak
8	32	1/2.31	12	3.09	7.85	Good ball, slits could be deeper
9	16	1/2.31	12	3.09	7.85	Fair ball, slits could be deeper
10	56	1/2.31	6	3.09	7.85	Good ball, could be more slits
11	54	1/2.41	12	3.75	9.53	Good ball, could be thicker
12	11	1/2.73	12	3.75	9.53	Fair ball, total thickness could be increased
13	11	1/3	12	3.75	9.53	Fair ball, total thickness could be increased

Examples 1-17 (continued

Ex. No.	% Average Slit Length of Average Radius	Ratio of Total Thickness Average Diameter	Number of Slits	Average Diameter (in)	Average Diameter (cm)	Comments
14	56	1/4	12	3.09	7.85	Poor ball, needs to be thicker
15	32	1/2.31	6	3.09	7.85	Fair ball, slits could be deeper
16	70	1/2.31	12	3.75	9.53	Excellent ball
17	70	1/2.31	12	3.09	7.85	Excellent ball, lobes somewhat weak

CLAIMS

1. A scouring pad substantially in the shape of a highly conformable ball comprising a plurality of radially slit, regular-shaped, planar segments of conformable, lofty, low-density, nonwoven abrasive product arranged in a stack and fastened together under compression at their centres with fastening means, the stack having in the uncompressed state a thickness to average diameter ratio in the range of 1:1 to 1:3, each segment being slit along lines extending from the outer edge toward its centre in the average range of 10% to 80% of the length of a said line to provide 5 to 12 radially disposed equally spaced slits which define a plurality of radially aligned lobes having a width of at least 3/16 inch (about 4.8 mm) at the narrowest point, lobes in the same segment being capable of being alternatively at least temporarily positioned above and below the plane of such segment, whereby the total array of lobes in said pad defines said ball shape.

2. A pad according to Claim 1 wherein each segment is in the shape of a hexagon.

3. A pad according to Claim 2 wherein each segment is slit from each corner of the hexagon toward the centre.

4. A pad according to Claim 2 wherein each segment is slit from points on the outer edge of the hexagon midway between each corner toward the centre.

5. A pad according to any preceding Claim wherein each said slit extends 30-70% of the length of a said line.

6. A pad according to any preceding Claim wherein the thickness to average diameter ratio is in the range of 1:1.25 to 1:2.5.

7. A pad according to any preceding Claim including an elongate handle fastened at one end to the fastening means.

8. A scouring pad substantially as described herein with reference to Figures 1 to 3 of the accompanying drawings or modified as shown in any of Figures 4 to 6.

9. A scouring pad substantially as described in any of Examples 1 to 13 and 15 to 17 herein.

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