

July 7, 1953

J. R. O'NEIL, JR  
SANDING DISK ACCESSORY

2,644,280

Filed Sept. 13, 1950

2 Sheets-Sheet 1

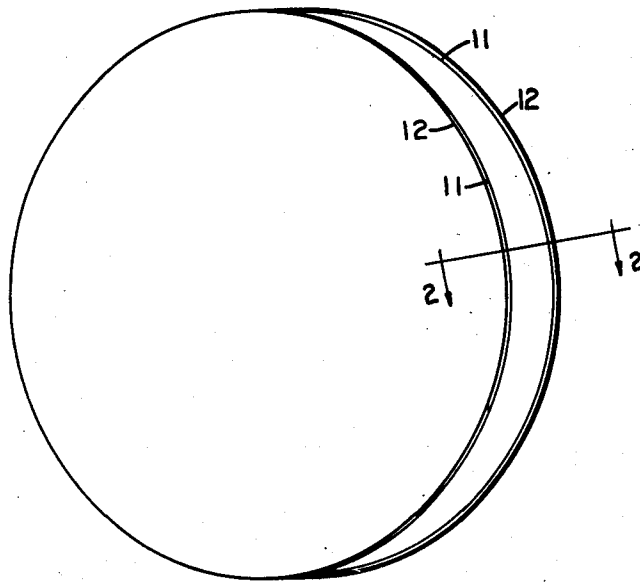


FIG. 1

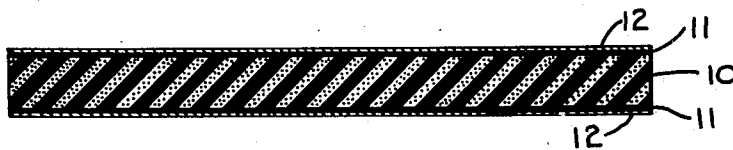


FIG. 2

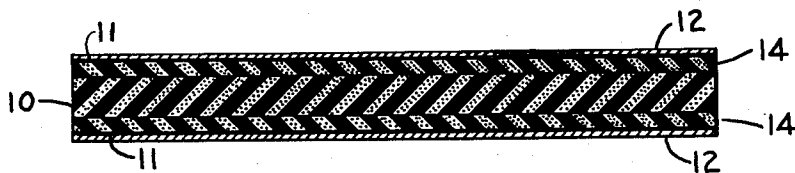


FIG. 3

INVENTOR.  
JOSEPH R. O'NEIL, JR.

