April 29, 1941. G. WALTERS 2,240,358

FRICTION-DISK AND METHOD OF MAKING THE SAME

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Fig. 1.

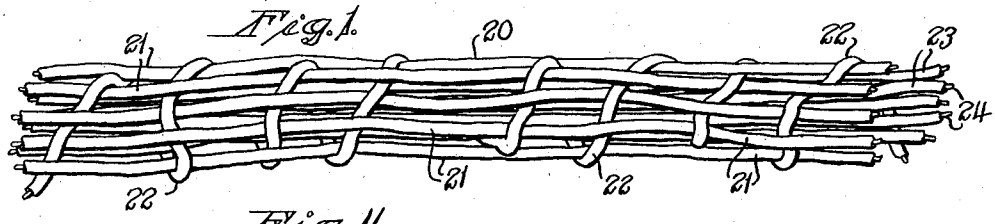


Fig. 4.

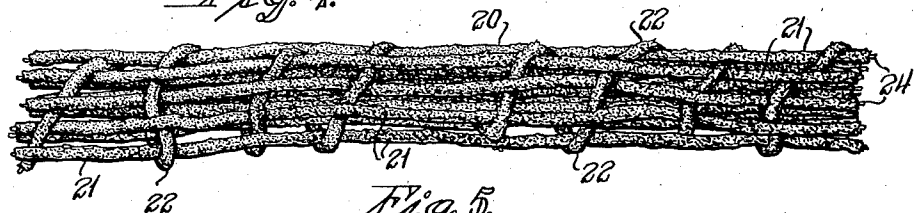


Fig. 5.



Fig. 2.



Fig. 3.

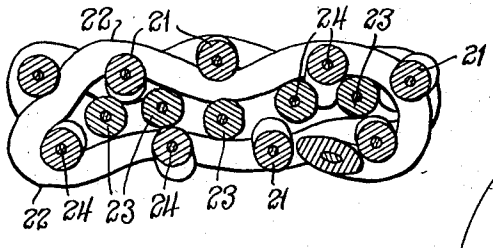
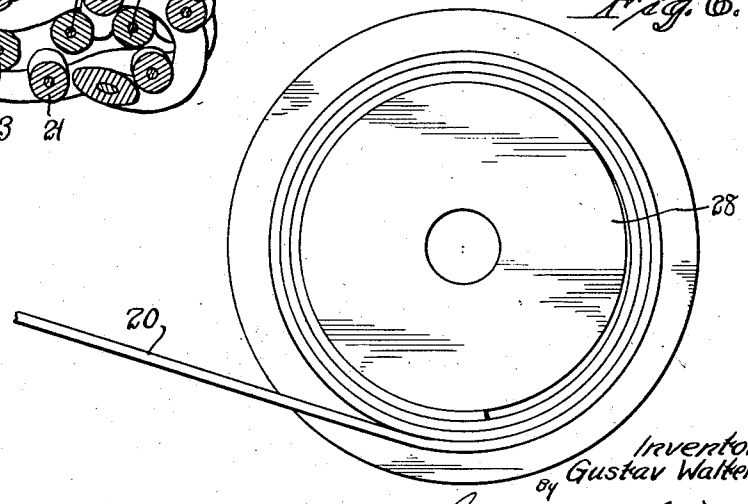


Fig. 6.



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FRICTION-DISK AND METHOD OF MAKING THE SAME

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Fig. 7.

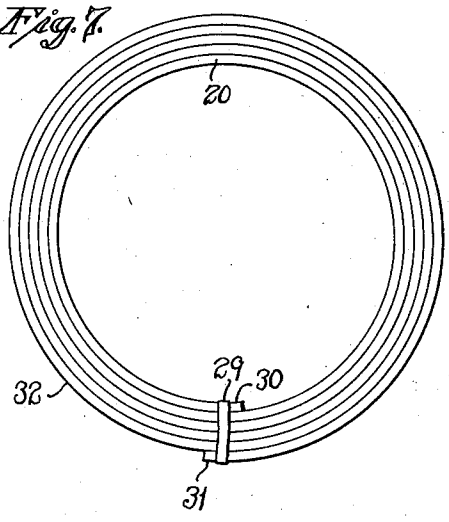


Fig. 10.

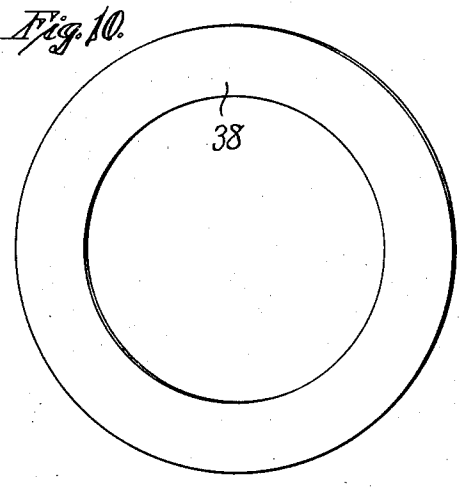


Fig. 8.

