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ORGANIC BOND ABRASIVE WHEEL

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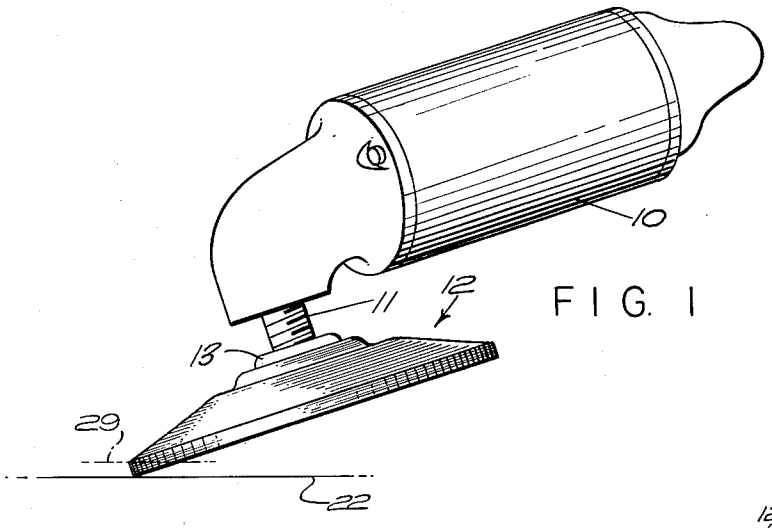


FIG. 1

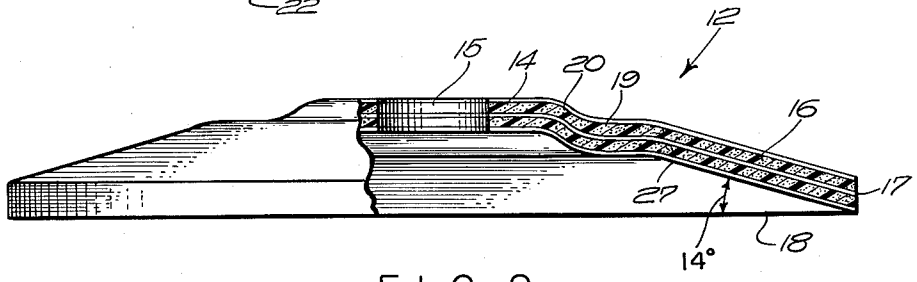


FIG. 2

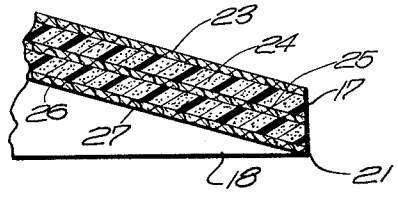


FIG. 3

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ORGANIC BOND ABRASIVE WHEEL

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This invention relates to an abrasive wheel of the resinoid type which is used for grinding rough or uneven surfaces to remove bumps or irregular projections thereon. The wheel is of the type in which the lower portion of the outer edge of the wheel is used for this work.

Wheels of this general type are usually flat on their under or inner face with an offset in the center at the location where it is mounted on a rotating shaft of a portable motor unit. However, in use the unit is manually handled so that the grinding wheel is tipped up and the lower peripheral edge or corner of the wheel used for application to the work. In such use of such a wheel the outer periphery usually wears thin on a rather long taper and finally is reduced to such a thinness that it cracks or breaks away from the center so that the wheel is then of no further value. In the use of such a wheel, also it requires the rotating motor to be tipped up at a rather sharp angle in order to use the corner of the wheel in the manner desired. It is rather awkward and tiring to maintain the motivating force for the wheel at such an angle.

One of the objects of this invention is to so shape the grinding wheel or grinding disc that at least a portion of the angle of the disc to the work is obtained by the shape of the disc so as to provide a more comfortable position of handling the motor unit.

A further object of the invention is to provide an angle of the wheel so that less pressure may be required to be exerted on the wheel for the cutting operation.

Another object of the invention is to provide a wheel which more nearly retains its original thickness and provides a narrower cutting face than heretofore to contact with the work as the cutting proceeds so that the wheel will not overload nor will the wheel become excessively heated through use as where a broad cutting face has heretofore occurred with the old shaped wheel.

