Oct. 7, 1941. C. BOCKIUS ET AL 2,258,237

FRICTION ELEMENT

Original Filed Nov. 20, 1935

Fig. 1.

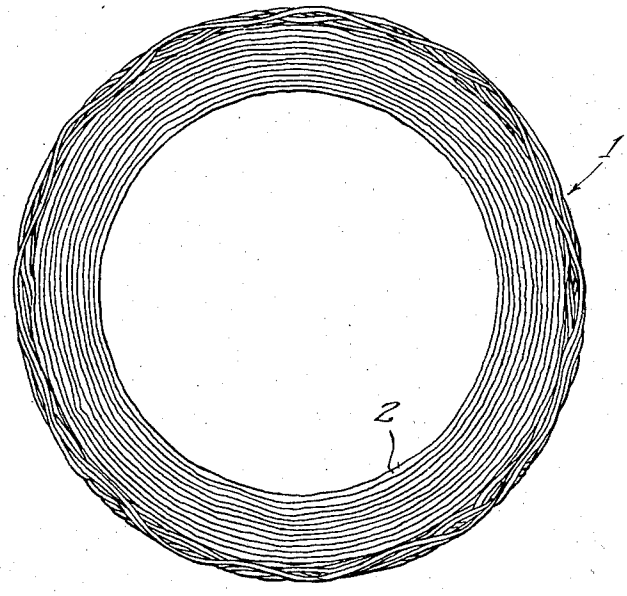


Fig. 2.



Inventors:
Judson A. Cook
Chris Bockius
By Lee J. Gary.
Attorney.

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FRICTION ELEMENT

Chris Bockius, Ridgewood, and Judson A. Cook, Haledon, N. J., assignors to Raybestos-Manhattan, Inc., Passaic, N. J., a corporation of New Jersey

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6 Claims. (Cl. 192—107)

This application is a division of our co-pending application Serial No. 50,802, filed November 20, 1935, issued September 20, 1938 as U. S. Patent No. 2,130,520.

This invention relates to improvements in friction elements for use as clutch facings, brake linings and the like. The novel product of this invention comprises a structure having no splices, staples or other hard projecting areas of juncture, constructed by endlessly winding fibrous yarn or roving into an endless wound structure.

The invention will be described with particular reference to its embodiment in a clutch facing, but it is to be understood that the invention embraces brake linings as well as clutch facings.

Among the objects of this invention are to provide an endless friction facing devoid of splices, thus eliminating variations in density and insuring uniformity of the facing throughout its entire contact area; to provide a facing having an unusually high resistance to centrifugal force; to provide a facing especially adapted for use with crimped pressure plates; to provide a structure which lends itself to economical manufacture, since there is no cutting or waste of material other than that lost in the grinding operation, which is negligible; to provide a structure in which, due to the peculiar spider-web method of winding and the manner in which the wave form strands fall over and overlap while curing, there is no danger of ply separation; to provide a structure in which the possibility of scoring is eliminated since it has no symmetrical pattern, and in general to provide an improved friction element for the purposes herein described.

Resistance to centrifugal force is becoming more and more important with the growing popularity of high speed engines and clutches, which may be disengaged at these high speeds, with the result that the side holding power of the pressure plate and flywheel plate are removed. This action brings a very high centrifugal force to bear upon the facing which it must resist with its own strength. Since the clutch facing of the present invention is devoid of splices, greater resistance to centrifugal force is obtained and hence the friction facing of this invention is especially adapted for use at the present time.

This invention overcomes the objection of straight wound yarn, in that the loops of each turn, being progressively ahead or behind the previous loops, develop great strength circumferentially and radially.

Facings have been constructed by winding yarn so-called endlessly, wherein the yarn or roving is wound upon itself spool-like without any attempt being made to obtain controlled placing of the yarn with reference to the location of the yarn in the previous turn. These have been found to be deficient in strength to retain the rivets and the strands may have a tendency to unwind or unravel, furthermore the facing may be sheared into separate concentric rings in line with the rivet circle or other sections of the ring which may show a weakness of adhesion circumferentially.

The construction provided in our pattern prevents any possibility of the facing shearing circumferentially at any place, including the rivet circle.

Friction elements made in accordance with the present invention do not nullify the action of crimped pressure plates as do other types of facings which, due to their rigidity, provide no cushioning action to take up the tolerances and irregularities of manufacture of the metal parts of the clutch.

From the viewpoint of economy of manufacture, while the friction element of the present invention has all the advantages of the woven type, the expense of weaving is saved. In addition, since the element has no symmetrical pattern the possibility of scoring is eliminated, as opposed to some types of woven structures heretofore proposed, (when the woven material is coned to form a ring) which have relatively high knuckles or loops in the warp threads which follow each other successively in one circumferential path, causing undue local abrasion or scoring.

In the drawing,

Fig. 1 is a face view of a friction facing comprising the concepts of our invention.

Fig. 2 is an edge view of the facing shown in Fig. 1.

Our invention involves the forming of friction elements by winding yarn or roving on a suitable form. The yarn or roving may be entirely of fibre, such as asbestos or cotton or combinations of different types of fibre, the preferred yarn or roving being asbestos with sufficient cotton to give it the required strength. Another common type of yarn or roving used in making friction elements is a combination of metal wire, such as brass or copper, with a fibrous material, such as asbestos or cotton or both. Sometimes this type of yarn is formed by winding the fibrous yarn or roving about the wire or the wire and fibrous yarn are twisted together, and this twisted yarn may comprise more than one strand of wire or more than one strand of yarn, as for instance two strands of wire and three strands of fibrous yarn or roving twisted together. After impregnating the yarn or roving with a suitable binder it is preferably dried and wound. The element after being wound is preferably compressed in a suitable mould to give it the desired density and shape.

