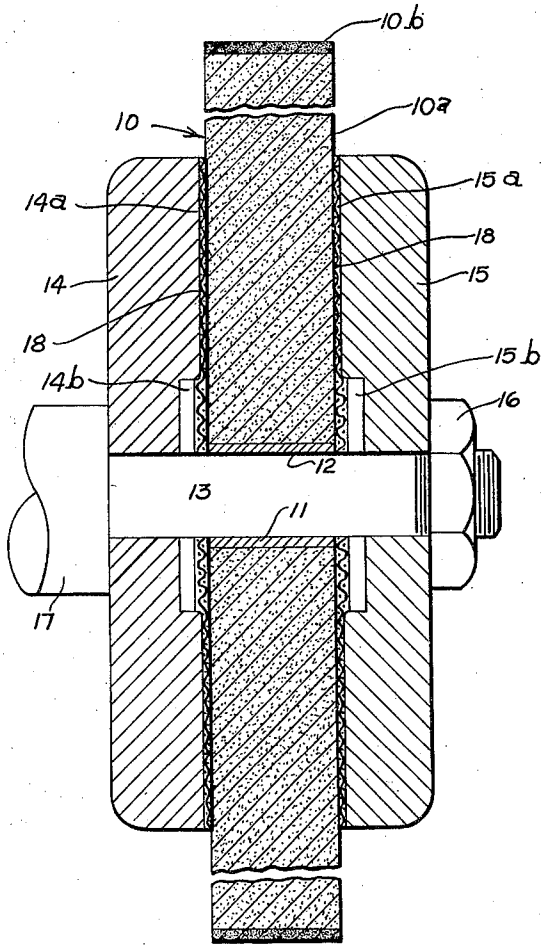
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GRINDING WHEEL MOUNTING

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Inventor

ROBERT H. LOMBARD

By William T. Kniesner

Attorney

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GRINDING WHEEL MOUNTING

Robert H. Lombard, Worcester, Mass., assignor to Norton Company, Worcester, Mass., a corporation of Massachusetts

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This invention relates to the mounting of grinding wheels, particularly wheels of the vitrified-bonded type, on a rotatable driving support, such as a shaft.

One of the objects of this invention is to provide a simple, practical and reliable mounting or assemblage of a grinding wheel on a shaft, and one that will be capable of dependably meeting various peculiar difficulties met with in practice. Another object is to provide a mounting of the above-mentioned nature in which the clamping of the wheel may be reliably effected in a manner to guard against shifting of the wheel off-center and hence to guard against the need of frequent re-trueing due to off-center shifts, and thus to effect saving in time and labor as well as saving in the grinding wheel construction itself inasmuch as frequent re-trueing where the abrasive employed is diamond grit is costly. Another object is to provide a grinding wheel mounting construction in which the clamping pressure is applied to the wheel face or faces underlying the clamping element or elements by means that effects dependable distribution of the clamping pressures to avoid concentrations of strains or stresses in the wheel structure and that has an inherent resiliency appropriate to give it good recovery upon release of the clamping pressure, so that it may be employed over and over again with effective action; another object is to provide a means of the last-mentioned character that will be inexpensive, long-lasting, unaffected by liquids commonly employed as a coolant in grinding wheel operations, unaffected by moisture, and unaffected by changes in temperature. Another object is to provide a grinding wheel unit comprising a grinding wheel having attached thereto, on one or both of its side faces, annular or disk-like members having characteristics such as those just mentioned, for assembly as a unit to a shaft or the like having clamping elements. Another object is in general to provide an improved, more efficient, long-lasting and reliable grinding wheel unit of the just-mentioned kind. 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 all as will be exemplified in the structure to be hereinafter described and the scope of the application of which will be indicated in the following claims.

In the accompanying drawing, the single figure is a central or diametrical sectional view of a grinding wheel mounting illustrating one of various possible ways of carrying out my invention.

As conductive to a clearer understanding of certain features of my invention, let it be assumed by way of illustration, but not by way of limitation, that the grinding wheel 10 is of the vitrified or ceramic type and also that it employs diamond grit as the active abradant; it may, therefore, have a main body or center 10a made up, for example, of any suitable fired ceramic or vitrifiable bonding material with or without suitable filler which may comprise such materials as grains of silicon carbide or of alumina, and an outer abrasive annulus 10b of small radial dimension, for example, 1/8 or 1/4 of an inch, the abrasive annulus 10b comprising, in the illustration, diamond grit bonded by a vitrified or ceramic bond which may be the same as that employed in the supporting center 10a, the two portions being fired as a unit and hence forming one single integral whole. Because of the costliness of the diamond abrasive, the abrasive annulus 10b is of small radial dimension as above noted and to avoid costly waste, it is highly desirable to avoid having to true the operative or grinding face of the annulus 10b excepting at such times as when initially mounting the wheel and for subsequent dressing of the abrasive surface during the continued operation of the wheel.

