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McAleer

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[54] **SANDING PAD ASSEMBLY**

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[52] **U.S. Cl.** **51/358;** 51/379; 51/296

[51] **Int. Cl.²**... **B24D 17/00;** B24B 1/00; B24D 3/00

[58] **Field of Search** 51/358, 376–379, 51/391–393, 394, 401, 402, 405, 296, 297; 15/230.1, 230

[56] **References Cited**

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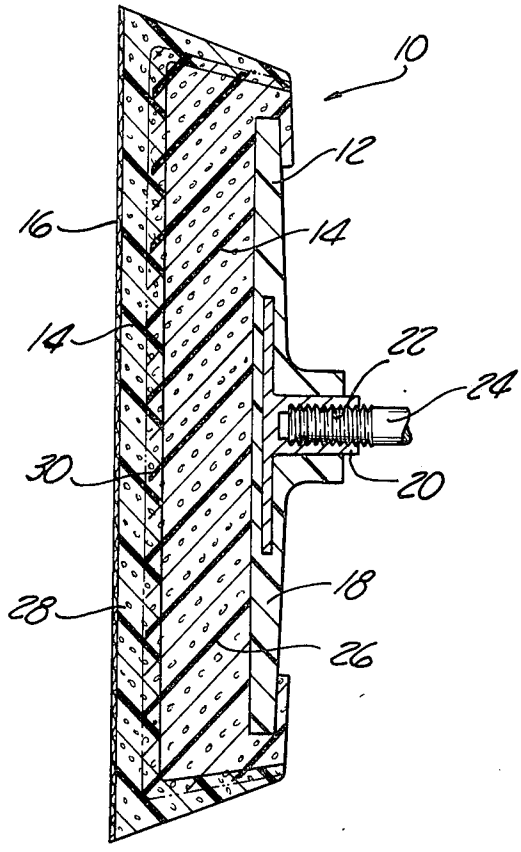
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[57] **ABSTRACT**

A sanding pad assembly made of foam material and having a core and an outer layer of different hardnesses and in one form having a soft, flexible foam inner core and a tough semi-rigid foam outer layer and in another form having a soft, flexible foam outer layer and a tough semi-rigid inner core.

