

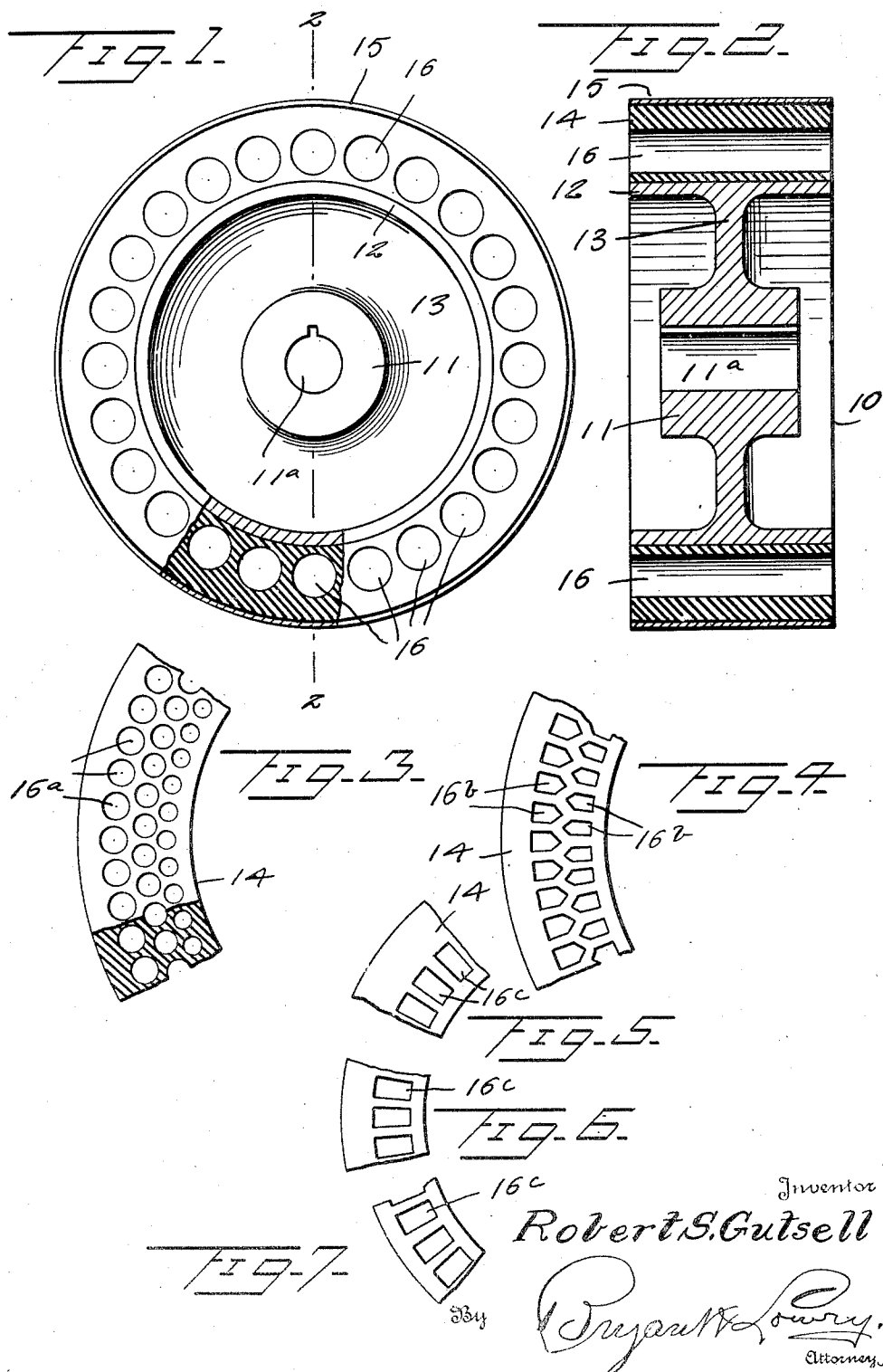
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CENTRIFUGAL ABRASIVE-SHEET HOLDING WHEEL

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CENTRIFUGAL ABRASIVE-SHEET HOLDING
WHEEL

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This invention relates to the art of grinding, sanding, polishing and buffing in which rotating wheels or drums are used to carry and support bands or sleeves of paper, cloth—or combinations of these—and other materials, to the outer surface of which abrasive or polishing materials are applied. In particular, the invention relates to such devices wherein the peripheral portion of the supporting element for the band or sleeve is composed of rubber or rubber-like substance to permit expansion of the rubber or rubber-like substance under the action of centrifugal force during service to thereby retain the abrading or polishing band in place under working conditions, and without adhesive connection of the band with the support; the invention is therefore of the type disclosed in the patent granted to me November 12, 1940, No. 2,221,173, the present invention being designed as an improvement upon the disclosure of the patent.

