Feb. 4, 1930. E. SLADE 1,745,774

FRICTION MATERIAL

Original Filed Dec. 24, 1923

Fig. 1.

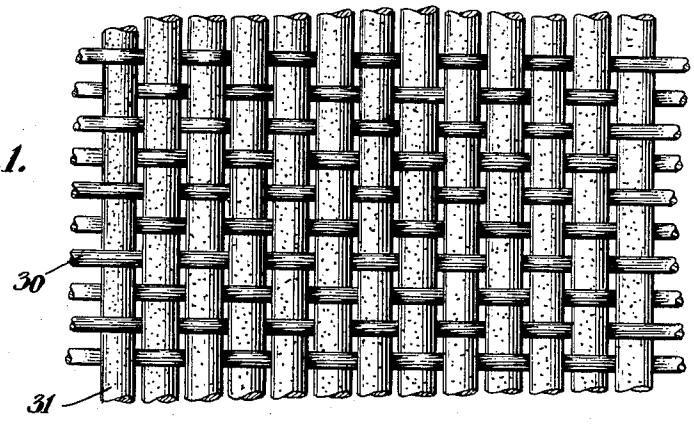


Fig. 2.

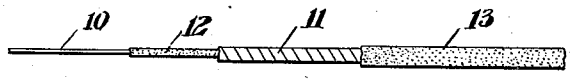


Fig. 3.

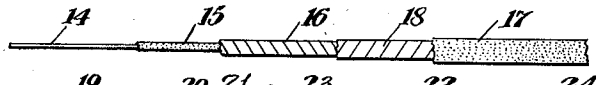


Fig. 4.



Fig. 5.

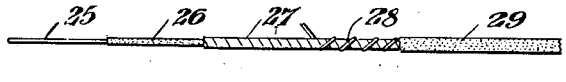


Fig. 6.

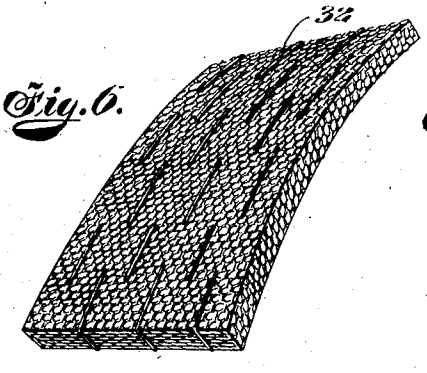
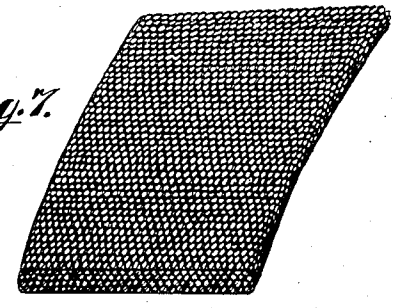


Fig. 7.



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asbestosclaims.law/library/22431/1

Patented Feb. 4, 1930 1,745,774

UNITED STATES PATENT OFFICE

EDWARD SLADE, OF NEW YORK, N. Y.

FRICTION MATERIAL

Application filed December 24, 1923, Serial No. 682,595. Renewed June 16, 1928.

This invention relates to friction material such as brake or clutch lining and the like.

The invention aims to produce an article of this class which shall be long wearing, have a high co-efficient of friction, be water and oil-proof, and will not squeak, chatter or burn, and will also be non-gummy and odorless under high heat.

In the drawings which are part of the present application.

Fig. 1 is a fragmentary view of a section of one form of the fabric formed in accordance with this invention.

Figs. 2, 3, 4 and 5 are illustrations of strands of which the fabric may be made.

Fig. 6 is a fragmentary view of a folded brake lining, and

Fig. 7 is a similar view of what is known as a woven brake lining.

The form of fabric, such as illustrated in Fig. 1, includes, preferably, warp strands of deformable wire and weft strands of deformable wire core and asbestos covering containing no combustible material. It is to be understood that the fabric may be made with the warp and weft strands both of the type of strand which includes the core and covering.

Several forms of weft strands which may be used are illustrated in Figs. 2 to 5 inclusive of the drawing. One of these strands includes a wire core 10 which is surrounded by a convolute covering 11, preferably, of a strip of sheet asbestos which latter makes possible the use of short fibre asbestos. This strip covering 11 is prevented from relative movement with the core 10 by suitable means such as finely comminuted asbestos 12 which may be fixed to the core by an adhesive. Surrounding this covering 11 is a molded coating material 13 such as asbestos fibres or floats. In this form of strand the thus built up cover is compacted and the outer surface may be substantially smooth, the compacting, however, being to such a degree that the strand remains pliable and may be deformed without cracking or otherwise mutilating the covering and being such that a strand of sufficiently uniform diameter for weaving results.

The second form of strand, as shown in Fig. 3, is built up in much the same manner as that shown in Fig. 2 and includes the wire core 14, the anti-slip compound 15, the convolute strip covering 16, and the molded coating 17. However, in this form a second convolute strip covering 18 is applied between the coating 17 and the first strip covering 16, the convolutions of the strip 18 being opposite to those of the strip 16. This thus built up cover is likewise compacted and sized for the same reason and with the same result as the first described strand.

