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GRINDING WHEEL

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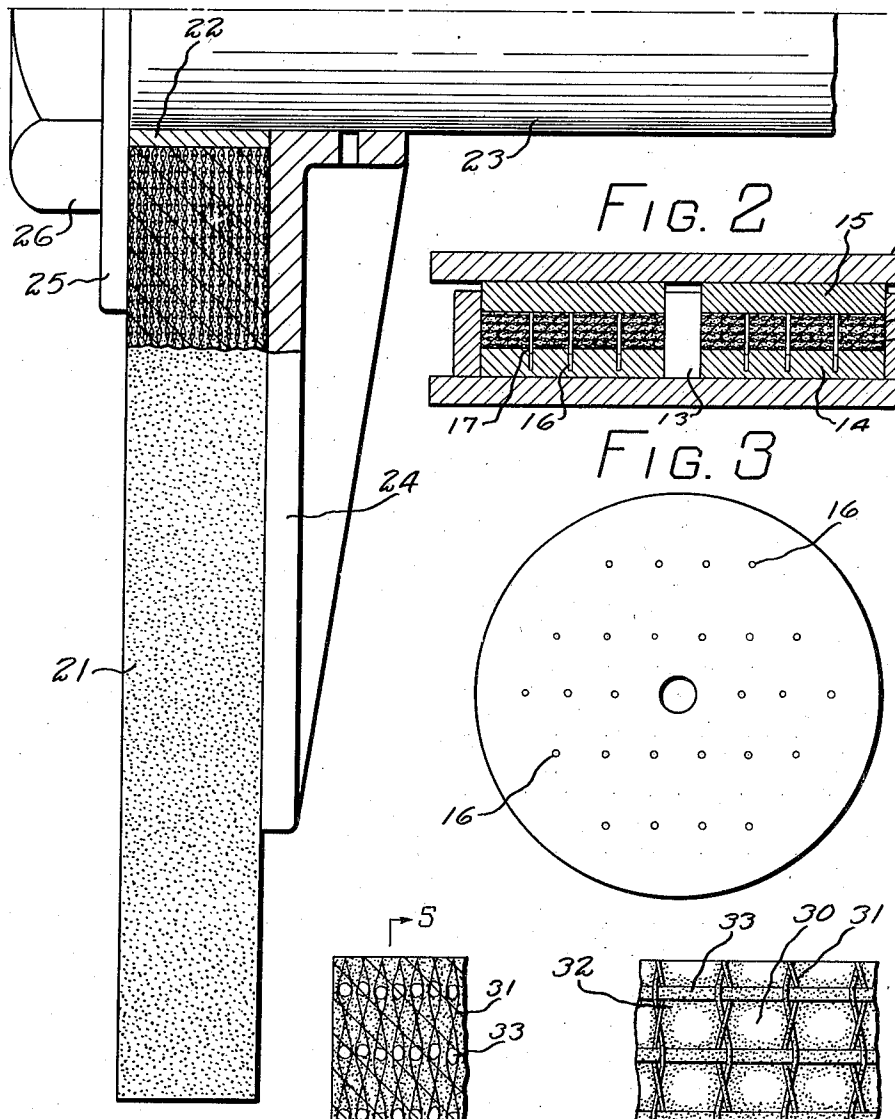

FIG. 1

FIG. 3

FIG. 4

FIG. 5

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GRINDING WHEEL

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4 Claims. (Cl. 51—193)

The invention relates to grinding wheels and with regard to its more specific features to organic bonded grinding wheels.

One object of the invention is to provide a very porous organic bonded grinding wheel. Another object of the invention is to provide a grinding wheel particularly applicable for the abrading of wood. Another object of the invention is to provide an organic bonded grinding wheel particularly applicable for grinding on the side face. Another object of the invention is to provide a porous grinding wheel bonded with an organic bond and of adequate strength. Another object of the invention is to make a cellular or honeycombed grinding wheel. Other objects will be in part obvious or in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements and arrangements of parts and in the several steps and relation and order of each of said steps to one or more of the others thereof, all as will be illustratively described herein, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawing, in which is shown one of various possible embodiments of the mechanical features of this invention,

Fig. 1 is a view partly in cross section and partly in side elevation of one half of a grinding wheel together with mounting therefor, constructed in accordance with the invention,

Fig. 2 is a cross sectional view of a mold for the production of the wheel of Fig. 1, showing the material about to be pressed,

Fig. 3 is a plan view of the mold,

Fig. 4 is a fragmentary sectional view, on an enlarged scale, of a portion of the wheel of Fig. 1,

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 4.

I provide a quantity of open mesh cloth. As far as certain features of the invention are concerned I may use any open mesh cloth, but I prefer to use cotton leno because it has high absorptive qualities, adequate strength, is inexpensive, and the leno weave is a weave which maintains the open mesh and regular spacing of the cloth during handling and otherwise. While so far as the broad features of the invention are concerned, any mesh size whatsoever may be used, I prefer to use rather open mesh, for example on the order of eight picks to the inch and corresponding sley to produce square openings, this sley being in reality 16 to the inch as there are two ends of warp for each pick in a square pattern leno weave, as will be apparent from inspection of Fig. 5.

I now die out from a given die a number of disks of this cloth with central holes, which disks correspond in area to the grinding wheel to be made. I take care, however, that the disks are similar to each other, that is to say their locus with respect to the plan of the cloth is the same. This may be accomplished by always bringing the edge of the die at the place where it is tangent to the weft to a particular location with respect to the weft, and locating the edge of the die perpendicular to the aforesaid edge at a given distance in from the selvage.

