Dec. 2, 1947. A. MORTEN 2,431,882

HAIR DRYING AND SCALP TREATING ARTICLE

Filed Oct. 24, 1945

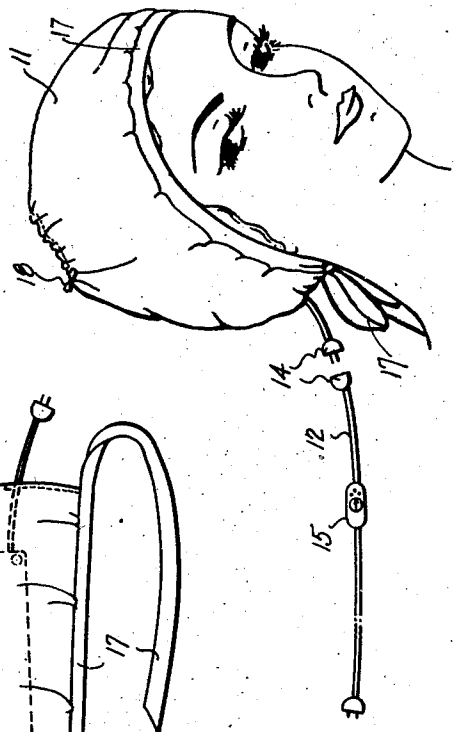


FIG. 3

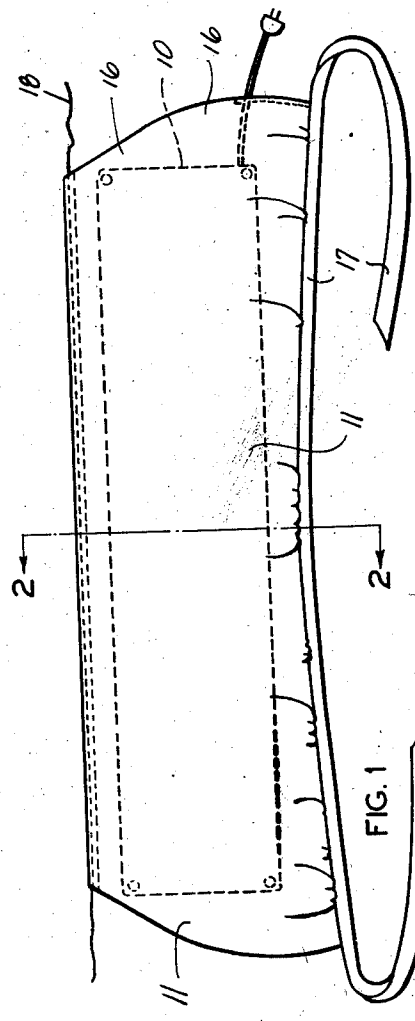


FIG. 1

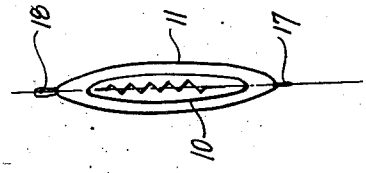


FIG. 2

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FRICTION FACING AND METHOD OF PRODUCING IT

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Fig. 4.

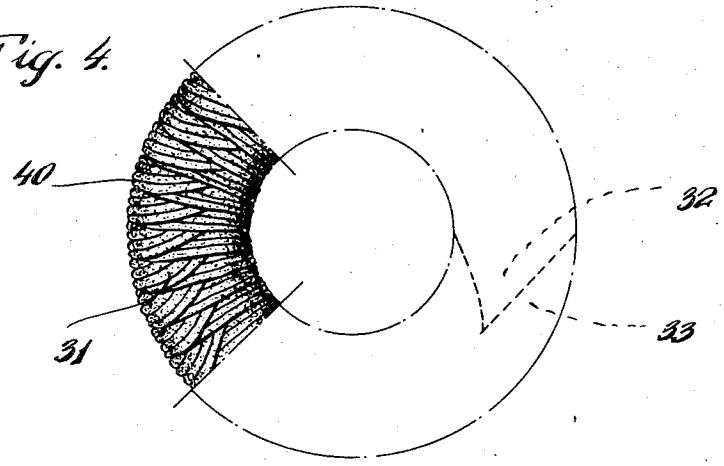


Fig. 5.

