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3,041,796

WAFFLE BACK ABRASIVE DISC

Filed Jan. 26, 1960

FIG. 1

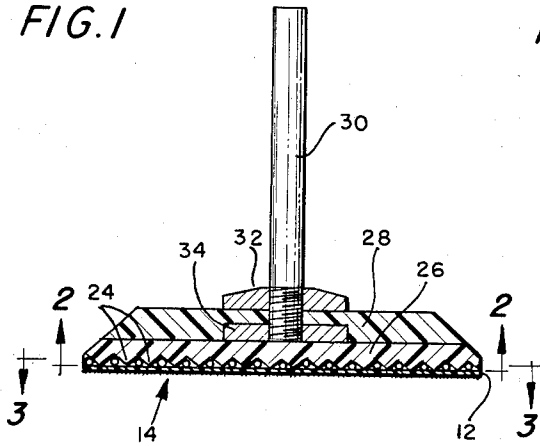


FIG. 4

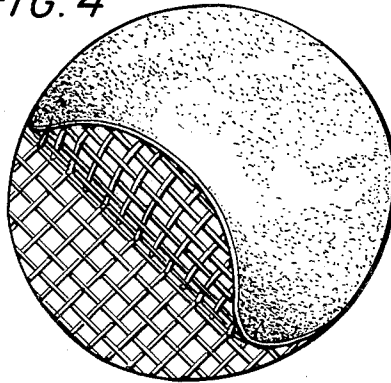


FIG. 2

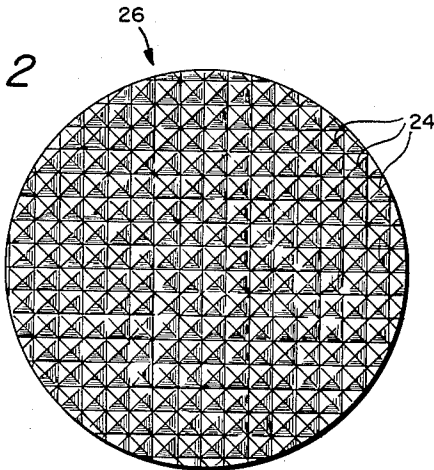


FIG.5

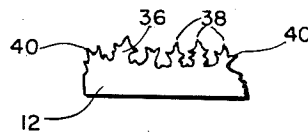


FIG. 6

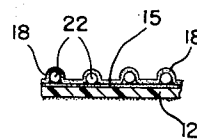
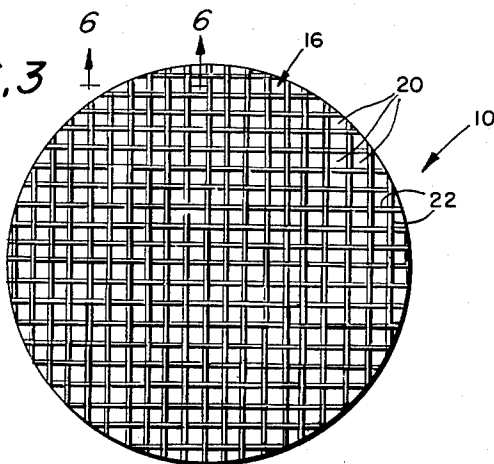


FIG. 3



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WAFFLE BACK ABRASIVE DISC

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This invention relates to abrasive coated sheets and more particularly to such a sheet having a flexible web secured to the back side thereof which is coated with a pressure sensitive coating for cooperation with a similarly coated back-up pad.

Abrasive sheets currently in use having their backs coated with a pressure sensitive material have substantially flat backs thereby assuring maximum surface contact, and hence adhesion, between the flat, adhesive-coated back-up pad and the abrasive sheet. This large contact area between the abrasive sheet and the back-up pad is useless, however, at sanding (or grinding, etc.) speeds which are quite high causing excessive heat in the sheet which liquefies the adhesive material thereby permitting the abrasive sheet to fly off the back-up pad.

In making abrasive sheets of the desired size and shape, large sheets are usually stuck together with the adhesive side of one sheet stuck to the abrasive side of an adjacent sheet, see United States Patent No. 2,485,295, and then the various shapes and sizes of discs, rectangular bands, etc. are die cut from these stacked sheets.