Referring in detail to the drawing, 1 indicates a friction element which is constructed of fibrous

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strands 2. The strands 2 preferably comprise asbestos roving or asbestos yarn with or without wires, the strands being given one or more coatings or rubber or other like cement. The strands may then be dried and subsequently wound on spools or bobbins (not shown) from whence they are fed to a suitable winding machine. In feeding the strands to the machine the strands may be passed forwardly singly or two or more strands may be simultaneously wound. Each strand 2 may comprise a single strand of roving or yarn, or two or more single strands may constitute one unit strand, as shown best at 3 in Fig. 2.

In winding the strands, the strands are wound upon a rotating mandrel (not shown), and are guided by means of a reciprocating guide (not shown) back and forth along the axis of the mandrel, the rate of rotation of the mandrel and the rate of reciprocation of the guide may be so correlated as to wind the strands in wave fashion circumferentially around the mandrel, the wave preferably repeating itself a plurality of times during each revolution of the mandrel. In addition, the rate of rotation of the mandrel, the rate of reciprocation of the guide and the size of the facing is so correlated that the waves of each layer, corresponding to each revolution of the mandrel, lock or lead the waves of an adjacent layer in such a manner that a large number of revolutions of the mandrel takes place before the wave of a predetermined layer comes into phase with the wave of a previously laid layer.

Also in winding the facing the throw of the guide is such that a friction facing of conventional thickness, after compression and cure, is obtained, and in addition the number of layers is such as to build up a radial width equal, after compression and cure, to that of the conventional friction facing. Of course, as in the case of the conventional friction facing, the working face of the facing is parallel to its radial width and at right angles to the spiral plane which embraces the wave hereinbefore described.

The strands of yarn 2 prior to winding, if desired, may be impregnated with any of the conventional binders employed in friction materials or after winding, the facing, as a whole, may be impregnated.

After winding the structure 1 the same may be compressed to the approximate dimensions of the finished facing. The compacted structure may then be placed in molds (not shown) and further compressed and cured to the finished state thereby providing an endless friction element which is ideally adapted for use as a clutch facing or for like uses. Of course, after curing the facings the same are ground and baked or heat treated in the usual manner and rivet holes may be punched therein.

In impregnating the strands 2, as has been hereinbefore described, any of the well known saturants or binders used in the manufacture of friction materials can be utilized, such as, rubber, latex, oxidizable oils, resins, bitumens, colloidal mixtures, or the like. If desired, the first windings of the structure 1 may be saturated with one saturant or a predetermined concentration of a predetermined saturant and the last windings may be saturated with a different saturant or a different concentration of the same saturant, so as to impart different frictional characteristics to different portions of the facing.

While we have specifically described the invention utilizing yarn or roving impregnated with a suitable binder prior to winding, it is to be understood that the invention in its broader aspects includes the winding of unsaturated yarn or roving in which case the wound structure would be saturated as well as the step of saturating or impregnating the wound structure with a suitable binder even when made from previously impregnated yarn.

We claim as our invention:

1. A friction facing of greater radial width than the thickness comprising a bonded, compressed structure composed essentially of endlessly wound strands comprising asbestos wound in superimposed layers, said layers being disposed at substantially right angles to the working face of the facing, each layer comprising an unwoven strand wound in wave fashion, said waves being disposed in the plane of said layers.

2. A friction facing of greater radial width than thickness comprising a bonded, compressed structure composed essentially of endlessly wound strands comprising asbestos helically wound in superimposed layers, said layers being disposed at substantial right angles to the working face of the facing, each layer comprising an unwoven strand wound in wave fashion, said waves being disposed substantially in the plane of said layers.

3. A friction facing of greater radial width than thickness comprising a bonded, compressed structure composed essentially of endlessly wound strands comprising asbestos wound in superimposed layers, said layers being disposed at substantially right angles to the working face of the facing, each layer comprising an unwoven strand wound in wave fashion, said waves being disposed substantially in the plane of said layers and each wave repeating itself a plurality of times in each layer.

4. A friction facing of greater radial width than thickness comprising a bonded, compressed, cured structure composed essentially of endlessly wound strands comprising binder treated asbestos wound in superimposed layers, said layers being disposed at substantially right angles to the working face of the facing, each layer comprising an unwoven strand wound in wave fashion, said wave repeating itself a plurality of times in each layer, and said waves being disposed in the plane of said layers.

5. A friction facing of greater radial width than thickness comprising a bonded, compressed, cured structure, composed essentially of endlessly wound impregnated or treated fiber yarn including asbestos and wire strands wound in superimposed layers, said layers being disposed at substantially right angles to the working face of the facing, each layer comprising an unwoven strand wound in wave fashion, said waves being disposed in the plane of said layers, and each wave repeating itself a plurality of times in each layer.

6. A friction facing of greater radial width than thickness comprising a bonded, compressed, cured structure composed essentially of endlessly wound yarn impregnated with binders and fillers, the yarn comprising fibers including asbestos and being wound in superimposed layers, said layers being disposed at substantially right angles to the working face of the facing, each layer comprising an unwoven strand wound in wave fashion, said waves being disposed substantially in the plane of said layers, and each wave repeating itself a plurality of times in each layer.

CHRIS BOCKIUS.
JUDSON A. COOK.