I now treat each disk so prepared with a liquid organic bond. I then sprinkle on both sides of each wetted disk a quantity of abrasive grain. After coating the disk is allowed to dry or set at room or elevated temperature, to set the bond at least partially.

Referring now to Fig. 2, I provide a mold comprising a platen 10, a top plate 11, a central core 13, a lower mold plate 14, and an upper mold plate 15. Referring now to Figs. 2 and 3, the bottom plate 14 has a number of vertical holes 16 therein in which I locate wooden pegs 17. These wooden pegs 17 are about the size of toothpicks. I now stack on top of each other and in the mold of Fig. 2 that number of layers 20 of the treated leno cloth which are required for a particular structure of a wheel according to my invention. The purpose of the wooden pegs 17 is to locate the layers 20 in matched relation, so that the openings in the leno cloth are everywhere in substantial register with each other. A wheel so made is nearly transparent in a direction parallel to its axis. It may not be actually transparent because some bond will flow and form a light film but for abrading purposes it is cellular in construction.

I preferably apply an additional coat of liquid bond to each disk as I place it in the mold. This may be done with a spray gun. I now apply pressure to unite the disks. After this the wheel is dried or heat treated, depending upon the particular bond selected.

Referring now to Fig. 1, the wheel 21 may be provided with a suitable center 22 of lead or otherwise and mounted upon a shaft 23 against a back plate 24, and held in position by means of a washer 25 and nut 26. Such a wheel, by reason of its cellular construction, is particularly applicable for the abrading of wood and other substances lacking in tensile strength, which substances when cut with prior grinding wheels have

usually filled up the pores thereof and generated too much heat. The wooden pegs 17 may be forced further down into the holes 16 during the pressing operation, or in some cases they may be broken, and in either event to some extent they may remain in the finished wheel, but being relatively few in number as compared with the total number of cellular pores, and being of soft substance, they have no particular effect.

Considering now the bond to be used, the invention may be carried out with many different bonds, particularly artificial resinous bonds such as the condensation products of phenol-formaldehyde, and also such bonds as vinyl acetate, plasticized cellulose acetate, shellac dissolved in alcohol, air drying glyptols, and many other types of bonds. Glue may be used in so much as it will have a chance to harden throughout the mass by reason of the cellular construction. Casein may also be used. The mode of treatment after application of the bond will depend upon the bond used. For example, in the case of a glue bond, the layers 20 will be pressed cold and then allowed to set without the use of heat. In so much as the time and temperature required for setting heat-settable bonds is already known for each, I shall not specify such in detail here, but I prefer to use a cold setting bond or one which sets with a low heat in order not to injure the textile fibers. However, certain heat-settable bonds are strong enough so that it will be immaterial that the fibers are destroyed.

In designing the mold and determining the number of layers 20 to be placed therein to form the wheel 21, just enough compression should be resorted to to bring the fibers of the leno into intimate contact, for example a compression of 25–30% after the layers have been placed in the mold. A volumetric compression is preferable and high pressures need not be attempted because with very high pressures the cellular structure would be destroyed.

Referring now to Fig. 5, it will be seen that the wheel structure includes warp threads 31 saturated with bond and having abrasive grains 32 clinging thereto, together with weft threads 33 likewise saturated with bond and having abrasive grains 32 clinging thereto, together with rectangular cells 30 which extend parallel to the axis of the wheel. It will be understood that despite the use of pegs 17 perfect alignment of the warp and weft of the leno is not to be expected, and this condition is desirable for there should be some thickness to the walls of the several cells. It is impossible to reproduce the exact condition in a drawing and Fig. 5 is to be deemed illustrative of a sliced section only. Fig. 4, however, illustrates the general condition to a certain extent and shows the average irregularity of the layer construction.

Any abrasive grain may be used, but alumina and silicon carbide grain are preferred. In some cases garnet may be used with success as it has excellent qualities for woodworking. I prefer, however, to use fine mesh silicon carbide grain, the average diameter of the grains being of the order of one-fifth or less of the diameter of a weft thread. One hundred mesh grain and even finer may be advantageously employed.

It will thus be seen that there has been provided by this invention a method and apparatus in which the various objects hereinabove set forth together with many thoroughly practical advantages are successfully achieved. As various possible embodiments might be made of the mechanical features of the above invention, and as the art herein described might be varied in various parts, all without departing from the scope of the invention, it is to be understood that all matter hereinbefore set forth or shown in the accompanying drawing is to be interpreted as illustrative and not in a limiting sense.

I claim:—

1. The method of forming an abrasive body which consists in providing open mesh cloth, treating the cloth with an adhesive substance, depositing abrasive grain upon the cloth, matching sections of the cloth to form continuous cells, pressing and setting the adhesive.

2. The method of forming an abrasive body which consists in providing open mesh material, treating the material with an adhesive substance, depositing abrasive grain upon the material, matching sections of the material to form continuous cells, pressing and setting the adhesive.

3. An abrasive structure comprising matched pieces of open mesh cloth, there being substantial openings between successive picks of the cloth and between successive warp elements thereof, thereby constituting regularly spaced parallelopipedal cells separated by thin walls and constituting a cellular structure which is continuous throughout the abrasive structure, the cloth being held together by an organic bonding material, and abrasive grain existing in the walls of all the cells and stuck to the warp and weft of the cloth and existing also in the planes of the walls of the cells.

4. An abrasive structure comprising pieces of open mesh leno cloth of the same weave superimposed upon each other and matched so that the warp and weft of the several pieces lie in two sets of parallel planes, thus forming a continuous and uniform rectangular parallelopipedal cellular structure, organic bond holding the pieces of cloth together, and abrasive grain held by the bond, there being some abrasive grain on the inside of each cell.

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