31 Claims, 4 Drawing Figures



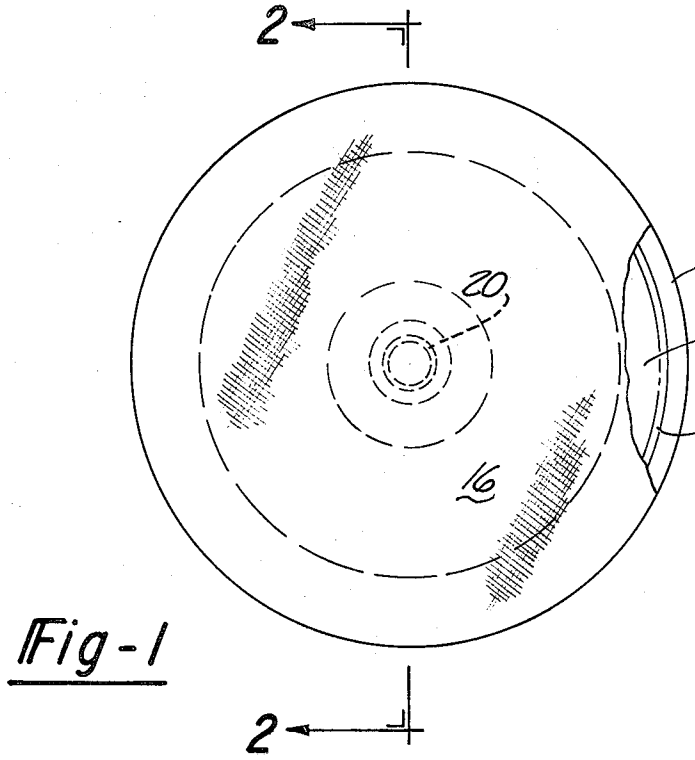


Fig-1

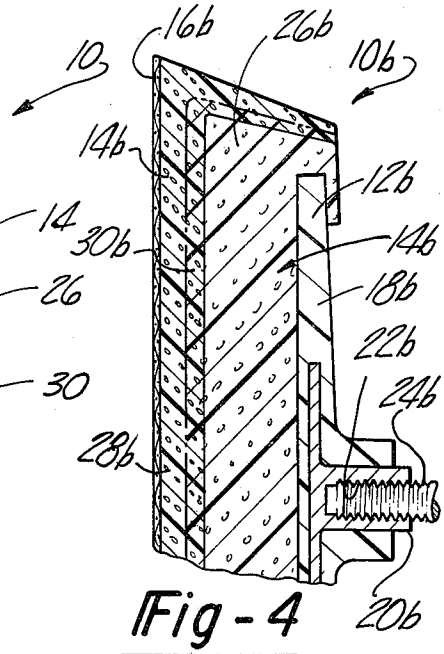


Fig-4

Fig-3

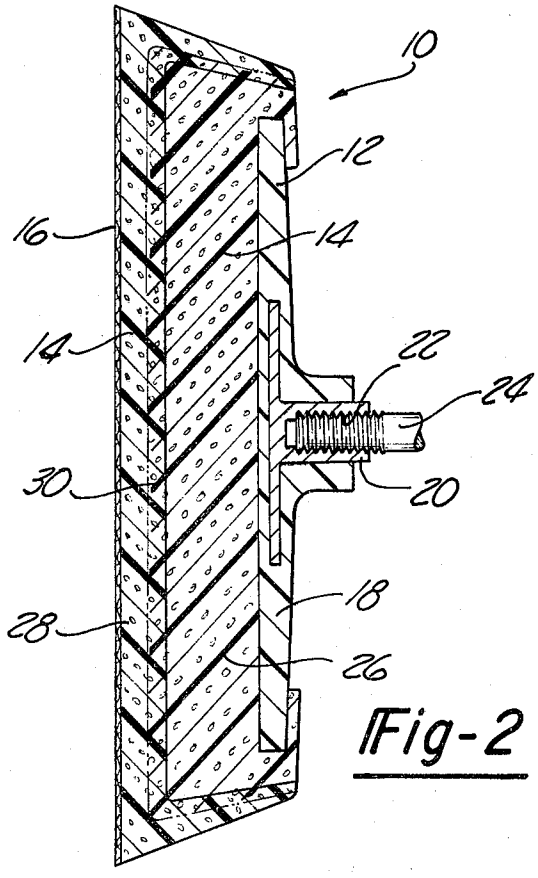
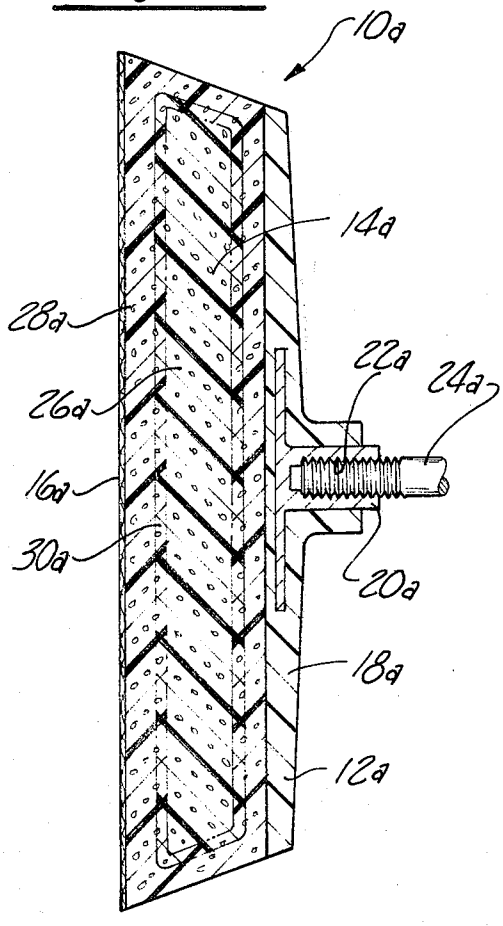


Fig-2



SANDING PAD ASSEMBLY

SUMMARY BACKGROUND OF THE INVENTION

The present invention relates to molded foam sanding pad assemblies. Sanding pad assemblies having molded foam sanding pad members are commonly used for sanding irregularly curved surfaces such as automobile bodies. The pad member is constructed to be resilient and deformable in order to readily conform to these surfaces. To accomplish this, pad members in the past have been made of an open cell foam structure such as that shown in the U.S. Pat. No. 3,082,582 issued to B. G. Jeske on Mar. 26, 1963. Such pad members are made with an impervious outer skin of the same material as the remainder. The overall hardness of the pad can be varied to suit the needs of various applications; however, the overall softness or lower limit of durometer is restricted by the resultant loss of durability of the pad, i.e., the softer pad has an outer skin not as tough as the harder pad. For example, while a low hardness might be advantageous and highly desirable for an application having difficult surfaces with which to conform, the resultant soft pad will be more susceptible to tearing and ripping, hence requiring more frequent replacement. A tougher skin could be provided, however, that would result in a harder pad. A softer pad will have a concomittantly less tough skin.