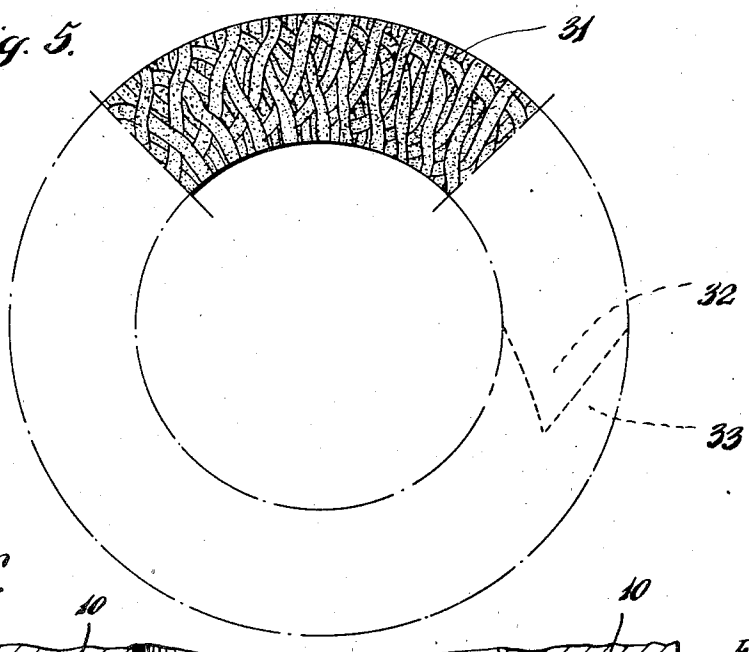
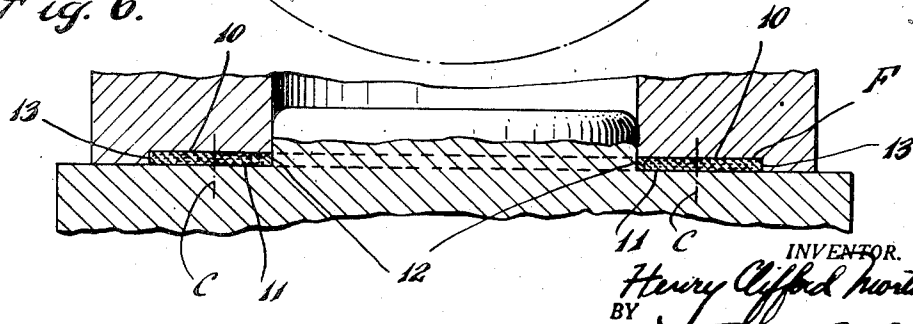


Fig. 6.



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FRICTION FACING AND METHOD OF PRODUCING IT

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5 Claims. (Cl. 154—81)

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This invention relates to friction facings of combined yarn and impregnant, and particularly to such facings for brakes, clutches and the like.

The object of the invention is to provide a facing structure which will be inexpensive in manufacture and efficient and durable in use.

Further objects of the invention particularly in the winding of the yarn and the pressing of the wound mass into final form will appear from the following:

Fig. 1 is a face view in perspective of a finished clutch facing illustrating the invention;

Fig. 2 is a longitudinal sectional view illustrating the initial step in the process of manufacture;

Fig. 3 is a diagrammatic view on enlarged scale showing a typical yarn winding operation;

Fig. 4 is a face view of a ring structure illustrating an intermediate step in manufacture;

Fig. 5 is a face view showing the ring structure of Fig. 4 after cold pressing; and

Fig. 6 is a view illustrating the curing of the clutch disk.