Of course, it is to be understood that the number of covering strips and the thickness and width of the strips may be increased, if desired, the controlling factor being the diameter of a strand which it is desired to obtain.

A third form of strand, such as illustrated in Fig. 4, includes a core, 19, which carries an anti-slip compound 20, a convolute covering strip 21, a second convolute covering strip 22 with the convolutions extending in the direction opposite to those of the strip 21, and an interposed convolute binding element 23, preferably, of wire. It also includes a molded coating 24 which envelops the cover in its entirety. This thus built up cover is compacted and sized so that it likewise possesses the desired characteristics.

An additional form of strand such as illustrated in Fig. 5 includes a metallic core 25 which carries an anti-slip compound 26, a convolute fibrous strip 27, a metallic convolute binding element 28 with the convolutions extending in the direction opposite to those of the strip 27. This form also includes a molded coating 29 and the covering thus built up is compacted and sized as in the other instances. It is, of course, appreciated that the number of strips used in the form shown in Fig. 4 may be increased as the occasion demands.

Using any of these types of strands illustrated in Figs. 2 to 5 inclusive as the weft, the cloth is woven as shown in Fig. 1 with the warp strands 30 and the weft strands 31 or, if desired, the built up strands of wire and asbestos may be used both for the warp and weft.

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When it is desired to form what is known as a folded and stitched braking lining, for instance, the fabric is woven to a width sufficient to permit its folding into the desired number of thicknesses. The thus woven fabric is, in the preferred form of the laminated brake lining, thoroughly impregnated with a compound preferably containing graphite or other lubricant and a filler in a suitable liquid vehicle. This impregnation is preferably performed under pressure so that the fabric will absorb throughout its entire thickness a substantially uniform amount of the compound. The thus impregnated fabric is then dried to drive off a portion of the volatile ingredients of the impregnating compound and is folded into laminations with the weft strands running in the line of folding, that is to say, in the direction of the force which is applied in the use of the brake or clutch lining. In folding the fabric care is taken not to expose any raw edges and to this end the folding preferably is such that the raw edges will be covered by the bight portions of the folds as shown in Fig. 6.

The thus folded lining is then subjected to the action of a high pressure squaring machine bringing it roughly to its final form and the several thicknesses are then bound together by stitching or riveting 32 which is preferably of metal. The ends of the stitches or rivets are clinched into the wearing surface of the lining so that during wear they will be continuously upset and thus always operate to hold the laminations of the fabric together.

After the laminations are thus stitched or riveted together the lining is again squared and compressed thus bringing it very closely to its final form and it is then heat treated to drive off the remaining volatile constituents of the impregnating compound and to bring the compound to the proper consistency and hardness. There is thus left in the fabric a lubricant comprising graphite and also a filler which tends to fill the interstices of the fabric and which by being heated is so hardened as to present the greatest resistance to wear compatible with the flexibility of the lining.

The lining is then finally squared under great pressure to bring it to the exact shape and size desired.

The use of the filler and lubricating material together with the shaping and pressing steps described result in a material of far greater density and uniformity than it has heretofore been possible to produce in practice. This, together with the fact that the lining contains no combustible material, makes for much greater life of the lining.

The fabric may also be so woven as to form what is known as a woven brake lining such as shown in Fig. 7 of the drawing and this thus formed lining may be impregnated with a lubricant compound and squared and compressed as desired.

When a wire warp is used in the manner described the weft strands are preferably, in the weaving of the cloth, driven against the intersecting warp strands with considerable force so that the warp strands bear upon the weft and hold the weft strands firmly and in close proximity with one another. This results not only in holding the fibres together but also holding adjoining convolutions of the covering strips in place without substantial penetration and furthermore prevents the fraying out of the asbestos fibres.

Of course, it is to be understood that the fabric which constitutes a part of this invention may be incorporated not only in brake linings to which reference has herein been made but also in other forms of brake or clutch linings or other friction elements so that I do not wish to be confined to the particular form of lining illustrated.

The method of forming the laminated lining may be varied as to the folding, impregnation, compression and stitching.

Irrespective, however, of the particular form of the friction element, it always contains a maximum amount of metal and a substantially uniformly impregnated asbestos fibrous strand, and preferably without the presence of any combustible material. As a result, during the entire life of the brake lining, the maximum amount of metal co-operates with the brake drum and lubrication is present during the entire life to a substantially uniform degree.

I do not wish to be limited to the particular embodiments of the invention illustrated nor to the particular uses described as it is obvious that many changes may be made in each.

What I claim is:

1. A strand for friction fabric which includes a deformable metal core, convolute fibrous coverings therefor, the convolutions extending in opposite directions, and a convolute binding element disposed between the convolute coverings.

2. A strand for friction fabric which includes a deformable metal core, a convolute fibrous covering therefor, and a felted coating of fibrous material enveloping said convolute covering.

3. A strand for friction fabric which includes a deformable metal core, a convolute strip sheet asbestos covering therefor, and a compacted asbestos coating enveloping said strip.

In testimony whereof, I have signed my name to this specification this 22nd day of December, 1923.

EDWARD SLADE.