Another problem with conventional pads is that a softer pad will distort substantially more at higher speeds than the harder pad. This places, in a sense, a pretension at the periphery of the pad which could render the softer pad more susceptible to tearing.

In the present invention, two different foam materials are used, one for the core and the other for an outer layer having the outer skin. In this way a soft, pliable, resilient core can be provided with an outer layer having a tough outer skin. The overall hardness of the pad member can then be made to suit the desired application and a pad member having an overall or compound low hardness can be provided which is still durable. Therefore, it is an object of the present invention to provide an improved sanding pad assembly having a pad member with a core and an outer layer of different materials. It is another object to provide a sanding pad member having a core and outer layer of substantially different hardnesses. It is another object of the present invention to provide an improved sanding pad member having a soft core of one material having one hardness and an outer layer having a tough outer skin of a different material having a different hardness for providing a pad member having an overall desired resilience. It is another general object to provide an improved sanding pad assembly.

In another form of the invention, the makeup of the core and outer layer is reversed. Thus in the alternate form a soft, pliable, resilient outer layer can be provided with a harder, tough core. Again the overall hardness of the pad member can then be made to suit the desired application but the local working surface will be softer than the first form noted. The harder core minimizes high speed distortion and as a result the latter pad can be run at even higher speeds than the former without undue distortion. It is another object of the present invention to provide an improved sanding pad member having a soft outer layer of one material having one hardness and a core of a different material having a different hardness for providing a pad member having an overall desired resilience.

Other objects, features, and advantages of the present invention will become apparent from the subsequent description and the appended claims, taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a plan view of the working face of one form of a sanding pad assembly embodying features of the present invention with some parts shown broken away;

FIG. 2 is a sectional view of the assembly of FIG. 1 taken generally along the line 2—2 in FIG. 1;

FIG. 3 is a view similar to FIG. 2 of a different form of the invention; and

FIG. 4 is a fragmentary view similar to FIG. 2 of a still different form of the invention in which the make up of the core and outer layer is reversed.

Looking now to the drawings a sanding pad assembly **10** is shown and includes a back up plate assembly **12,** a pad member **14** and a reinforcing member **16.** The back up plate assembly **12** includes a disc **18,** which may be formed of rigid rubber, plastic or equivalent material. A center hub member **20** is molded within the disc **18** and has an internally threaded tubular portion **22.** Portion **22** is adapted to be threadably supported upon an arbor **24** which can be rotated by a suitable tool (not shown). The pad **10** is molded to the disc **18** and partially extends over the periphery thereof to provide a secure bond therewith.

The pad **14** has a soft inner core **26** and an outer layer **28** having a tough outer skin. After foaming the core **26** onto the disc **18,** the core **26** is crushed to open the cells and hence to provide greater resiliency or conformability. The core **26** can be made from a flexible polyurethane foam system with the polyol side of the system utilizing a polyester resin, an amine catalyst system (including an amine such as triethylamine, etc.), and a suitable blowing agent; the other side of the system can include toluene diisocyanate (TDI). The two sides can be appropriately mixed in a suitable mold and will foam at a determined temperature (see patent to Jeske, supra, the disclosure of which is incorporated herein by reference). The resilience and/or durometer of the core **26** can be varied by varying the quantity of polyol (i.e., polyester resin) and associated materials used in the mold. Preferably the core **26** will be formed to have a durometer on the shore A scale in the range of from about 10 to about 60.

After the core **26** has been crushed and cured the outer layer **28** is molded thereto. The outer layer **28** can also be made from a semi-rigid polyurethane foam system with the polyol side of the system utilizing a polyether resin, an amine catalyst system (including an amine such as triethylamine, etc.,) and a suitable blowing agent; the other side of the system can include toluene diisocyanate (TDI). Again, the two sides can be mixed in a suitable mold and at a determined temperature, will foam about the exposed surfaces of the core **26.**

Since the core **26** was generally an open cell construction, the material of the outer layer **28** will foam partially into the core **26** forming a transition area **30.** This transition area **30** will provide a good bond between the outer layer **28** and core **26** and will also provide a zone in which there is a gradual change in physical properties from one to the other. The outer layer **28** is a substantially closed cell semi-rigid foam structure and hence is generally impervious to dirt, water, etc.,

encountered in the sanding operation and hence will minimize loading.