BY *W. Poley*  
ATTORNEY

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2 Sheets-Sheet 2

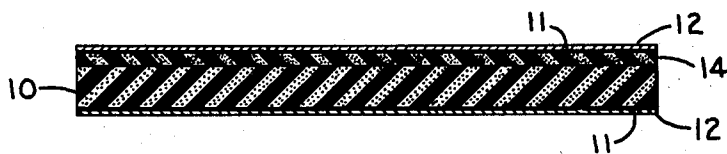


FIG. 4

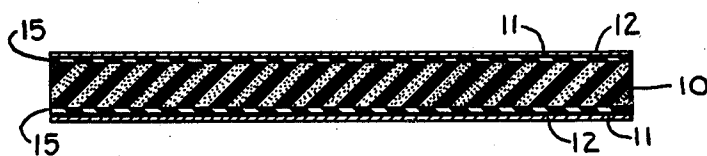


FIG. 5

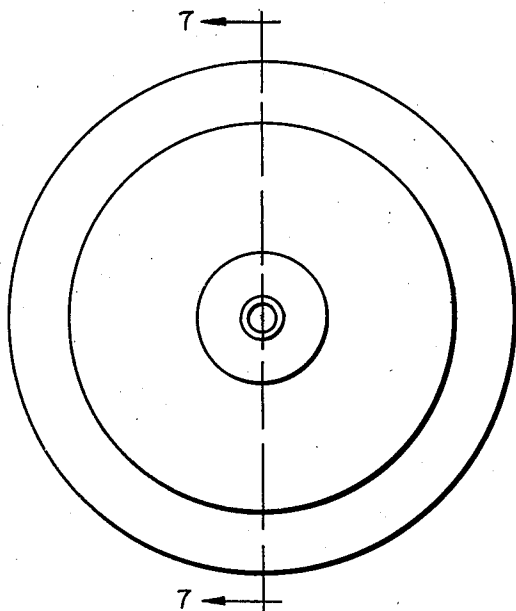


FIG. 6

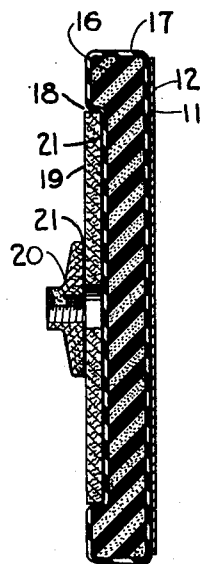


FIG. 7

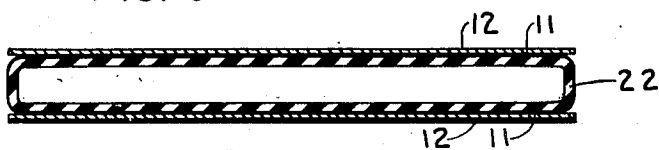


FIG. 8

INVENTOR.  
JOSEPH R. O'NEIL, JR.  
BY *W. J. Soley*  
ATTORNEY

## UNITED STATES PATENT OFFICE

2,644,280

## SANDING DISK ACCESSORY

Joseph R. O'Neil, Jr., Niagara Falls, N. Y., as-  
signor to The Carborundum Company, Niagara  
Falls, N. Y., a corporation of Delaware

Application September 13, 1950, Serial No. 184,613

5 Claims. (Cl. 51—195)

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This invention relates to a new and improved sanding disc accessory which is useful in conjunction with all types of rotary surfacing, polishing, sanding and grinding devices and the like.

In the use of all types of portable sanding and grinding equipment employing discs, buffs, grinding wheels and other abrasive or polishing media, it is normally the practice to secure the abrading or surfacing means to the machine spindle with or without a threaded sander pad by means of a threaded nut of one design or another, or to employ draw strings or similar means to maintain the position of the buffing media or the like. Practices of this type have been acceptable under many operating conditions, but from a method and equipment viewpoint, these various mounting techniques heretofore used have interfered with the development of unusually good surfaces and finishes since the threaded nut or comparable mounting has prevented the obtaining of a satisfactorily flat contact in substantially all cases. Even in those circumstances where the threaded nut is recessed, as in the use of specially designed sanding discs, there is a substantial unsupported depressed area to permit the recessing of the threaded nut referred to above. The use of such portable equipment employing coated abrasive discs or the like often presents the further problem of maintaining the abrasive medium in perfectly flat condition since the center may be drawn down excessively or the curvature of the sanding disc may be either convex or concave as mounted so as to produce high and low spots which interfere seriously with the finish to be obtained.

It is further noted that the use of such threaded nuts and/or draw strings requires the expenditure of a substantial amount of time in the replacement of the worn-out abrasive article or material on the spindle or shaft of the abrading device.

It is an object of the present invention to provide an improved sanding disc accessory which will constitute an improvement over the various mounting means heretofore employed as described above with a resultant improvement in the development of superior finishes.

It is a further object to provide a sanding disc accessory of the aforesaid improved type which will offer additional improvements in respect of

(a) The time and effort required to replace the worn-out abrasive or surfacing means used therewith, and

(b) The uneven, drawn, curved or curled characteristics commonly produced with other types of conventional equipment and practices.

