Feb. 18, 1936. L. D. REED 2,031,280

ABRASIVE SUPPORTING PAD AND METHOD OF MAKING THE SAME

Filed May 21, 1935

Fig. 1.

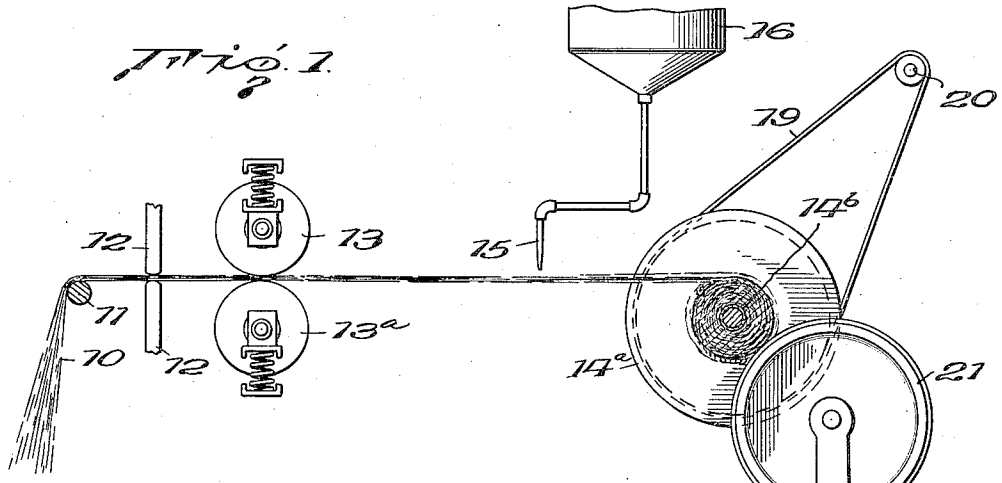
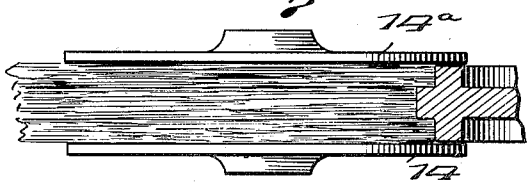


Fig. 3.



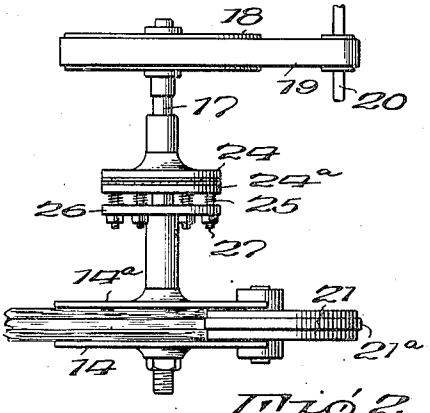


Fig. 2.

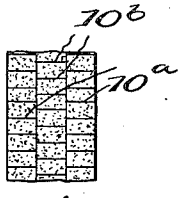


Fig. 4.

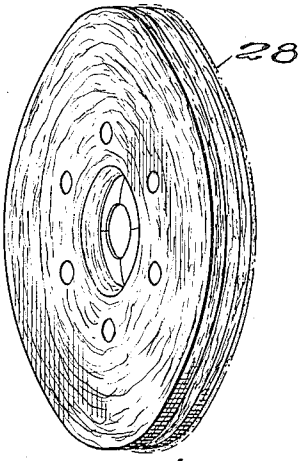


Fig. 5.

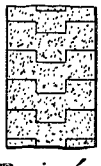


Fig. 4a

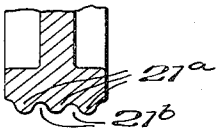


Fig. 8.

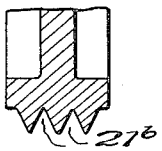


Fig. 6.

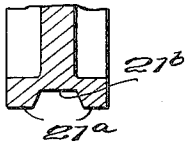


Fig. 7.

Inventor
Leslie D. Reed

By Church & Church
His Attorneys.