In the previous art the band-retaining effect has been obtained by using solid, soft rubber in the rim of the drum, the core of which is composed of some relatively inelastic substance, or by employing sponge rubber in the rim or peripheral portion of such drums—these are referred to in the disclosure of my prior patent. When solid rubber is used for this purpose it is difficult to obtain the necessary expansion unless the speed of rotation is greater than that usually employed for abrasive wheels and drums of corresponding diameters; it is also difficult, when using solid rubber rims, to obtain sufficient compressibility or cushioning effects needed to obtain the best results in certain operations. Although almost any desirable degree of compressibility and the necessary tendency to expand against the abrasive sleeve may be obtained by employing various qualities and thicknesses of sponge rubber in the rims of such wheels, similar results were not produced and controlled—under previous art practice—by employing solid or dense—as opposed to sponge or cellular—rubber.

The present invention therefore has for its objects the production of a sanding or polishing drum, the rim of which is composed of solid or dense rubber or rubber-like substance, and in which the drum presents most if not all of the advantageous effects present in drums of the sponge rubber type; for instance, there is an increased tendency at working speeds to expand by centrifugal force, as compared with the previous art activities of the solid or dense rim type; in addition, the compressibility of the working face may be increased and the degree of compressi-

bility controlled. In the latter respect, superior results over the sponge rubber type, may be obtainable in certain cases, owing to the fact that in the present invention the cellular structure is along predetermined, and therefore controllable lines, as compared with the more or less irregular cellular formations found in sponge rubber.

In addition, the result is produced under relatively low-cost conditions. For instance, any attempt to produce a composite drum effect—a solid rim and a sponge rubber backing—would require special forms of expensive production, and with uncertain results; the present structure is unitary and can be readily produced and molded. This is of especial advantage in making possible the production of drums of different characteristics—different thicknesses of rims, for instance, and which affect compressibility; it is advantageous to provide individual forms of drums for particular services, and the difference in cost in providing the needed forms would be very substantial.

To these and other ends, the nature of which will be more readily understood as the invention is hereinafter disclosed, said invention consists in the improved constructions and combinations of parts hereinafter more particularly described, illustrated in the accompanying drawing, and more particularly pointed out in the appended claims.

In the accompanying drawing, in which similar reference characters indicate similar parts in each of the views,

Figure 1 is a side elevation, with parts broken away, showing one form of the present invention.

Figure 2 is a vertical cross-section taken on line 2—2 of Figure 1.

Figure 3 is a fragmentary view of a portion of a modified form of supporting body.

Figure 4 is a similar view of another form.

Figures 5, 6 and 7 are similar views of other modifications.

The wheel or drum 10 disclosed herein is shown as comprising, in general, a hub 11 having an axial opening 11a to receive the arbor (not shown) on which the wheel or drum is mounted for service, a core or body zone formed of an annular zone 12 connected with the hub by web 13—these all being illustrated as a unitary structure which may be considered as a hub or body zone; an annular rim zone 14 having its inner periphery secured to the annular zone 12; and the abrading or polishing band or sleeve 15, the latter being of a well-known type, the band being endless and flexible and carrying an abrasive or polishing outer surface. As in my prior patent, the band or

sleeve is not adhesively secured to the rim 14, but is held in position by the expansibility of the rim under centrifugal force activity.

Of these elements the rim zone 14 forms the dominant feature of the present invention, although, as indicated, the core or body zone may be of variable characteristic. The dominance of the rim zone is due to the fact that upon its proper action depends both the expansibility of the drum for retaining the band or sleeve in position and the compressibility characteristic of the drum during service. Because of the seeming conflict presented by these terms, a brief explanation is given:

As is apparent, a rotating body will develop centrifugal force values, dependent upon speed of rotation; if the body is of solid metal, the effect of these values may be of no importance unless the speed becomes so high as to cause the body to burst into fragments. Wherein, however, the body has elasticity and extensibility, as with rubber or a rubber-like substance, the centrifugal force values can become active to expand the diameter of the body within certain limits, due to the inherent stretch possibilities of the material, necessary since expansion increases the length of the circumference of the body; the degree of expansion will depend upon (1) the speed of rotation, and (2) the characteristics of the zone being expanded.