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In accordance with the present invention an improved sanding disc accessory is provided comprising a resilient cushion or pad of substantial thickness which is precoated on one or both flat sides with a pressure-sensitive adhesive cement, the cement being protected from the accretion or accumulation of dust and dirt by the attachment upon the pressure-sensitive adhesive-coated surface or surfaces of a removable layer or layers of thin protective sheet material. For example, a resilient layer of soft foam rubber approximately 1" in thickness is coated with pressure-sensitive adhesive cement on both sides, the one side being sufficiently coated to hold a conventional coated abrasive disc or buff or felt, or any sheet material to which abrasive particles are bonded, coated, included or applied in any manner whatsoever, while the other side is coated either over the entire surface, or concentrically only, to a sufficient degree to hold the article in a concentric position on a typical sander pad of rubber, sisal fibre or other conventional body material. The foam rubber or other type of porous or soft rubber body constituting at least the greater part of the overall thickness of the sanding pad as herein described is normally of extreme softness so as to provide the maximum amount of resilience or cushioning action for the abrasive or surfacing device with which it is used. For example, the foam rubber or other type of soft, resilient material used to make up the major part of the body of the present sanding pad should normally give a very low Shore durometer reading in the neighborhood of 5 to 10 or less, although under certain conditions of use such as sanding primer surfacers, sealers, and the like on flat surfaces, the basic body of the device can be so provided as to have higher durometer readings even as high as 50.

It is preferred to provide the sanding pads of the present invention with greater durability against breakdown which might be caused by frequent removal and replacement of the abrasive materials used therewith by constructing the sanding pad body of a composite of layers where-in the main body or thickness of the pad is composed of a foam or other porous or soft rubber of extremely low durometer reading, or in other words, a foam or other porous or soft rubber of maximum softness and compressibility, faced on one or both sides with a relatively thin layer of porous rubber of higher durometer reading, i. e., having greater stiffness and less compressibility, or a thin layer film or skin of soft rubber such as can be obtained by spraying the surface of the foam, porous or soft rubber making up the main

body of the article with a thin layer of natural or synthetic rubber latex or by the adhesive attachment of a thin layer of soft vulcanized, tough rubber such as a layer of soft polychloroprene.

Resilient sanding pads as above described can be made by preparing or obtaining foam rubber or otherwise porous rubber of suitable durometer reading in sheet form and dyeing or otherwise cutting disc shapes of the desired diameter from the selected sheet material. A surface layer of the desired thickness of stronger porous rubber or a film of soft rubber can be adhesively applied, when desired, to either or both surfaces before or after cutting the disc shaped pieces from the sheet material.

As an alternative to making the herein described sander pad from porous rubber sheet stock the desired pad body structure can be formed by a molding operation wherein the pad is molded directly to the desired shape in a suitable mold from natural or synthetic rubber of suitable composition to yield a porous rubber body structure of the desired softness and resilience.

A further modification of the present invention is the construction of a resilient, cushioning sander pad accessory in which the main porous or soft rubber body structure of the device is replaced by a substantially flat, circular, hollow, soft rubber bag of the desired diameter and thickness, the soft rubber bag being either inflated with air or other gas, or filled with fragments of porous or soft rubber. The outer flat surface or surfaces of the hollow bag is, as in the case of the foam rubber body structures described above, coated with pressure-sensitive adhesive which is in turn protected by a removable layer of thin protective sheet material.

The pressure-sensitive adhesive which is applied to one or both of the flat sides of the main body structure of the pad can be selected from the many conventional pressure-sensitive adhesive cements now available on the market or it can be one of the specific compositions described later herein, in either case, however, being an adhesive which will provide the necessary strength to hold the coated abrasive sander disc or other surfacing material to the front face of the pad during use, and, where the pressure-sensitive adhesive is also applied to the back side of the pad or cushion it will be of sufficient strength to hold the pad to the supporting sander head. Obviously, the pressure-sensitive adhesive used for one side of the pad may be the same or different from that employed on the opposing side. The pressure-sensitive adhesive can be applied by knife coating, brush coating, roll coating, spray coating or other means of coating common to the art. After the material is coated it is either air-dried or oven-dried, after which a thin layer of protective sheet material is attached to the pressure-sensitive adhesive-coated surface to protect it from the accumulation of dust and dirt and to permit convenient and satisfactory handling of the article.