The grinding wheel 10 is provided with a suitable hole at its center to mount it on a shaft. The hole may in some cases be bushed, as by a bushing 11 of a metal like lead or Babbitt metal or analogous alloy, usually cast in position and thereafter the hole 12 of the bushing is given, as by drilling or reaming, a true cylindrical surface of the desired diameter. In any case, the surface of the mounting hole is intended to be coaxial or concentric with the grinding surface of the abrasive annulus 10b, and its diameter is such as makes a snug but relatively easy fit with respect to a shaft or stud 13 or the like onto which the wheel is to be mounted for driving at a peripheral grinding speed. Sometimes some play or looseness of fit develops particularly after repeated removals or replacements of the same wheel with respect to its supporting shaft. More frequently, looseness or play occurs because of variations in the intended diameter of the shaft or stud, some shaft being more worn than others, for example. It is possible therefore that the wheel, when initially mounted on the stud or shaft 13 is slightly off-center, a condition which is rectified by trueing or dressing the wheel after it is clamped onto the shaft 13, but thereafter it is possible for

an unintentional radial shift to take place of the wheel relative to the shaft 13 to the extent of the above-mentioned play or looseness with the result that the resultant eccentricity of the grinding surface has to be corrected by again trueing or redressing. Thus it is possible to effect costly waste, and prior attempts to overcome such disadvantages, as by the use, for example, of suitable thicknesses of fibrous or so-called "blotting paper" through which to transmit the clamping pressure to the wheel have not always met with success, for various reasons; for example, the blotting paper or so-called "blotters" are detrimentally affected by water, oils, emulsions and other liquid coolants and undergo deterioration or other physical change so that a sufficient looseness or relief of the clamping pressures takes place to permit a radial shifting of the wheel relative to its supporting shaft. Other materials have heretofore been proposed; for example, materials like leather, cloth and the like, but they are not only attacked by certain coolants but also are subject to deterioration from other causes, such as drying out and becoming brittle in the case of leather, and rotting or disintegration in the case of cloths. Moreover, most if not all of the materials heretofore proposed are deficient or entirely lacking in proper or desirable coactions with the clamping plate or plates, both during continued operation of the mounted wheel and upon release of the clamping pressure when the wheel is demounted; in the former case the materials appear to suffer from mechanical fatigue, often brought about by deterioration such as above mentioned, and thus fail to exert a proper follow-up action in transmitting clamping pressures, with the result that sufficient looseness develops to permit radial shift of the wheel. In the latter case, that is upon release of the clamping pressure upon demounting of the wheel, the materials, having undergone compression against the wheel surfaces by the clamping element or elements, fail to make any or sufficient mechanical or physical recovery as they should in order to ready them for proper functioning the next time that the wheel is again mounted on a driving shaft or stud; they thus thereafter permit relatively quick radial shift of the wheel and moreover, because increased clamping pressures are thereafter employed by the operator in the endeavor to overcome the deficiency, there is at once brought about grave risk of breaking the wheel, a risk that is enhanced by the failure of the material to compensate for possible unevenness of side faces of the wheel with resultant non-uniform transmission of the clamping pressures from the clamping plate or plates to the wheel center or wheel structure itself. In accordance with my invention I am enabled to provide a wheel mounting in which such deficiencies as those just mentioned are in substantial measure overcome.

According to my invention, I interpose between the side faces of the wheel 10 and the relatively heavy clamping elements 14 and 15, between which the wheel 10 is clamped in position on the shaft 13 as by a nut 16 which clamps the assemblage against a suitable shoulder 17 provided on the other end of the stud 13, elements 18 which are annular or disk-like in shape and are of sufficient radial extent to underlie the faces 14a and 15a, respectively, of the clamping members 14 and 15. The latter are generally in the form of heavy strong disks, having holes in them to accommodate the shaft 13 and to substantially center them or fix them coaxially with the shaft 13; preferably, they are under-cut as at 14b and 15b where it is desired to avoid applying clamping pressure too close to the innermost or central portions of the grinding wheel 10. As indicated in the drawing, the radial dimension of the elements 18 is greater than the radial dimension of the clamping faces 14a and 15a of the clamping members 14 and 15.