If the zone is of solid rubber, the speeds required to produce the desired expansion may be so high that the tensions developed materially reduce the compressibility of the drum; in other words, the yieldability of the drum under pressure on the working surface of the band or sleeve, may become almost negligible, thus reducing the field within which the drum may be used; in addition the speeds required may exceed those best suited for producing the abrading or polishing action desired. This is due to the fact that the stretch must be both radial and circumferential; the circumferential expansion required may be made small by the use of a closely-fitted band or sleeve, but the compressibility is limited, since the pressure is then exerted inward in opposition to the normal centrifugal force action, thus tending to make the rim more dense at the point of pressure application, thus resisting the yielding that is desired.

While many of these difficulties are overcome by the use of sponge rubber, as indicated by the disclosure of my prior patent, the inherent low strength value of this type of rubber tends to reduce the field of service to which the drum can be applied. This can be understood from the fact that while the interstitial formation is of advantage in securing compressibility, the extension of this to the actual periphery can provide non-uniformity in expansion results as well as disintegration, to overcome which a marginal zone is cast on the body or a band cemented therein, thus setting up the characteristics of a composite rim structure with its increased cost of production as well as a marginal structure of small radial depth, a condition which can restrict the field of service of the drum.

In the present invention, the rim zone is formed unitary, with the interstitial effects produced through the use of openings which extend from side to side of the drum and are generally of uniform dimensions from end to end of the opening. These openings are arranged in annular series, and may be presented as a single annular series, as in Figures 1, 2, and 5 to 7, or as a plu-

ality of series as in Figures 3 and 4, the openings of a series being generally symmetrical to the axis of rotation, and preferably equally-spaced. The openings may be of any desired contour, dimension and arrangement, as indicated in the drawing.

For instance, in Figures 1 and 2, the openings—indicated at 16—are a single annular series of large circular spaced-apart openings, located closer to the inner periphery of the rim than to the outer periphery, thus providing an outer marginal zone of material width. This permits ready compressibility of the rim so that the band 15 can be readily positioned even though its size closely approaches the dimensions of the outer periphery of the rim; hence, the circular expansion required in service is not large and can be provided without the use of undue speeds, the material between the openings permitting the necessary radial adjustment to compensate. Obviously, the plurality of openings permit compressibility in service, since the actual resistance then is found in the minor width of the outer imperforate zone which will permit reasonable compression.

In Figure 3, the openings 16a are shown as arranged in three annular series of circular openings, with the openings of a series preferably equally-spaced, and with the openings of one series preferably staggered with respect to those of the adjacent series, and with the openings of an inner series of smaller dimensions than those of the succeeding outer series. This form provides an intermediate cellular form which assures ready compressibility and yet provides for the compensating expansibility in service.

The Figure 4 form shows the use of two annular series of openings 16b, with the contour of each opening of the angular type—five sides are shown; this provides for the intermediate compressible zone which compensates for expansibility in service.

In Figures 5 to 7 the openings 16c are shown as in a single annular series of angular-contour openings which are equally spaced. The openings are shown as of similar dimensions in each of these views, the latter being designed more particularly to indicate the ability to provide for outer margins of different radial depths, and therefore of different degrees of compressibility in service, it being apparent that the form of Figure 7 is of less resistance to compression than Figure 6, with the latter less resistant than Figure 5; however, all of the forms provide for compressibility due to the presence of the intermediate zone, with the material between the openings compensatory during expansion. As is apparent, the Figure 5 form will produce greater reaction to the centrifugal force action due to the greater thickness of the outer marginal zone and therefore of greater weight subject to the maximum centrifugal effect. As a result, it is possible, with drums of these three types, to meet the conditions of service in a number of fields of service even when the fields actually require varying degrees of resistance to compressibility in action, and yet permit of proper action.

As is apparent, and due to the fact that the rim zone is formed of rubber or of rubber-like substance, the rim zone has elastic characteristics even though it may be considered as dense when compared with sponge rubber. Consequently, the outer marginal portion of the zone—which is at least equal in radial width to that of the inner marginal portion of the zone—has the necessary

strength, circumferentially to properly support the band or sleeve; but, due to the elasticity characteristic, the marginal portion is capable of being stretched in the angular direction. Hence, drum rotation produced under centrifugal force action will cause such outer marginal portion to expand sufficiently to provide the desired traction of the band or sleeve with the drum, doing this without affecting the drum itself, since the material which connects the inner and outer marginal portions—and which forms the walls of the openings—has this same elasticity characteristic and can therefore supply the material which may be needed to compensate for the expansibility and without materially affecting such strength of the outer marginal portion.

Obviously, each of the forms permits such compressibility in service as may be needed. For instance, the rim zone can be readily compressed to permit of the positioning of the band or sleeve, even though the latter may be but a shade larger than the normal periphery—or if the band or sleeve be arcuate in cross-section instead of planar as shown. Again, when in service, the outer marginal zone will readily yield under inward pressure of the work, thus making it possible to provide the desired abrading or polishing action even where the work is non-planar in type; this is permitted due to the compressibility of the rim zone as provided by the openings.