In using the herein described pads the protective coating on the rear flat side of the pad is removed and the pad positioned as near center as possible on a conventional flexible sander head supporting pad of rubber, sisal fibre or other type, the pad being held in place by means of the exposed layer of pressure-sensitive adhesive. The protective coating of sheet material on the other side of the pad is then removed and the coated abrasive sheet material, or other surfacing me-

dium to be used therewith, is applied to the exposed pressure-sensitive adhesively-coated surface. As far as the herein described sander pad accessory is concerned it can be used under either wet or dry surfacing conditions depending entirely upon the nature of the polishing or surfacing media used in conjunction with the pad.

In order that the invention may be more clearly understood, reference is made to the drawing, in which:

Figure 1 is a perspective view of a foam rubber sander disc accessory made in accordance with the present invention;

Figure 2 is a vertical sectional view through the line 2—2 of Figure 1;

Figure 3 is a view similar to Figure 2 showing a modified form of sanding disc accessory;

Figure 4 is a view similar to Figure 2, showing a still further modification of the present invention;

Figure 5 is a view similar to Figure 2 showing still another modification of the present invention;

Figure 6 is a back plan view of a molded sanding disc accessory made in accordance with the present invention;

Figure 7 is a vertical sectional view through the line 7—7 of Figure 6; and

Figure 8 is a view similar to Figure 2, but showing a sanding disc accessory in which the main body structure is constructed of a hollow inflated soft rubber pad in place of the porous rubber body structures of the previously shown modifications.

Referring further to Figures 1 and 2 of the drawing, the simplest and most inexpensive type of sander disc pad which can be made following the practices and principles of the present invention is as shown and is composed of a circular resilient layer 10 of natural latex foam rubber of very low Shore durometer reading and approximately  $\frac{3}{4}$ " to 1" thickness. Although latex foam rubbers are preferred because of their greater softness, resilience and yieldability, the foam rubber can be replaced by a layer of soft vulcanized natural rubber or synthetic rubber such as polychloroprene when the pad is to be used where maximum softness and resilience are not required. The foam or soft rubber body structure 10 is coated on both flat sides with a layer of pressure-sensitive adhesive 11, which is shielded by a removable thin protective sheet material 12 such as disc shaped sheets of tough creped paper. However, any other relatively inexpensive protective sheet material can be used although it is preferred to use a material which will be creped or otherwise provided with a rugose surface so as to facilitate the removal of the protective sheet material when desired and at the same time permit a satisfactory and thorough protection to the pressure-sensitive adhesive. If desired, the protective sheet material on the one side of the body structure can be a layer of the abrasive-coated sheet material which is ultimately to be used in conjunction with the sander disc accessory pad.

By "pressure-sensitive adhesive" is meant an adhesive which under ordinary atmospheric conditions is tacky and non-drying and in a condition such that adhesion is secured by the application of slight pressure and without the necessity of activating the adhesive by solvents or otherwise treating it for firm adherence to, or

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removal from surfaces. Examples of such permanently tacky adhesive are as follows:

## Example I

|                                        | Per cent |
|----------------------------------------|----------|
| Ethyl cellulose, medium viscosity----- | 10-20    |
| "Paraplex" RG2 or RG5-----             | 80-90    |

"Paraplex" is an alkyd resin manufactured and sold by the Resinous Products Company of Philadelphia, Pa.

## Example II

|                 | Per cent |
|-----------------|----------|
| Rubber-----     | 80       |
| Rosin-----      | 16       |
| Zinc oxide----- | 4        |

## Example III

|                         | Per cent |
|-------------------------|----------|
| Pale crepe rubber-----  | 45       |
| Zinc oxide-----         | 35       |
| Hydrogenated rosin----- | 20       |

In these compositions, the rubber and the cellulose derivative provide strength to the adhesives while the resins and the zinc oxide make the adhesives tacky.

The adhesives are dissolved in a suitable solvent and applied in solution, the solvent being removed by evaporation.

A commercially available pressure-sensitive adhesive cement which has been found satisfactory in carrying out the present invention is that known and sold by the Flintkote Company under the trade-mark designation as "Syntex 11563EJ," and which is understood to be a pressure-sensitive adhesive based upon a mixture of an aqueous reclaimed rubber dispersion and a suitable rubber tackifying resin dispersion.