The elements 18 are preferably made up in sheet-like form out of spun glass fibre, sometimes known as "fibre glass," and the glass fibres may be woven or inter-engaged in any desired manner to make up a fabric or mat of any desired thickness; the glass fibre may, for example, be processed in a manner analogous to the making up of various textiles. Thus, the glass fibres may be built up or spun, if desired, into yarn of as many individual fibres as desired and the resultant yarn then inter-locked or inter-woven according to any desired and suitable textile practice. Thus, also, the glass fibres or strands thereof may be simply made up into a suitable mat with the fibres more or less indiscriminately arranged for inter-locking or inter-engagement to hold them together as a mat, with sufficient uniformity of distribution to achieve substantial uniformity of thickness. Several such fabrics or mats may be superimposed upon one another, preferably held together by any suitable means, such as fibre-interlocking, thus forming a composite or laminated textile fabric or fibrous mat of the desired thickness. Any of the commercially available glass filaments may be used, both as to available thicknesses and chemical compositions; and also as to lengths, such as so-called "continuous" glass fibres of unlimited length or short fibres called "staple."

Illustratively, I employ so-called fibre glass mats or, preferably, so-called fibre glass cloth, made of glass fibres and both available on the market in various forms, with the textile form or cloth being available in various weaves, etc., etc. For convenience, I comprehend all such forms within the term "mat" or "mat element" used in the claims, in which I also term any of the above described inter-relationships of glass fibres as "woven" without specific regard to whether it is an actual weave of fibres or yarn as distinguished from knitting or is a criss-crossing of fibres or yarns, or is any other form of glass fibre or yarn inter-relationship. If desired and as above mentioned, several sheets or layers of glass fibre fabric, such as fibre glass cloth, may be superimposed one upon the other to make up a single element 18 of the desired thickness. Illustratively, for an 8" vitrified wheel the elements 18 may be of a thickness on the order of $\frac{1}{32}$" and the weave can be any standard weave.

The criss-crossing of the glass fibres, as in a mat, and particularly where made up as by spinning into yarn which is inter-engaged and criss-crossed or looped back and forth in a regularity of pattern as is the case in weaving or knitting, gives the elements 18, I have found, a capacity to coact with the surfaces between which they are compressed so as in effect to resiliently grip the body of the wheel 10; apparently the many bends given the glass fibres in making up the glass mat, or the many bends given the fibres and yarn in making up the fabric cause each one of them to function as a spring. The many fibres of the yarn when made up into the fabric or mat function as a multiple or composite spring. In mat

form, underlying springy glass filaments lend springy support to those overlying them.

When the nut 16 is tightened up, thus to draw the assemblage against the shoulder 17, those portions of the elements 18 that underlie the clamping faces 14a and 15a, which are of substantial area, undergo some compression as is indicated with some exaggeration in the drawing by contrast with the uncompressed portions thereof that extend into the under-cuts 14b and 15b of the clamping members 14 and 15. Due to the springy action, such as above mentioned, the elements 18 accommodate themselves to irregularities in the side faces of the wheel 10 and substantially distribute uniformly the clamping pressure exerted by the clamping members 14 and 15, to the interposed or underlying body of the wheel 10; the springiness aids in avoiding over-concentration of clamping pressure at unintentionally and possibly present "high" regions in the side faces of the wheel and thus aids in guarding against breakage of the wheel. The mass of glass fibres or strands, or the mass of glass fibre yarn, I have found, tends to restore itself to initial thickness, that is, the thickness before compression, and this action may be aided by the coating material; thus there is a reliable follow-up action, throughout long continued operation of the wheel, in exerting the initially applied clamping pressure against the two sides of the wheel center, resulting in reliable long continued gripping of the wheel and reliable opposition to such relief of the clamping pressure as would permit radial shift of the wheel due to play or looseness between the shaft 13 and the wheel, as above mentioned.

