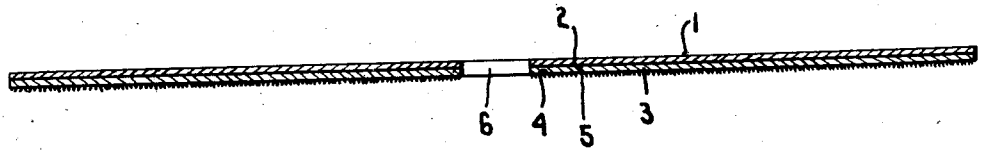
Oct. 9, 1928.

1,687,071

H. R. STRATFORD

SURFACING DISK

Filed June 27, 1927



INVENTOR.

Herbert R. Stratford

BY Fray, Oberlin & Fray

ATTORNEYS.

Patented Oct. 9, 1928. 1,687,071

UNITED STATES PATENT OFFICE.

HERBERT R. STRATFORD, OF CLEVELAND, OHIO, ASSIGNOR TO THE STRATMORE COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

SURFACING DISK.

Application filed June 27, 1927. Serial No. 201,961.

The present invention, relating as indicated, to abrasive surfacing disks, is more particularly directed to an improved composite abrasive disk for use in that type of machines now generally known as sanding machines for the surfacing or abrading of metal, wood and other surfaces on articles such as sheet metal bodies, metal and wooden hulls of boats, floors and numerous other articles having a surface which must be cut down to a smooth and generally level condition. In such machines the operation is effected by means of a rotating disk, the disk being secured at its center to a supporting pad having either compressibility or flexibility, or both, the pad and disk thus being rotated in unison by a single shaft. The outer edge portion of the disk, which is covered on its operating surface with a suitable abrasive is then pressed against the work, and particularly where the operation is carried out on metal there is an extremely high resistance to the rotation of the disk, by reason of the cutting of the abrasive grains into the metal. The result is that the disks, in order to have a suitable life, must be made of extremely strong, tough materials, and yet the choice of such materials is greatly limited, and thus materials ordinarily used are entirely excluded by another condition which is required in the disks, namely, that the disks have a certain degree of flexibility to permit them to bend and flex as the supporting pad compresses or bends. It is essential that the material be capable of withstanding alternate bending or flexing at a high rate of speed and without the separation of one layer of the composite material from another. Tests which I have made indicate that substantially the minimum requisite in this respect is the ability to flex at a rate of some 3500 flexures per minute without breakage and without separation of the layers.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims; the following description and drawing setting forth in detail one approved combination of elements embodying the invention, such disclosed means constituting, however, but one of various forms in which the principle of the invention may be used.

In said annexed drawings;

The single figure there appearing is a transverse central section through my improved disk.

The invention consists of a new and improved abrasive surfacing disk for use under the above conditions. It consists, briefly stated, of laminations of a suitable flexible cloth and a tough and flexible cellulose product in the form of "vulcanized fibre" suitably cemented to the cloth. The cloth is also provided on the face opposite to that cemented to the fibre with a layer of suitable cementitious material, such as glue, varnish or the like, which serves to unite to the composite disk a layer of suitable abrasive grains. In addition to the separate layers of material enumerated above there are also the intermediate layers of cementitious material, such as glue, which cement the layer of fibre to the cloth and the cloth in turn to the layer of the abrasive material. The cloth may either be cotton drill having a weight of about one pound for every 2.85 lineal yards 29 inches wide, or it may be duck, jeans and other similar materials, either of the weight named or of other weights so long as it is suitably selected and combined into a disk of the character hereinafter described.

In the single figure of the drawing I have shown a disk constructed as described above and consisting of a circular sheet 1 of fibre, to one surface of which is applied a layer of adhesive 2. Against this adhesive there is then applied a disk of cloth 3 of the same shape and size as the fibre disk, and to the outer surface of the cloth is applied a layer of adhesive 4. Abrasive 5 is secured to the disk by the adhesive 4, the composite structure thus formed being provided with a central opening 6 which illustrates the simplest means for permitting attachment of this disk to a supporting and driving pad and shaft.

From my experience in the manufacture and use of composite abrasive disks for sanding machines, and from numerous tests conducted on the properties of various materials, I have found that only a composite disk of the structure referred to above possesses all of the qualities required in such an article, that is, the flexibility, the torsional strength under the resistance set up by the engagement between the grains and the work, the resistance to fraying at the edge of the disk, resulting in the loss of the abrasive from that portion of the disk, and the life which is necessary for economical operation of such ma-

chines under the above strains and under alternate flexure. A further important characteristic which the present invention has and which I have not been able to secure in any other composite disk, is the capacity of the material which permits a disk of the original diameter of 9 inches to be cut down to 8 inches after some use, and subsequently even to 7 inches as the abrasive adjacent the edge is worn off, thus permitting the maximum amount of service from a single disk. No other composite disks have this quality and thus give very much less total service than the present composite disks, the other disks splitting when cut, and apparently not having sufficient toughness to undergo this operation.