Patented Feb. 18, 1936

2,031,280

UNITED STATES PATENT OFFICE

2,031,280

ABRASIVE SUPPORTING PAD AND METHOD OF MAKING THE SAME

Leslie D. Reed, Auburn, N. Y., assignor to Columbian Rope Company, Auburn, N. Y., a corporation of New York

Application May 21, 1935, Serial No. 22,608

8 Claims. (Cl. 51—195)

This invention relates to improvements in fibrous bodies for use in abrading or buffing devices and method of making the same, and is especially applicable to the production of a disk-like body, commonly termed a pad, which is adapted to have an abrasive material applied to or supported on one of its side surfaces.

Usually, in devices of this particular type, a sheet of abrasive material is secured to one side surface of the disk or pad and in performing the abrading or buffing operation the object operated upon is usually pressed against said abrasive near the periphery of the pad, while the latter is rotated. In other words, under working conditions, pressures are imposed on the pad laterally thereof so that the peripheral portion of the pad is flexed laterally.

This flexing of the pad naturally tends to cause what is here termed shear failure, particularly in those structures where the pad is formed of radially arranged laminations or a plurality of convolutions of material superimposed one upon the other radially of the pad. In other words, the individual layers of material tend to move relatively to one another under the lateral pressures imposed thereon.

Primarily, therefore, the object of the present invention is to provide a pad or disk-like abrasive supporting member whose peripheral portion is composed of successive radially superposed layers or convolutions of fibers, contiguous layers or convolutions being interlocked in such fashion as to prevent the interlocked layers moving relatively to one another laterally of the disk under the lateral pressures imposed thereon under working conditions.

More specifically, the invention consists in forming a plurality of layers of fibers around an arbor and, as each layer is formed, one or more groups of the fibers constituting said layer are offset from the plane of the remaining layers, forming a rib or ribs at one side of each layer and a recess or recesses at the opposite side, the ribs and recesses of contiguous layers being interlocked.

The preferred method consists in forming a length of parallel fibrous elements, either individual fibers or elements each composed of a plurality of fibers, and winding said length on a suitable form. The density of the disk body, thus formed, is determined by the tension placed on said length and by a pressure roll which is associated with the winding form and compacts the successive convolutions thereon. The periphery of said pressure roll is formed with an annular rib or recess for each rib to be formed on each convolution so that, as the roll is pressed against the length of material, one or more groups of the elements are displaced radially, thus forming the rib or ribs on each convolution. A suitable binder is applied to the elements during the formation of the disk to secure the layers or elements together.

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

In the accompanying drawing,—

Figure 1 is a side elevation, illustrating more or less diagrammatically one form of apparatus for carrying out the present method of producing a pad or disk of the type referred to.

Fig. 2 is a top plan view illustrating one form of tensioning means;

Fig. 3 is an edge view of a pad or disk form with a portion of the length of fibrous elements wound thereon;

Fig. 4 is a sectional view through one of the pads produced by the present method.

Fig. 4*a* is a similar view of a modified form of pad.

Fig. 5 is a perspective view of a finished pad with a sheet of abrasive material indicated in dotted lines on one side thereof.

Figs. 6, 7 and 8 show modified profiles which may be used on the presser roll.

Referring particularly to Figs. 1 to 5, a plurality of fibrous elements, such as hemp or other fibers of appreciable length, are arranged in substantial parallelism with one another longtudinally of the length of said body of elements, as shown at 10 in Fig. 1. This may be accomplished by passing successive overlapping hanks of fibers through the usual preparation machines commonly employed in the rope and cordage industry for combing the fibers preparatory to the spinning of yarns, etc. While the individual fibers are preferred, it is, of course, entirely practical to utilize small threads or spun yarns in preparing the continuous length of elements 10.

In the preferred form of apparatus, this length of material 10, after being thus prepared, is passed over a guide 11 and then between oppositely disposed spreader devices 12. From the spreader 12, the material passes between rotating rolls 13, 13a, yieldingly urged toward one another and driven at a constant peripheral speed. Before reaching the form on which the material is wound to produce the pad or disk, a suitable binder is

applied to the material. Various binders may be used, such as latex cement, glue or the like, or a combination of latex cement and glue may be used, as the resiliency of the finished pad can be varied by varying the proportions of said ingredients. The glue tends to reduce resiliency and the latex cement to increase that characteristic. The binder may be applied in various ways, the application thereof not being limited to the devices shown in the present instance wherein binder from a reservoir 16 is projected onto the material through one or more nozzles 15.