Other pressure-sensitive adhesive compositions which can be used in carrying out the present invention are those described in U. S. Reissue Patent No. 19,128 wherein the preparation and compositions of a number of suitable pressure-sensitive adhesives are fully described.

Although the sanding disc accessory pad shown in Figures 1 and 2 is highly satisfactory and renders commendable performance under many conditions of use and is often favored because of its relatively inexpensive structure, a preferred form of sanding disc accessory or pad made according to the present invention is that shown in Figure 3, which is more durable and therefore suitable for use under more exacting conditions. The pad shown in Figure 3 is of substantially the same overall thickness as that shown in Figures 1 and 2 and the main body structure of the pad is likewise composed of a layer 10 of natural latex foam rubber of very low Shore durometer reading. In other words, the layer of foam rubber 10 is very soft, highly compressible and resilient, and provides the article with a maximum cushioning ability. However, the foam rubber body structure is faced on both flat sides with relatively thin layers, usually from  $\frac{1}{8}$  to  $\frac{1}{4}$  of an inch each in thickness permanently bonded to the main body structure 10. These surface layers 14 have a higher Shore durometer hardness and are therefore less compressible, stronger and more resistant to breakdown than the main body layer 10 and as facings protect the main body structure from destruction during the course of the removal of the protective sheet material or operating sheet material from the upper surface as well as protecting the pad during its removal from the permanent sander head supporting

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disc which latter may be attached to the back of the pad by means of a suitable adhesive cement of either the permanent or pressure-sensitive type. One material which has been found highly satisfactory for facing purposes is a sheet of polychloroprene closed cell porous rubber  $\frac{1}{8}$  of an inch in thickness. Figure 4 shows a similar pad differing from that shown in Figure 3 only in that the protective facing of polychloroprene or other relatively tough porous rubber facing is provided on the top side only of the accessory pad. Again, the sisal fibre or other permanent supporting disc can be attached to the back side of the accessory pad by a permanent adhesive or by means of a pressure-sensitive adhesive, either as the accessory pad is supplied or later by the user.

Sanding disc accessory pads of the type shown in Figures 3 and 4 have been found capable of use under rotating speeds as high as 2500 revolutions per minute although the recommended operating speeds for sanding operations involving the use of such pads or cushions are between 900 and 1300 revolutions per minute. Furthermore, discs of the described construction are of sufficient strength due to the facing layers 14 to permit repeated removal of worn out abrasive sheet material from the surface and replacement by new abrasive coated material without breakdown of the pad structure.

A modified form of sanding disc accessory pad such as that shown in Figure 5 can be made in which the main resilient body portion 10 of foam rubber is provided with surface facings 15 of soft rubber in place of the facings 14 of porous rubber embodied in the article of Figure 3. The thin soft rubber facings 15 of the article shown in Figure 5 can be applied to the foam rubber body on both sides as shown in Figure 5 or, if desired, the soft rubber facing may be applied to one side only of the foam rubber body. One manner of providing a soft rubber skin or facing layer is to apply a thin film of natural or synthetic rubber latex over the surface of the foam rubber and air-dry the thusly coated foam rubber disc in air followed by a suitable oven cure at 200° F. for 2 or more hours to set the adhesive latex film to a non-tacky condition. The resulting soft rubber coated pad is then coated with a layer of pressure-sensitive adhesive 11 which is allowed to air-dry an hour in air and then dried in an oven for 2 hours at approximately 200° F. in the manner described in connection with the method of making the previously described pads. The pressure-sensitive adhesive-coated surface is then protected by attaching the sheet or sheets of thin protective sheet material 12 which can be any of the protective sheet materials previously set forth and is preferably a creped paper or other crinkled fibrous material to facilitate its removal.