These abrasive sheets are shipped and stored in die cut stacks. This mode of shipment and storage has two main disadvantages. When a die cut stack of abrasive sheets is delivered to the job, the workman finds it a tedious operation to separate a single sheet from the stack—especially where the sheets are coated with a fine abrasive. In his haste he often inadvertently separates a pack of two or three sheets from the stack thinking the pack is a single sheet. Since the sheets are adhered abrasive side to adhesive side, it is possible, even when several sheets are removed from the stack, to use the pack of sheets removed as if it were a single sheet. This results in wasting one, or two, or more abrasive surfaces, depending on how many sheets were in the pack removed from the stack.

Another drawback of storing the sheets stacked as described is that the adhesive material currently in use is organic and tends to "grow" onto surfaces with which it is in contact. Over a long storage period this "growth" can cause difficulty in separating the sheets and, even if the sheets can be separated, adhesive residue may remain on the abrasive side of one sheet.

One object of this invention is to provide a cooler cutting abrasive sheet thereby reducing the likelihood of sheet slippage on the back-up pad under high temperature operating conditions.

Another object is to improve the abrading characteristics of an abrasive sheet having a pressure sensitive coated back.

A further object is to eliminate the possibility that a workman may use more than one abrasive sheet at a time.

The first two objects are accomplished by bonding a flexible fiber grid to the back of the abrasive sheet with a resilient setting adhesive and coating the grid with a pressure sensitive adhesive. Even though the grid backed abrasive sheet does not adhere as strongly to the back-up pad as a conventional sheet when sanding or grinding is not in progress (because of the smaller contacting area), when sanding or etc. is in progress the heat on the abrasive face of a conventional sheet is rapidly conducted to the pressure sensitive coating on the back of the sheet and this heat may liquefy the adhesive thereby freeing the abrasive sheet from the back-up pad. Applicant's "waffle back" construction forms several insulative cham-

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bers between the abrasive surface of the sheet and the face of the back-up pad. This reduces the heat build-up at the interface between the back-up pad and the abrasive sheet thereby reducing the hazard of adhesive liquefaction. The possibility of slippage may optionally be further reduced by providing the back-up pad with protuberances which project into the grid openings.

The abrading characteristics of a grid backed abrasive sheet are also better than the characteristics of a conventional flat backed sheet because of the greater flexing of the abrasive surface caused by the grid backing. Flexing the abrasive surface is important because each abrading particle has several sharp points which project at different angles and are located at different distances from the sheet itself. When a flat backed abrasive sheet is used, only the high points on the abrasive particles are utilized and then the disc takes on a shiny appearance and loses its abrasive characteristics. When a grid backed sheet is used, the sheet continually flexes or ripples thereby using many more points on each of the abrading particles than are utilized by conventional flat backed pads. This greater usage of the available points on the abrading particles obviously lengthens the life of the abrasive sheet.

The third object is accomplished by shipping the discs with a pressure sensitive grid stuck to another pressure sensitive grid. Obviously a workman cannot inadvertently place a pair of back-to-back adhered sheets on a back-up pad. Back-to-back shipment is possible because of the relatively small contacting area between the two adhesive grids. This method of shipment has the further advantage that no adhesive can stay on the abrasive surface when the discs are separated since an adhesive grid at no time contacts an abrasive surface.

Other objects and advantages will be pointed out in or be apparent from the specification and claims, as will obvious modifications of the single embodiment shown in the drawings in which:

FIG. 1 is a side sectional view of a grid backed disc mounted on a sanding device;

FIG. 2 is a plan view of the surface of a back-up pad having pyramid shaped protuberances;

FIG. 3 is a plan view of the "waffle" backing on an abrasive disc;

FIG. 4 is a perspective view showing two partially separated sanding discs;

FIG. 5 is an enlarged view of a portion of the abrasive surface of a disc; and

FIG. 6 is an enlarged view of a portion of the abrasive disc showing the adhesive layers thereon.