The form on which the layers of material are assembled, in the present instance by winding successive convolutions of the material 10 thereon, is a spool composed of readily detachable sections to permit the removal of the finished pad therefrom. This winding spool is mounted on a shaft 17 carrying a pulley 18 to which power is supplied by a belt 19 from a drive shaft 20. The construction of the spool illustrated consists of disks 14, 14a, adapted to be secured on the end of shaft 17 with an arbor 14b interposed between the two disks. After the pad is finished, it is removed by backing off the outer disk 14. The arbor forms an opening in the center of the pad, as shown in Fig. 5. The radial thickness of said arbor may be varied, it only being essential that the fibrous material constitute the peripheral portion of the pad on which the lateral stresses hereinbefore mentioned are imposed.

As the successive convolutions of material are wound between the disks 14, 14a, they are pressed radially inward by a pressure roll 21 journaled in pivoted bearing members 22 yieldingly urged toward the spool form by spring 23. In order to interlock successive convolutions with each other against relative lateral movement and thus eliminate destruction of the finished pad by the lateral shearing effect produced by pressures imposed laterally of the pad under working conditions, the periphery of the pressure roll is of irregular formation. For instance, if a single interlocking rib and recess is deemed ample, the pressure roll may be formed with an annular rib 21a on its periphery or, as shown in Fig. 6, with a circumferential recess 21b. In either case the central group of elements of the length of material will be displaced radially from the remaining elements in any one winding or convolution forming a rib on one surface of said convolution and a recess in the other and, as will be appreciated, the rib formed on one convolution will be interlocked in the recess formed in the next adjacent convolution. The interlocked ribs and recesses are illustrated at 10a and 10b in Fig. 4. The cross-sectional contour of the rib and recess may, of course, be varied, and, where more than one rib is desired on each winding, the pressure rolls may be made as illustrated in Figs. 7 and 8, wherein they are formed with a plurality of circumferentially extending ribs 21a or grooves 21b. So far as the feature of forming an interlock between contiguous layers of material 10 is concerned, it will readily be seen that the formation of the ribs and recesses is not necessarily limited to use where successive layers or laminations are formed by a winding operation. It can be used in various forms of laminated pad construction, but the winding of a continuous length of material is preferred because of its simplicity.

To properly tension the fiber elements and impart the required density or compactness to the finished pad, shaft 17 is made sectional and a friction or slip clutch interposed between said sections. This clutch may consist of a plate 24 fast on one shaft section frictionally engaging a second plate 24a loose on the other shaft section, but urged toward plate 24 by springs 25 interposed between said plate 24a and a plate 26 fast on said other shaft section. Springs 25 may be coiled on bolts 27 threaded through plate 26 and loosely engaging plate 24a. By adjusting nuts 28 on bolts 27 the frictional engagement between plates 24, 24a may be varied or regulated at will. Of course, the density of the finished pad is also affected by the pressure exerted on the material by the pressure roll. If desired, the tensioning of the windings may also be controlled by manual operation of the winding spool.

In addition to the formation of the ribs 10a and grooves 10b in contiguous laminations or convolutions, the fiber elements of each winding embed or wedge themselves between juxtaposed elements of the same or preceding convolutions, thus further facilitating the formation of a compact mass. This is especially true where the length of material is formed of individual fibers because of the comparatively small diameter of the fibers.

It may, in some instances, be desirable to place the pad, after being formed, but before the binder has dried, in a mold under pressure and permit it to dry therein. This is not essential but with certain types of binders the strength of the latter is increased. Where latex, in a vulcanizable compound is used as a binder, heat may be applied to the mold to vulcanize said binder.

Summarizing, the present method consists in forming the peripheral portion of a pad of disk-like formation by assembling a plurality of radially superposed layers of material, preferably fibers arranged in parallelism, and interlocking contiguous layers by forming interengaging, circumferentially extending ribs and recesses in said contiguous layers. In a pad produced by such a method, lateral pressures imposed upon the side surface of said peripheral portion will not destroy the pad because the interlocked layers will be unable to move laterally with respect to each other.

A finished pad, produced according to the present method, is illustrated in Fig. 5 and in said figure there is also illustrated in dotted lines a body of abrasive material 28 supported on the side surface of said pad.