The foam rubber or other porous or soft rubber main body structures of the pads described above and shown in Figures 1-5, inclusive, have been obtained by dyeing or otherwise cutting the foam, porous or soft rubber from suitable foam, porous or soft rubber sheet stock in the form of circular discs of the desired diameter size. However, similar disc shapes can be alternatively obtained by a molding procedure wherein the disc shaped body structure of the pad is obtained directly by molding to the desired size and thickness. One specific modification of a molded foam or porous rubber pad made in accordance with the present invention and embodying cer-

tain additional structural features is that shown in Figures 6 and 7. As there shown the foam latex body portion 16 of the pad is molded directly to shape by filling a mold of the required shape with a natural or synthetic rubber latex composition which has been mechanically frothed or contains chemical foaming agents and which when cured or set in the mold will form a porous body structure conforming to the desired shape and in the course of its molding operation will be provided with an impervious tough rubber surface film or skin 17 entirely surrounding the central porous rubber body of the molded pad. Such molded pads can be made of the same simple disc shapes shown for the pads presented in Figures 1-5, inclusive, and can be likewise provided, if desired, with a sisal or other supporting pad of the same or lesser diameter permanently cemented to the back side of the pad by permanent or pressure-sensitive adhesive cement. The molded pads can also be provided, if desired, with a tapered side which tapers inwardly toward the back side of the disc so as to provide an added degree of yieldability to a narrow peripheral portion of the pad. However, the specific pad shown is featured by having the back face of the pad recessed to provide a central circular cavity 13 of sufficient depth to accommodate a latex impregnated sisal fibre reinforcing pad 19 to which is mounted a rigid threaded mounting flange 20. The sisal fibre pad 19 is also threaded to provide additional mounting security. The frontal face of the molded pad 16 is coated with a layer 11 of pressure-sensitive adhesive of the type and by the process described in connection with the pads made according to Figures 1-5, and similarly provided with an attached thin protective sheet material 12. The pad 19 is cemented or bonded in place by means of a layer 21 of rubber cement of any conventional type as well known in the art.

A still further modification of the present invention is the sanding disc accessory shown in Figure 8 in which the resilience or cushioning effect of the pad is obtained by means of a molded flat circular inflated soft rubber bag 22 and in which the flat faces of the inflated bag are coated with the same pressure-sensitive adhesive films used in the previous modifications, the pressure-sensitive adhesive being protected by attached layers 12 of protective sheet material. Instead of using a hollow inflated soft rubber bag as the main body of the pad the hollow bag may be filled with fragments of porous or soft rubber of sufficient softness and in sufficient quantity to provide the desired degree of softness and cushioning effect to the pad.

In making the various specific types of sander disc accessory pads hereinabove described wherein the main body portion of the pad is composed of a thick layer of porous or soft rubber most satisfactory results have been obtained with the use of a foam rubber made from natural and/or synthetic rubber latices. Such porous foam rubbers, which are made directly from the aqueous rubber latex possess the unusually high degree of softness and resilience, and maximum compressibility desired to provide the greatest amount of cushioning and yieldability in the final product. This high degree of resilience and compressibility are desirable so that the surfacing material will follow the contours of the work being surfaced with a minimum of scratching accompanied by a maximum efficiency in removing surface irregu-

larities and imparting a high degree of satisfactory and uniform surface to the finished article. Although for the above reasons it is preferred to use foam rubber for the main body portion of the herein described pads, chemically blown sponge rubbers or expanded rubbers, either natural or synthetic, can be used providing the material is of sufficient softness and compressibility. However, the various chemically blown or expanded sponge rubbers commonly available commercially are usually too stiff and lack the required resilience of maximum efficiency when incorporated in products made according to the present invention except for those instances where the conditions of use may be more severe or rugged or a lesser amount of cushioning effect is sought. A detailed description and explanation of the various foam rubbers which it is preferred to use in carrying out the present invention, together with an explanation of the differences between those foam rubbers and other types of chemically blown or expanded porous rubber products, is set forth in the India Rubber World, volume 121, No. 4, on pages 419-423.