The hardness or resilience of the outer layer **28** can also be varied by carrying the amount of polyol (i.e., polyether resin) and associated materials used in the mold. The outer layer **28** had a durometer on the Shore A scale within a range of from about 30 to about 100. In a preferred form the durometer on the shore A scale is within the range of about 50 to about 100. In one example in a pad member **14** which is approximately 1 ¼ inches to about 1 ½ inches thick, the outer layer **28** has a thickness of at least about one-sixteenth inch to about one-fourth inch with the transition area **30** being at least about one-eighth inch to about one-fourth inch. Note then that the outer layer **28** is of substantially greater thickness than the normal skin resulting from foaming polyurethane parts in a closed mold.

The outer layer **28** being semi-rigid, harder and tougher provides better wear and durability characteristics than the core material while still permitting the overall flexibility or resilience and/or deformability of the pad member **14** to be maximized. In addition, in some applications the minimum hardness has been limited by the speed of rotation of the pad assembly; thus at high speeds, a soft pad could produce undue distortion; in some applications the pad assembly may be rotated as fast as 15,000 r.p.m. Likewise the outside diameter of a pad assembly of given hardness may be limited in high speed applications.

With the pad assembly **10**, the hard outside layer **28** assists in minimizing high speed distortion and permits the use of a larger diameter pad member for a given overall hardness at a given rotational speed.

As noted the pad member **14** has a reinforcing member **16** supported at its outer working face. The member **16** can be formed of a relatively heavy fabric material such as canvas, burlap or the like and can be secured in place during foaming of the outer layer **28** with portions of the outer layer **28** penetrating the voids in the fabric to provide a tight, secure bond.

FIG. 3 shows a different form of the invention; in FIG. 3 elements similar to like elements in FIGS. 1 and 2 have been given the same numerical designation with the addition of the letter *a*. There the core **26***a* is completely captured by the outer layer **28***a*. The back up plate assembly **12***a* has a disc **18***a* which extends substantially over the entire back surface of the pad member **10***a* and can be bonded thereto either in the molding process or subsequently with a suitable adhesive. In any event, the back up plate assembly **12***a* will transfer the torsional forces to the pad member **10***a* through the stiffer, harder outer layer **28***a*. Note that the outer layer **28***a* could also be molded to partially overlay the periphery of the disc **18***a*.

FIG. 4 shows a still different form of the invention in which the materials for the core and outer layer are reversed. In FIG. 4 elements similar to like elements in FIGS. 1 and 2 have been given the same numerical designation with the addition of the letter *b*. In FIG. 4, however, the core **26***b* is made from a semi-rigid polyurethane foam system the same as the outer layer **28** in the embodiment of FIGS. 1 and 2; the outer layer **28***b*, on the other hand, is made from a flexible polyurethane foam system the same as the core **26** in the embodiment of FIGS. 1 and 2. With the embodiment of FIG. 4 a pad member **14***b*, softer than that of a pad member such as member **14***b* utilizing the construction of FIGS. **1** and **2**, can be provided with the pad member **14***b* having a high speed distortion characteristic superior even to the improved characteristic of pad member **14**. The outer layer **28***b* will termainte in a tough outer skin and a reinforcing member **16***b* can be supported at its outer working face. A transition area **30***b* will be located between the outer layer **28***b* and core **26***b* and will include materials of both the core **26***b* and outer layer **28***b*.

While it will be apparent that the preferred embodiments of the invention disclosed are well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the invention.

What is claimed is:

1. A sanding pad assembly comprising: a pad member, back up means secured to said pad member for supporting said pad member for rotation, said pad member comprising a core of soft flexible foam material and an outer layer on said core of a semi-rigid foam material extending over the work surfaces of said pad member.

2. The pad assembly of claim **1** with said outer layer terminating in a tough outer skin.

3. The pad assembly of claim **1** and said core being substantially open cell structure.

4. The pad assembly of claim **1** with said outer layer being substantially a closed cell structure.

5. The pad assembly of claim **1** with said core being a flexible polyurethane foam having a substantially open cell structure.

6. The pad assembly of claim **1** with said outer layer being a semi-rigid polyurethane foam having a substantially closed cell structure.