The drawings show only disc shaped abrasive sheets, however the invention disclosed herein is not limited to discs, it relates to all shapes and sizes of abrasive sheets.

Referring to the drawings, a "waffle back" abrasive disc 10 is composed of a base sheet 12 having an abrasive coating 14 on one side and a "waffle" or grid 16 bonded to the other side. Grid 16 is composed of woven fiber, which is very inexpensive, or any other suitably flexible and inexpensive material. It should be appreciated that the "waffle" backing need not be in the form of a grid, it can be several generally parallel string-like strands, or an unsymmetrical web, or any other configuration which performs the functions of grid 16 hereinafter described. The bond between the grid and the base sheet is made with a strong, flexible setting, high temperature resistant adhesive 15.

Grid 16 is coated with a pressure sensitive adhesive 18. Adhesive 18 may be applied immediately after the grid is glued to the base sheet.

The "waffle" backed disc has several depressions or openings 20 between string-like members 22 which compose the grid. String-like members 22 are spaced so

that depressions 20 receive pyramid shaped protuberances 24 which project from soft rubber back-up pad 26. Protuberances 24 and the rest of the back-up pad are coated with pressure sensitive adhesive. Of course protuberances 24 can have any shape—applicant chooses to use the pyramid shape only because this is a standard, commercially available product. In fact, the present "waffle" backed pad is suitable for use with a conventional back-up pad having no protuberances, however, best results are obtained by use of a back-up pad equipped with protuberances of some sort.

Back-up pad 26 is cemented to a hard rubber pad 28 which is fixed on mandrel 30 by sandwiching pad 28 between nuts 32 and 34 threaded on the end of mandrel 30. Nut 34 is hexagonal in shape so that when it is tightened into pad 28 it prevents twisting of the pad with respect to mandrel 30.

When grinding is in progress, the abrasive surface of disc 10 tends to ripple or flex. As shown in FIG. 5, abrasive particles 36 each have several sharp points and this rippling permits not only high points 38 on the abrasive particles to be utilized, but also brings points 40 into contact with the workpiece. Points 40 on abrasive particles mounted on a conventional flat-back disc are not utilized to an appreciable extent and so a conventional disc becomes shiny and useless much sooner than a "waffle" backed disc.

At high sanding speeds considerable heat is generated on the abrasive face of disc 10. Depressions 20 serve as insulating chambers between back-up pad 26 and base sheet 12 thereby cutting down the temperatures at the interface between grid 16 and the back-up pad. Therefore, pressure sensitive adhesive 18 is not melted at sanding speeds at which the adhesive on flat backed discs would liquefy. If the heat does rise high enough to liquefy the adhesive between members 22 and pad 12 protuberances 24 prevent disc 10 from flying off the back-up pad. Thus, the pad may slip only a short lateral distance and then grid 16 contacts adhesive on the back-up pad which was almost completely insulated from disc 10 before the disc slipped and such adhesive is, therefore, capable of reestablishing an adhesive bond with grid 16.

The "waffle" backed pads are stuck together in pairs

for shipment as shown in FIG. 4, and may be shelved for long periods since the contacting area of the two grids is quite small. The grids also serve to space the discs so that separation is quite easy.

Although but one embodiment of the present invention has been illustrated and described, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. In combination with a back-up pad having abutment means protruding from one side, an abrasive sheet comprising, a base sheet, an abrasive surface on one side of said base sheet, and abutment means on the other side of said base sheet having a pressure sensitive adhesive contact thereon, said abutment means cooperating with said back-up pad abutment means to prevent lateral shifting of the abrasive sheet with respect to the pad.

2. The combination according to claim 1 in which the abutment means on said base sheet forms the side walls of a depression having the base sheet for the bottom, and said abutment means on the back-up pad projects into said depression for cooperation therewith to prevent lateral movement of the abrasive sheet with respect to the back-up pad.

3. The combination according to claim 2 in which the abutment means on said base sheet comprises a plurality of string-like members.

4. The combination according to claim 3 in which the abutment means on said back-up pad comprises a plurality of protuberances projecting from said pad.

5. The combination according to claim 4 in which said string-like members form a grid and said protuberances project into the openings therein.

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