This action continues unimpaired by water, oil or other liquid coolants applied during the grinding operation for the glass of the elements 18 is unaffected thereby, and moreover, though the elements 18 might become subjected to substantial temperature rises or heating, assuming substantially the same temperature as the body of the wheel does, such heating effects do not impair the structure or composition or characteristics of the glass as would be the case if reliance were placed upon materials like leather, paper, cloth or the like. On the contrary, as compared to such materials as these, the glass of the elements 18, having a superior coefficient of heat conduction, permit the conduction of heat from the body the wheel to the metal clamping members 14—15 which are of high heat conductivity, and thus heat flow from the body of the wheel is expedited for the metal clamping members 14—15 can act as heat radiators or dissipators, particularly when aided by a liquid coolant that flows over them. In contrast to such actions as these, materials like leather, cloth, felt, paper, and the like are in general relatively very poor conductors of heat and thus contribute toward building up very substantial temperatures in the body of the wheel and in the portions directly engaged by them with the result that deterioration of these materials by heat is a multiplying or cumulative action.

The above-described resiliency or follow-up action of the glass elements 18—18 is of aid also in maintaining sufficient tightness of gripping during dimensional changes that accompany temperature changes. Upon release of the clamping pressure, as when the wheel is removed from the shaft, the springiness of the glass fibres or strands gives the mat-like elements 18—18 a substantial extent of recovery in the sense that the theretofore compressed portions expand in thickness and even though they do not make complete recovery and restore the elements 18 to their initial or normal uncompressed thickness, the recovery is so substantial as to permit repeated use of the elements 18 as for repeated subsequent assemblies of the wheel unit to an operating or mounting shaft, and each time retain inherent springiness, yieldability and resiliency to function and coact generally in the manner above described.

Preferably, and if desired, the elements 18 are attached in any suitable way to the respective side faces of the grinding wheel 10, and in such case any suitable adhesive may be employed. The adhesive is preferably water-resistant and resistant to oil. A suitable adhesive to employ is latex or other rubber or resinous compositions.

The elements 18, furthermore, can take a suitable printing ink and hence identifying indicia, such as wheel size, grit size of abrasive, concentration of abrasive, etc., etc., may be printed upon the outer faces of the elements 18, and the lasting qualities and resistance to deterioration of the elements 18, as noted above, also make for permanency of the applied identification.

It will thus be seen that there has been provided in this invention a wheel unit and mounting arrangement in which the various objects heretofore noted together with many thoroughly practical advantages are successfully achieved. Though in the illustrative embodiment it has in the above been assumed that the wheel is of the vitrified or ceramic bond type, the invention is to be interpreted as embodying, or as applicable to, any other type of grinding wheel structure or any other abrasive article, such as an abrasive stick, wheel segments, or the like, for which it is desired to achieve the many advantages of the invention, and in the claims, the term "grinding wheel," unless otherwise qualified, is therefore to be interpreted to include any such abrasive article.

As many possible embodiments may be made of the mechanical features of the above invention and as many changes might be made in the embodiment above set forth, all without departing from the scope of the invention, it is to be understood that all matter hereinabove set forth, or shown in the accompanying drawing, is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. A grinding wheel mounting comprising a rotatable grinding wheel support having clamping members, and a grinding wheel having against a face thereof a mat element of woven glass fibres presented to one of said clamping members for compression of its springy fibres to thereby transmit and substantially yieldingly distribute throughout said face of the grinding wheel the clamping pressure exerted by the clamping member.

2. A grinding wheel unit for assembly to a rotatable wheel mounting having spaced clamping members of substantial surface areas for clamping therebetween the body of the grinding wheel, comprising a grinding wheel having on its two side faces and throughout the areas thereof to be engaged by said clamping members, mat elements of woven glass fibre, the configurations given the glass fibres because of the woven character of the mat elements causing the glass fibre strand elements of the mat elements to have springiness, whereby clamping pressures exerted

by said clamping members are yieldingly transmitted and distributed to the body of the wheel.

3. A grinding wheel having on a clamping face thereof a mat element of woven glass fibre, the configurations given the glass fibres because of the woven character thereof giving the glass fibre elements springiness to substantially yieldingly transmit and distribute clamping pressures to the body of the wheel.

4. A grinding wheel having on a clamping face thereof an element for receiving and transmitting to the wheel the pressure exerted by a clamping member, said element comprising glass fibres made up into yarn and the yarn made up into a mat whereby the mat is substantially self-accommodating to irregularities in the face of the wheel and the yieldability of the yarns effect substantially uniform distribution of the clamping pressure to the area of the wheel engaged by the mat.

ROBERT H. LOMBARD.