7. The pad assembly of claim **1** with said core having a hardness in the range of from about 10 to about 60 on the Shore A scale and with said outer layer having a hardness in the range of from about 30 to about 100 on the Shore A scale.

8. The pad assembly of claim **1** with said core having a hardness in the range of from about 10 to about 60 on the Shore A scale and with said outer layer having a hardness in the range of from about 50 to about 100 on the Shore A scale.

9. The sanding pad assembly of claim **1** with said pad member having a transition zone between said core and said outer layer, said zone being comprised of semi-rigid foam interfoamed with flexible foam.

10. The sanding pad assembly of claim **1** wherein said outer layer has a thickness of from about one-sixteenth inch to about one-fourth inch where said pad member is approximately 1 ¼ inches to around 1 ½ inches thick.

11. The sanding pad assembly of claim **9** wherein said outer layer has a thickness of from about one-sixteenth inch to about one-fourth inch, and said transition zone being about one-eighth inch to about one-fourth inch thick where said pad member is approximately 1 ¼ inches to around 1 ½ inches thick.

12. The pad assembly of claim **1** with said core being a flexible polyurethane foam of a polyester resin and having a substantially open cell structure and with said outer layer being a semi-rigid polyurethane foam of a polyether resin and having a substantially closed cell structure.

13. The pad assembly of claim **1** with said back up means comprising a rigid disc secured to one side of said core with the material of said core extending over the radially outer periphery of said disc.

14. The pad assembly of claim 1 with said back up means comprising a rigid disc secured to said outer layer at one side of said pad member.

15. The sanding pad assembly comprising: a pad member, back up means secured to said pad member for supporting said pad member for rotation, said pad member comprising a core of flexible polyurethane foam of a substantially open cell structure, said pad member further comprising an outer layer of semi-rigid polyurethane foam of a substantially closed cell structure, said core having a hardness in the range of from about 10 to about 60 on the Shore A scale, said outer layer having a hardness in the range of from about 30 to about 100 on the Shore A scale.

16. The pad assembly of claim 15 with said pad member having a transition zone between said core and said outer layer which is comprised of semi-rigid foam of said outer layer interfoamed with the flexible foam of said core.

17. The pad assembly of claim 16 with said outer layer having a thickness of from about one-sixteenth inch to about one-fourth inch.

18. The pad assembly of claim 17 with said transition zone having a thickness of from about one-eighth inch to about one-fourth inch.

19. The pad of claim 17 with said core being of a foam of a polyester resin and with said outer layer being of a foam of a polyether resin.

20. The pad assembly of claim 19 with said back up means comprising a rigid disc secured to one side of said core with the material of said core extending over the radially outer periphery of said disc.

21. The pad assembly of claim 19 with said back up means comprising a rigid disc secured to said outer layer at one side of said pad member.

22. A sanding pad assembly comprising: a pad member, back up means secured to said pad member for supporting said pad member for rotation, said pad member comprising a core and an outer layer, one of said core and said outer layer being made of soft flexible foam material, the other of said core and said outer layer being made of a semi-rigid foam material, said outer layer extending over the work surfaces of said pad member.

23. The pad assembly of claim 22 with said outer layer terminating in a tough outer skin.

24. The pad assembly of claim 22 with said core being substantially a closed cell structure.

25. The pad assembly of claim 22 with said outer layer being substantially an open cell structure.

26. The pad assembly of claim 22 with said outer layer being a flexible polyurethane foam having a substantially open cell structure.

27. The pad assembly of claim 22 with said core being a semi-rigid polyurethane foam having a substantially closed cell structure.

28. The pad assembly of claim 22 with said outer layer having a hardness in the range of from about 10 to about 60 on the Shore A scale and with said core having a hardness in the range of from about 30 to about 100 on the Shore A scale.

29. The pad assembly of claim 22 with said outer layer being a flexible polyurethane foam of a polyester resin and having a substantially open cell structure and with said core being a semi-rigid polyurethane foam of a polyether resin and having a substantially closed cell structure, said back up means comprising a rigid disc secured to one side of said core with the material of said core extending over the radially outer periphery of said disc.

30. The sanding pad assembly of claim 29 wherein said outer layer has a thickness of from about one-sixteenth inch to about one-fourth inch, and said transition zone being about one-eighth inch to about one-fourth inch thick where said pad member is approximately 1 ¼ inches to around 1 ½ inches thick.

31. The pad assembly of claim 29 with said pad member having a transition zone between said core and said outer layer which is comprised of semi-rigid foam of said core interfoamed with the flexible foam of said outer layer.

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