It will also be appreciated that the extent of interlock between the laminations or convolutions will be governed by the depth of the recess or rib on the pressure roll 21. For instance, to obtain the pad construction shown in Fig. 4, the depth of the rib on the roll would have to exceed the thickness of the individual layers of material; whereas, for the pad illustrated in Fig. 4a, the depth of the rib would be less than the thickness of the individual layers.

In addition, the interlocking feature is not limited to use in abrasive supporting bodies. It is of advantage to embody this structural feature in any disk-like body of fibers, such as wheels, rollers, or the like where pressures tend to cause a lateral shifting or relative movement of the fibers in the body.

What I claim is:

1. A disk-like body adapted to carry an abrasive material on one of its side surfaces and to flex when subjected to pressure against said surface, an annular portion of said body adjacent its periphery being formed of a group of substantially parallel fibrous elements laid in convolutions circumferentially of said disk, a portion of the elements of one convolution being offset radi-

ally and interlocking with the elements of the next adjacent convolution, and a binder for securing said fibrous elements together.

2. A disk-like body adapted to carry an abrasive material on one of its side faces and to flex when subjected to pressures on said face, an annular portion of said disk adjacent its periphery being formed of successive convolutions of fibrous elements arranged circumferentially of the disk, said convolutions having elongated recesses therein extending substantially circumferentially thereof, and a portion of the elements of individual convolutions being formed into an elongated rib extending substantially circumferentially thereof and interlocked in a recess in one of the next adjacent convolutions, said ribs and recesses being of a depth exceeding the cross section of the individual elements and a binder for securing said fibrous elements together.

3. A pad body of disk-like formation adapted to have an abrading substance applied to one side surface thereof and adapted to flex under lateral pressures applied to an annular portion thereof adjacent its periphery said annular portion being formed of a plurality of fibrous elements wound in successive convolutions, a portion of each convolution having a circumferentially extending recess therein, and ribs on said convolutions engaging in the recess of a next adjacent convolution, said ribs and recesses being of appreciable depth to prevent lateral movement of contiguous convolutions relatively to one another and a binder for securing said fibrous elements together.

4. A pad body of disk-like formation adapted to flex under lateral pressures imposed on an annular portion thereof adjacent its periphery, said annular portion being composed of a plurality of laminations and a binder for securing said laminations into a unified mass, a portion of said laminations having recesses of appreciable depth therein extending transversely of the direction in which said pressures are imposed on the body, and ribs on said laminations corresponding in cross section to said recesses interlocking in a recess in a next adjacent lamination.

5. A pad body of disk-like formation adapted to flex under lateral pressures imposed on an annular portion thereof adjacent its periphery, said annular portion being formed of successive layers of fibers imposed upon each other radially of the disk, said layers having recesses therein extending transversely of the direction in which said pressures are imposed on the disk each recess being formed by a group of fibers being offset radially from the normal plane of the layer, ribs on said layers of fibers formed by a group of fibers being offset radially from the normal plane of the layer, the rib of one layer interlocking in the recess of a next adjacent layer, said ribs and recesses being of appreciable depth to prevent substantial lateral movement of interlocked layers relatively to each other, and a binder for securing said fibers together.

6. The method of forming the peripheral portion of a disk-like pad of the type described which comprises winding a length of fibrous elements in successive, superimposed convolutions on a form, applying a binder to said elements, and forcing a group of elements of a convolution radially out of the normal plane of said convolution to form a recess in one surface of the convolution, and a rib on the opposite surface thereof, the rib on one convolution projecting into the recess in a next adjacent convolution.

7. The method of forming the peripheral portion of a disk-like pad of the type described, which comprises forming a length of loosely assembled fibrous elements, winding said length of elements on a form, applying a binder to said elements, forcing a group of elements of an individual convolution radially out of the other elements of said convolution to form a rib on one surface of said convolution and a recess on the opposite surface thereof, and interlocking the rib of one convolution in a recess of a contiguous convolution.

8. A body of disk-like formation having its peripheral portion formed of fibrous elements arranged in successive layers extending circumferentially of the disk and a binder securing said elements together, a group of elements of each of two successive layers being offset as a body radially of the respective layers, said offset portions forming interlocking ribs and recesses of appreciable depth in said layers.

LESLIE D. REED.