Referring to Fig. 1 the clutch facing F in the form of an annular disk has opposite surfaces 10, 11, inner edge 12 and outer edge 13. Each surface 10, 11 is speckled with short lengths 14 of exposed metal strands extending irregularly across the disk from inside to outside. The body of the disk comprises a yarn of asbestos and metal strands permeated with and embedded in a matrix of a binder such as rubber, butadiene polymer, synthetic resin, drying oil or the like or combinations of these materials.

The yarn embodied in the disk preferably comprises asbestos fibers and metal in filamentary form, but the metal may be omitted. The yarn is in continuous length in the form of a series of loops winding back and forth from edge to edge around the center line C and approaching and receding from the surfaces 10, 11 in successive increments. The portions of the yarn loops at the surfaces 10, 11 extend in various directions between the inner edge 12 and the outer edge 13 as shown by the bare metal filaments forming the flecks 14 (Fig. 1) exposed by the final sanding. These yarn loops are interlaced and strongly bonded together so as to be heterogeneously disposed in the set matrix lending great strength and resistance to rupture to the material of the facing.

To produce this structure of the yarn in the facing, it is preferably wound in continuous lengths as illustrated in Figs. 2 and 3. The loops of yarn may be wound in the form of conical helices of predetermined size and shape. For

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instance, starting at 20 (Fig. 3) the yarn is carried along the conical surface 21 to 22, then around to 23 and 24 which is the point of least diameter, and here the direction changes back to 25, thence to 26 and around 27 nearly opposite 20, after which the next conical helix is similarly formed and so on to a desired depth on the mandrel 30 against which lie the inner loop ends of minimum diameter. Then successive similar conical helices are wound on the top of those previously laid down to nest the series of layers together between the mandrel 30 and an outer generally cylindrical surface 31 (Fig. 2). At the end of the winding the outer conical layer of loops 32 is left uncovered at substantially the same angle as the inner end layer 20—27 of recess 33, as indicated in Fig. 2.

The yarn is thus wound upon mandrels 21, 30 of suitable size and shape giving successive conical helices with the built up layers having their outer and inner surfaces 31, 34 parallel to the axis. The pitch of the conical surface may be regulated by controlling the movement of yarn and the rate of rotation of the mandrel, and in practice the outside diameter of the coil is regulated by means of a conical section attached to the winding machine, which progressively moves away from the laid down conical surface, such movement being controlled by the friction between the conical section and the yarn. During the initial stages of winding, the inside diameter of the wound coil is given a recessed conical structure 33 by the mandrel's correlated and opposed shape, and this is adapted to receive the similarly tapered conical winding 32 at the opposite end of the coil.

Preferably the yarn before winding is impregnated with the binder in the form of a viscous cement as, for instance, by drawing the yarn through the binder bath as it is fed to the winding mechanism. The yarn may, however, be in the untreated state and the winding subsequently impregnated with the binder, such as a thermosetting resin, to form the clutch ring. Finished facings will usually contain from 50–80% of strand material and the remainder the set binder.

The wound coil as illustrated in Fig. 2 is shaped into circular form 40 (Fig. 4) by suitable means, the conical end 32 of the coil being forced into the opposite recessed end 33 of the coil in such manner that the continuous series of loops extend progressively around the extent of the facing with an overlap between the ends of the series and between each loop and its adjacent loop and the ultimate thickness at the point of juncture is the

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same as the remainder of the coil. Each loop has its smaller portion in the interior of the facing and its larger portion adjacent the surfaces thereof. The mass is then roughly in the form of a clutch facing and may be cold pressed to completely shape and form the ring.