Regardless of the specific type of rubber sanding disc accessory pad constructed in accordance with the various examples hereinabove set forth the pad offers the advantage of providing a smooth, uniformly even mounting surface for the polishing or sanding medium, which not only obviates the use of recessed threaded mounting nuts, circumferential draw strings and other previously known mounting devices and all their inherent disadvantages but the pads made according to the teachings herein moreover provide a most expeditious means of removing a worn-out polishing or sanding material when it has served its useful life and replacing it with a new surface sheet material with a minimum of effort and expenditure of time. Whenever necessary to do so the layer of pressure-sensitive adhesive used to provide such effective attachment can be restored to substantially its original effectiveness by an application of an additional thin layer of pressure-sensitive adhesive cement which is preferably one of an emulsion type, many of which are available on the market. One such pressure-sensitive adhesive which has been found satisfactory for such use and which can be applied by spraying technique is that known and sold by the Pierce and Stevens Company as Pierce and Stevens No. B9189 Cement.

The sanding disc accessory pads of the present invention have been found to be exceptionally effective when used in the sanding, final color coats and undercoats in the automotive manufacturing industry where a high finish is desired with a minimum of scratch pattern. The described pads have also been found satisfactory in feather edging work in the same industrial field. The described pads are not limited to the above uses, however, but are applicable with satisfactory results wherever dry or wet sanding is now done by hand or with reciprocating machines on putty, undercoats, final lacquer or enamel coats, force-dried finished coats and the like and can be used in the finishing of automobile bodies, furniture, radio and television cabinets, tile, tile board, wall board and elsewhere. As already pointed out the herein disclosed accessory pads are suitable for use not only in conjunction with various types of abrasive coated or abrasive included sheet materials but can also be used in conjunction with other surfacing elements such as buffs, felts, and other polishing materials.

Where the term "rubber" is used herein and in

the claims, it is intended to include by that term not only natural rubber derived from natural rubber latex, but to also include those various synthetic rubbers available commercially, such as the various butadiene-styrene copolymers, butadiene-acrylic nitrile copolymers, polychloroprene and the like either separately or combined or blended in various proportions with natural rubber.

Having described the invention in detail, it is desired to claim:

1. A sanding disc accessory comprising a circular composite pad comprising a main body portion of foam rubber faced on at least one side with a relatively thin layer of porous rubber of substantially higher Shore durometer reading, and having a layer of pressure-sensitive adhesive on at least that side of the pad having the porous rubber facing, said pressure-sensitive adhesive coated surface being protected from the accretion of dust and dirt by the attachment thereon of a removable layer of thin protective sheet material.

2. A sanding disc accessory according to claim 1, and having a resilient supporting pad adhesively secured to the rear face of said foam rubber body portion.

3. A sanding disc accessory comprising a circular composite pad comprising a main body portion of natural latex foam rubber faced on at least one side with a relatively thin layer of porous polychloroprene rubber of substantially higher Shore durometer reading, and having a layer of pressure-sensitive adhesive on at least that side of the pad having the polychloroprene facing, said pressure-sensitive adhesive coated surface being protected from the accretion of dust and dirt by the attachment thereon of a removable layer of thin protective sheet material.

4. A sanding disc accessory comprising a circular composite pad comprising a main body portion of foam rubber faced on at least one side with a relatively thin, tough layer of material having a Shore durometer reading substantially higher than that for the main body portion of the pad and a toughness substantially in excess of that of

the skin of a molded foam rubber body, and having a layer of pressure-sensitive adhesive on at least that side of the pad having the tough facing layer, said pressure-sensitive adhesive coated surface being protected from the accretion of dust and dirt by the attachment thereon of a removable layer of thin protective sheet material.

5. A sanding disc accessory comprising a circular composite pad comprising a main body portion of foam rubber faced on at least one side with a relatively thin layer of soft rubber of substantially higher Shore durometer reading than that of the main body portion of the pad and having a toughness substantially in excess of the toughness of the normal skin of a foam rubber molded article, and having a layer of pressure-sensitive adhesive on at least that side of the pad having the soft rubber facing, said pressure-sensitive adhesive coated surface being protected from the accretion of dust and dirt by the attachment thereon of a removable layer of thin protective sheet material.

JOSEPH R. O'NEIL, JR.

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