Another object of the invention is the safer operation of the wheel for a longer time by reason of the fact that the narrow contacting area remains thicker and less apt to crack and break off to cause damage to parts against which the breaking part of the wheel may hit.

Another object of the invention is to provide a minimum power loss by reason of this narrower cutting face and less heating of the wheel.

Another object of the invention is to provide a wheel of greater strength to resist a breaking load.

With these and other objects in view, the invention consists of certain novel features of construction as will be more fully described and particularly pointed out in the appended claims.

In the accompanying drawings:

FIGURE 1 is a perspective view showing the wheel mounted on a portable motor as a manually manipulatable unit;

FIGURE 2 is a side elevation partly in section showing the shape and construction of the wheel;

FIGURE 3 is a view similar to FIG. 2 of a fragmental portion greatly enlarged.

In proceeding with this invention, the wheel is of a molded resinoid type with reinforcing layers of glass cloth at locations where strength in tension is of assistance such as along its inner and outer faces extending to its periphery with an additional layer intermediate these faces, the whole being bonded together with a resin which impregnates the glass cloth reinforcement and is molded to an advantageous shape which presents the cutting edge of the wheel to the work.

With reference to the drawings, **10** designates a motor device having a rotating drive shaft **11** upon which the wheel designated generally **12** is mounted against a shoulder **13** by means of a nut to engage the inner surface of the wheel.

The shape of the wheel is shown more particularly in FIGURE 2 as providing a hub portion **14** having an axial opening **15** extending through this hub portion and at right angles to the plane of the hub portion. The working portion of the wheel designated generally **21** extends inwardly from its peripheral edge **17** a substantial amount and is in the plane **18** which plane is at right angles to the axis of the opening **15** and is spaced from the plane of the hub. The intermediate portion **16** is at an angle to these planes. This angle is approximately 14° as seen in FIGURE 2 for a wheel seven inches in diameter. This angle may be varied, if the angle is increased substantially the wheel must be strengthened to withstand centrifugal force as it rotates at an edge surface speed of upwards of 14,000 feet per minute. This angle of 14° is practical in a wheel approximately seven inches in diameter. For a wheel nine inches in diameter the angle would be about 10°. The intermediate portion **16** is joined to the hub portion **14** by a reversed curved portion **19** which has a mid portion in substantially a plane at right angles to the axis of the opening **15** and parallel to the plane **18** of the peripheral edge and the plane of the hub **14**. The juncture is by means of an offset portion **20** as seen in FIGURE 2.

By reason of this shape, the corner **21** as seen in FIGURE 3 will be used for grinding the work and as the unit as a whole as seen in FIG. 1 is further inclined about 15°, the wear will be generally parallel to the plane of the work surface **22** (FIG. 1) and will expose a reduced contacting edge as shown by the dotted line **29** of a rather minimum contacting and cutting area which prevents the wheel from wearing thin over any extended length from which breakage may readily occur.

The wheel is advantageously made up of aluminum oxide grains 72% by weight, a phenolic resin 16.39% by weight, cryolite 8.2% by weight and calcium oxide or lime 3.41% by weight. The phenolic resin and the other content act as a binder for the abrasive grains of aluminum oxide and bonds these firmly in the wheel. In laying up the wheel, there will first be a layer **23** of woven glass cloth, then a layer **24** of the resin, then another layer **25** of woven glass cloth, then another layer **26** of resin and then another layer **27** of woven glass cloth, the entire thickness of the wheel being about ¼ of an inch and the diameter being something in the neighborhood of from seven inches to nine inches. This disc is then pressed into the shape described above and cured so that the resin impregnates the glass cloth and the glass cloth reinforces the resin so as to provide a strong bonded wheel with the abrasive grains substantially homogeneously mixed through the resin.

In the use of the wheel in the position shown in FIG. 1, pressure is applied to the work, such as indicated by the surface **22**, through the rotating shaft designated **11**. Thus the force acting at the center of the wheel may be considered as acting generally downwardly whereas the opposing force acting at the outer periphery of the wheel is in the opposite direction or upwardly. This type of action may be likened to a structural beam where the lower surface comparable to the inner surface of the wheel is in tension whereas the upper surface of the beam or outer surface of the wheel would be in

compression, such action taking place about a neutral axis somewhere between the inner and outer surfaces. By placing the layer of glass cloth **27** along the inner surface and extending it to the very outer peripheral edge **17**, as appears in a new wheel, this glass cloth is placed in tension, which causes the strong glass cloth to be of maximum benefit in the structure, it being bonded to the inner surface of the wheel and as the inner surface tends to elongate under the acting forces it produces its maximum beneficial results. I find that by placing this reinforcing inner layer **27** on the inner surface that the breaking strength is increased by about 50% over the use of two layers of cloth completely embedded in the material and placed at equal distances from each other and from the upper and lower faces.