As a backing material I have found "vulcanized fibre" to possess all of the qualities required in a high degree and to show, both in actual use and under various types of tests, a great superiority over any other material which can conveniently and economically be used with the cloth in a composite disk of this general character. By the term "vulcanized fibre" I refer to chemically treated paper made from cotton. The general method of forming this material consists in taking pure cotton, usually in the form of old cotton rags, pulping it and then forming the sheets of paper in common types of apparatus from this pulp. The sheets are then passed through a zinc chloride bath, causing a part of the fibre to be dissolved and leaving a gelatinous or adhesive coating on each individual fibre, which is due, perhaps, to the dissolving of the outer coating on each fibre by the chloride solution. These sheets are then passed through rolls which compress the fibres together and remove the zinc chloride, after which the sheets are washed with water until the last traces of chloride are removed from them and then dried. During the drying considerable shrinkage takes place. This fibre may be made by other processes in which other reagents are used to replace zinc chloride, but under any of these processes the resulting product, which is known as "vulcanized fibre" has a very high tensile strength, in fact, the highest of any known cellulose product, density and rigidity. The chemical action which takes place during the process is not entirely understood, but it is believed to involve a hydration of the cellulose and the product is sometimes termed "hydrated cellulose" or "hydrolyzed fibre."

The term "vulcanized fibre," which has been used throughout the specification, is a popular and commercial name for the product just described, although the term "vulcanized" is a misapplied term in this connection, since it implies a rubber component, and no such component is present in the product. This vulcanized fibre is also known in the trade as "fibre," "hard fibre" and "horn fibre," and is manufactured and sold by different companies under trade names "Armite," "Leatheroid" and others.

Various comparative tests made on my improved disks and those made from other types of paper backing and cloth show a remarkable increase in strength, rigidity, life under alternate flexure and resistance to abrasion. Comparative tensile strength tests on strips 1" wide and 10 mills thick made from "vulcanized fibre," pattern paper and manilla rope paper (of two grades), show that the "vulcanized fibre" has a very much higher tensile strength, both longitudinally and transversely, than any of these other materials, as is indicated by the following table, which shows the average tensile strengths on strips of the size and thickness given.

	Longitudinal	Transverse
	Lbs.	Lbs.
"Vulcanized fibre"	190	90
Pattern paper	80	55
Manilla rope paper—Cylinder	120	45
Manilla rope paper—Fourdrinier	90	45

Rupture tests were made in which squares of "vulcanized fibre" and pattern paper were clamped in frames and then subjected to the fall of a four-pound weight. The height at which this weight may be allowed to fall and just break through the paper gives a clear comparison of the strength of the two papers against rupture. In such tests "vulcanized fibre" as compared to pattern paper showed that the same weight might be dropped 4½ feet as compared with 1½ feet for the weight when dropped upon pattern paper. The resistance or strength against rupture of the "vulcanized fibre" is therefore approximately three times that of pattern paper. The rupture tests indicate the relative resistance to sudden blows and shock, and this quality of the material is of course highly important in disks which are submitted to grinding operations of the character already described.

Abrasion tests were made which consisted in placing corresponding samples of fibre and pattern paper against a revolving abrasive disk, holding these in contact with identical pressures and then revolving the two for 100 revolutions. Pattern paper lost 31% in thickness in this test as compared with a 17% loss for the fibre. The abrasion tests indicate primarily the density, and secondarily the toughness of the material, and in this respect "vulcanized fibre" greatly exceeds all other cellulose products. Comparative densities are as follows:—

	Grams per cu. cm.
Fibre (one make)	1.35
Fibre (another make)	1.09
Pattern paper	.76
Manilla rope paper—Fourdrinier	.95

In actual use remarkable increases in life have also been found with my improved composition disks, disks consisting of laminations of fibre, cloth and abrasive having to an extremely high degree the properties required for sanding operations, such as a proper degree of flexibility, tensile strength, life in actual service, and also the ability to withstand repeated flexure without breaking or splitting, and the ability to permit recutting of the disk to small diameters without splitting or fraying of the edges.

Other forms may be employed embodying the features of my invention instead of the one here explained, change being made in the form or construction, provided the elements stated by any of the following claims or the equivalent of such stated elements be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. A composite surfacing disk consisting of abrasive integrally joined to one surface of a disk of cloth, and a supporting element for said cloth integrally joined thereto and consisting of vulcanized fibre having a longitudinal tensile strength for a section one inch wide and ten mills thick in excess of 150 pounds and a transverse tensile strength for the same strip in excess of 75 pounds.

2. A composite surfacing disk consisting of abrasive integrally joined to one surface of a disk of cloth, and a supporting element for said cloth integrally joined thereto and consisting of vulcanized fibre having an average longitudinal tensile strength of 170 pounds and an average transverse tensile strength of 85 pounds for a section one inch wide and ten mills thick.

Signed by me this 17th day of June, 1927.

HERBERT R. STRATFORD.