The cold pressed facing (Fig. 5) is then placed in a suitable mold and heated under pressure to partially cure the binder and compact the mass (Fig. 6). During this operation the strands of yarn with their helical loops criss-crossing and overlying each other in generally heterogeneous dispersed relation are firmly interlocked in position yielding a facing of great strength. After the initial curing has been accomplished the facing is removed from the mold and the conversion of the binder to its finely cured state completed by oven baking.

The initial coil shown in Fig. 3 is about $1\frac{5}{16}''$ in diameter for a clutch disk having an inner diameter of $3\frac{5}{16}''$ and an outer diameter of $5\frac{7}{8}''$. The outer diameter of the ring shown in Fig. 4 is about $4\frac{3}{8}''$ and the inner diameter a little over $1\frac{3}{4}''$, these dimensions being merely typical for the particular size of clutch facing taken as illustrative. The bulk of the wound yarn coil is, therefore, greatly compacted and reduced in the cold pressing formation of the disk (Fig. 5) forming the disk to 6'' outer diameter, $3\frac{3}{8}''$ inner diameter and a thickness of about $\frac{7}{32}''$. In the final cured clutch facing (Fig. 1) the diameters are slightly less ($3\frac{5}{16}''$ and $5\frac{7}{8}''$) and a thickness $\frac{3}{16}''$.

A prominent feature of the clutch disk where metal is used in the yarn is the disposition of the bare metal strands 14. These are numerous and of different lengths and directions. They vary in length from mere dots to $\frac{1}{4}''$ exposure or even more and they extend in all directions but with very pronounced radial drift. A composite of all of the metal strand directions would be nearly radial. This gives a wide heterogeneous distribution of the metal surfacing with resultant stable frictional effect, better heat conductivity and resistance to loss in thickness due to wear.

The interlooping of the continuous yarn by the overlapping conical helices extending back and forth across the annular disk inerlocks the strands and develops maximum resistance to bursting by centrifugal force during use. At the same time this continuity of the yarn and the bonding between the loops and the compact setting in the binder insure long life and freedom from chatter. The ring structure is manufactured at low cost with substantially no wastage and the final clutch rings are uniform in composition, inexpensive and thoroughly practical in service.

While the invention has been described in connection with an annular friction disk having its faces in parallel radial planes, it is not limited to such a formation. The facing may, of course,

be cut into arcuate sections and the stranded structure and composition of this invention may be embodied in other forms of friction disks, brake bands and the like where it will provide the strong set interlock between the overlapping interlacing loops of the continuous yarn winding as set forth in the appended claims.

I claim:

1. The method of forming an annular facing of friction material comprising winding yarn into a continuous coil of predetermined diameter and with a taper at one end and a correspondingly tapered recess at the other end, forming said coil into circular shape with the tapered end fitting in said recess, said coil being impregnated with an uncured binder, and pressing and heating said coil to form it into said annular facing and set the coiled yarn rigidly in a matrix of the cured binder.

2. A method of forming an annular facing of friction material as set forth in claim 1 in which the coil in circular shape is first cold pressed and then hot pressed to form the annular friction facing and cure the binder.

3. The method of forming an annular facing of friction material comprising winding yarn into a series of overlapping conically helical loops to form a continuous coil, forming said coil into circular shape, compressing said circular coil into annular facing form, said annular facing being impregnated with an uncured binder, and then curing said facing to set said binder as a matrix permanently permeating and containing said coiled yarn in a rigid body forming the clutch facing.

4. An annular facing of friction material comprising a fibrous yarn formed into a series of groups of loops extending from edge to edge of the facing and with each group overlapping and interlocking with adjacent groups and comprising loops of different diameters with the smaller loops confined to the interior of the facing and the larger loops extending adjacent the surface of the facing, and a binder forming a matrix impregnating and containing said yarn.

5. An annular facing of friction material as set forth in claim 4 in which the portions of the yarn loops exposed at the surface of the facing have a generally crosswise drift from edge to edge thereof.

HENRY CLIFFORD MORTON.

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