As is apparent, the specific shapes, dimensions and arrangement of the openings, as shown, are illustrative, since these may be varied to meet particular types of service. Due to the manner in which the rim zone is produced, the variations are provided by variations of the mold and these can be provided to meet any desired condition; hence, it is possible to develop a drum for a specific need if the user's equipment is found unsuitable for the particular service. Normally, the equipment will comprise a plurality of drums differing from each other—the different forms shown in Figures 5 to 7, for instance—and which will meet the conditions of a number of fields of service.

From the above description and explanation it will be seen that within the scope of the invention in a grinding or polishing drum, the rim of which is composed of dense or solid rubber, means have been obtained by which abrasive sleeves may be retained in place by centrifugal force operating thereon more readily and at slower speeds than in the previous art. The tendency to expand at working speeds may be controlled by varying the thickness of the rubber in the outer portion of the rim and by reducing the amount of rubber which connects the outer and the inner portions of the rim by the use of evenly spaced apertures or cavities therein. The character of the cushioning effect may be varied by varying the thickness of the outer portion of the rim, by varying the thickness of the middle portion of the rim and by varying the size and number of the holes or cavities in the middle portion of the rim. All of the above factors may be varied by employing rubber or rubber-like substances of varying degrees of weight, hardness and distensibility.

While I have herein shown and described my present invention and indicated a number of ways in which it may be carried into effect, it will be readily understood that changes or modifications therein may be found desirable or essential in meeting the exigencies of service or the particular desires of a user, and I therefore re-

serve the right to make any and all such changes or modifications as may be found desirable or essential, insofar as the same may fall within the spirit and scope of the invention as expressed in the accompanying claims, when broadly construed.

What is claimed as new, is:

1. In abrading tools for abrading or polishing service, wherein the tool includes a service band or sleeve carried by a rotatable drum and held to position on the drum by centrifugal force action effective on the drum during service, the drum of said tool including an annular rim zone formed of rubber or rubber-like substance, said rim zone being carried by and secured to a hub or body zone and containing at least one series of spaced-apart openings each of which extends from side to side of the rim and with the openings spaced from the inner and outer peripheries of the rim zone, each opening being of generally-similar cross-sectional dimensions from end to end of the opening, the openings of a series having generally similar distance relation to the drum axis to thereby secure band-securing expansion of the rim zone and compressibility of the tool during service.

2. A tool as in claim 1 characterized in that the openings of the rim zone form a single annular series with the openings uniformly-spaced relative to each other and symmetrically-disposed relative to the drum axis.

3. A tool as in claim 1 characterized in that the openings of the rim zone are arranged in a plurality of annular series, with the openings of a series uniformly spaced relative to each other and symmetrically-disposed relative to the drum axis, the several series being spaced apart and arranged in substantially concentric relationship.

4. A tool as in claim 1 characterized in that the openings of the rim zone are arranged in a plurality of annular series, with the openings of a series uniformly spaced relative to each other and symmetrically-disposed relative to the drum axis, the several series being spaced apart and arranged in substantially concentric relationship, with the openings of one series staggered relative to those of an adjacent series on radii of the drum.

5. A tool as in claim 1 characterized in that the openings of the rim zone are arranged in a plurality of annular series, with the openings of a series uniformly spaced relative to each other and symmetrically-disposed relative to the drum axis, the several series being spaced apart and arranged in substantially concentric relationship, the cross-sectional dimensions of the openings of one series differing from those of an adjacent series.

6. A tool as in claim 1 characterized in that the openings are circular in contour.

7. A tool as in claim 1 characterized in that the contour wall of each opening includes an angular configuration.

8. A tool as in claim 1 characterized in that the spacing of the openings from the outer periphery of the rim zone is at least equal to the spacing of openings from the inner periphery of the zone.

9. A tool as in claim 1 characterized in that the spacing of the openings from the outer periphery of the rim zone is greater than that of the spacing of openings from the inner periphery of the zone.

10. A rotary tool upon which abrasive sleeves may be mounted, comprising a hub mountable

on a shaft; a core of relatively dense, firm material having a cylindrical, peripheral face fastened to said hub; and a rim composed of relatively flexible, distensible, compressible rubber or rubber-like substance secured thereon, said rim being composed of a peripheral solid portion in the form of an annulus continuous with and attached

to an underlying portion connecting said annulus with the core or body of the wheel, said underlying portion having evenly spaced holes, cavities or apertures, these holes, cavities or apertures rendering said rim more easily extensible and compressible.

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