The inner strengthening layer **27** of glass cloth is carried to the outer periphery **17** of the wheel and thus provides a reinforcement along the portion of the wheel which operates at greater speed and it is this portion of the wheel which needs greatest strengthening. The glass, of which the cloth is formed, is of an abrasive character and blends well with the abrasive grains which are embedded in the resinoid bond.

The chief action of the reinforcing glass cloth layers **25** and **23** is to provide a hinge action should there be a cracking or breaking of the wheel adjacent its periphery as it becomes worn to a thinner edge. For the use which is above described, the glass cloth **23** being in compression would lend little or no strengthening quality to this side of the wheel but still it would act as a hinge to prevent a broken edge from flying from the wheel.

The glass cloth layer **25** being intermediate the inner and outer surfaces will be at about the neutral axis so far as compression and tension occurs.

It will be apparent that when the wheel is held in the position shown in FIG. 1 that the new wheel shape as shown will have a very narrow working portion at **21** (seen in FIG. 3) when grinding action commences. However, the wheel will wear so that this working portion will increase as wear occurs broadening the marginal peripheral edge of the working portion such as indicated by the line **29** in FIG. 1 up to a point where this working surface passes through the outer upper corner of the wheel and then the width will remain constant if the wheel is maintained at the same angle during its use. Thus, there is a somewhat increased area of the working portion from the time the wheel is new until some little wear occurs. As the wear occurs, the inner reinforcing layer **27** will be worn away, but will at all times extend to this working area to provide a maximum reinforcement which may be had to this working area. It will of course be understood that the reinforcing fabric **27** cannot cover the working portion and still provide a desired grinding surface for the wheel. It will also be understood that this working portion or area will vary somewhat with the angularity or angular position that the wheel assumes to the working surface such as **22**.

It is quite often desirable in the finishing of a piece of work to rest the wheel flat upon a surface such as **22** with no angularity and in the shape of wheel which I have above described, grinding will occur of the work by just steering the wheel around allowing its weight to rest upon the working surface. This could not occur if the wheel were flat in its inner surface and reinforced by a ply of fabric on any portion of such flat inner surface.

I claim:

1. A molded grinding wheel of bonded abrasive grains comprising a hub portion with an axial opening for mounting on a shaft, said hub portion being generally in a plane at right angles to the axis of the opening, and a working portion at the peripheral margin of the wheel, said peripheral margin being in a plane at right angles to the axis of said opening and spaced from the plane of said hub portion, and an intermediate portion between the working portion and hub portion at an angle to said planes providing a dished wheel with inner and outer surfaces, said inner surface of said intermediate portion being reinforced by a ply of woven fabric which extends along said intermediate portion outwardly to the peripheral edge of said inner surface.

2. A wheel as in claim 1 wherein said wheel is resin bonded and said reinforcement is bonded into said inner surface.

3. A wheel as in claim 1 wherein said wheel is resin bonded and said reinforcement is glass cloth.

4. A wheel as in claim 1 wherein said wheel is resin bonded and is reinforced by a ply of woven fabric intermediate its inner and outer surfaces.

5. A wheel as in claim 1 wherein said wheel is resin bonded and is reinforced by a ply of woven fabric intermediate its inner and outer surfaces and extending along said intermediate portion outwardly to said working portion.

6. A wheel as in claim 1 wherein said wheel is resin bonded and is reinforced by a ply of woven fabric at its outer surface.

7. A wheel as in claim 1 wherein said wheel is resin bonded and is reinforced by a ply of woven fabric at its outer surface and extending from the peripheral edge of the outer surface inwardly.

8. A wheel as in claim 1 wherein said wheel is resin bonded and is reinforced by a ply of woven fabric at its outer surface and also by a ply of woven fabric intermediate its inner and outer surfaces, said reinforcing extending alsong said intermediate portion outwardly to said working portion from said axial opening.

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