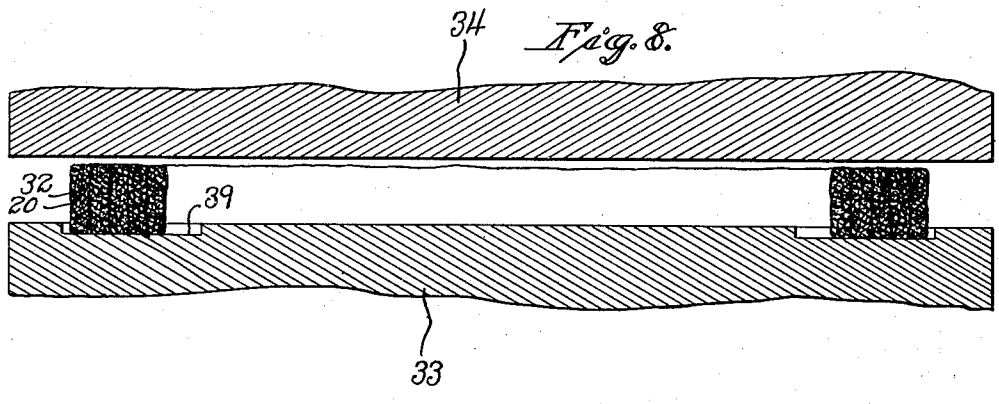
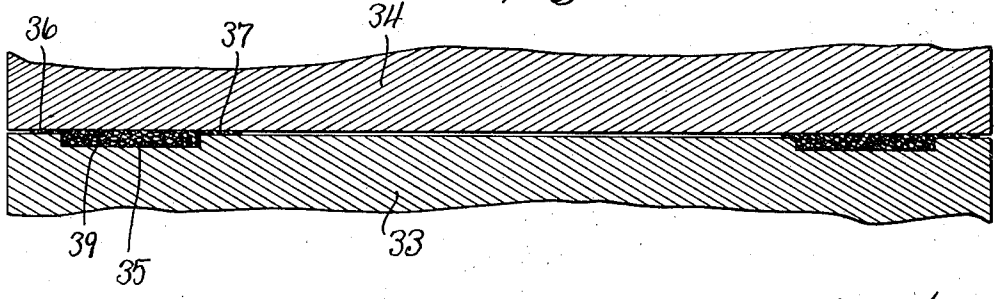


Fig. 9.



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UNITED STATES PATENT OFFICE

2,240,358

FRICTION-DISK AND METHOD OF MAKING THE SAME

Gustav Walters, Middletown, Conn., assignor to The Russell Manufacturing Company, Middletown, Conn., a corporation of Connecticut

Application December 14, 1939, Serial No. 309,152

10 Claims. (Cl. 192—107)

This invention relates to improvements in friction-disks or facings and methods of making the same.

One object of this invention is to provide improved friction-disks having maximum resistance to the various stresses to which such friction-disks are subject while in use.

Another object of this invention is to provide improved friction-disks which can be manufactured at lower cost than other disks possessing similar mechanical properties.

Another object of this invention is to provide an improved method of making friction-disks.

With the above and other objects in view, as will appear to those skilled in the art from the present disclosure, this invention includes all features in the said disclosure which are novel over the prior art.

In the accompanying drawings, in which certain ways of carrying out the invention are shown for illustrative purposes:

Fig. 1 is a side elevation of a fragment of a length of a woven member or band of textile-base material, used for making friction-disks in accordance with this invention;

Fig. 2 is an edge elevation of Fig. 1;

Fig. 3 is an enlarged cross section on line 3—3 of Fig. 2;

Fig. 4 is a view similar to Fig. 1 after the band shown in Fig. 1 has been treated or impregnated with binding material;

Fig. 5 is a side elevation of a fragment of a length of a braided band or member of textile-base material, which may be used for making friction-disks in accordance with this invention;

Fig. 6 is a schematic view illustrating the rolling or spirally winding up of a treated band of material to form a "biscuit" which is subsequently to be formed into a friction-disk;

Fig. 7 is a side elevation of a biscuit made in accordance with the process illustrated in Fig. 6;

Fig. 8 is a central vertical sectional view through a pair of dies and a biscuit just prior to the dies being forced together;

Fig. 9 is a view similar to Fig. 8 after the dies have been forced together, the dies preferably being heated to convert the biscuit into a rough-pressed friction-disk; and

Fig. 10 is a perspective view of a finished friction-disk or facing.

In the following description and claims the various parts and steps are identified by specific names for convenience, but they are intended to be as generic in their application as the prior art will permit.

Referring to the drawings, a length of material such as the band or member or web **20**, after being treated with suitable binding material which is preferably heat-hardenable, is spirally wound and formed into a friction-disk or facing or ring for clutches and the like, as will be more fully hereinafter set forth. The band **20** is made in the form of a flattened tube by loosely weaving together a plurality of warp strands **21** and a continuous generally-helical weft strand **22**. Preferably, a plurality of interior or central strands **23** extend through the tubular outer woven portion formed of the interwoven strands **21** and **22** in order to increase the bulk of the band. The strands **21**, **22** and **23** may be of the same or different sizes and are preferably formed of asbestos which may contain a certain portion of cotton or other strengthening fibre and, preferably, the strands have wire cores **24** of brass or other suitable metal. As is illustrated by the enlarged sectional view in Fig. 3, the warp strands **21** are spaced sufficiently apart and so loosely interwoven with the weft strands **22** as to produce the flattened tube illustrated, having a width considerably greater than its thickness. The band or web **20** is next impregnated with suitable friction binding treatment, preferably of a type which will give a strong bonding action under heat and pressure. Figs. 1, 2, 3 and 4 are made substantially proportionally true to scale from an actual sample.

Instead of making the flattened tubular band or web by a weaving process, any other mode of loosely interlacing the strands may be employed, such as making the band or web **25** illustrated in Fig. 5 by means of braiding together a series of exterior strands **26** to form a flattened tube. Central or interior longitudinal strands **27** may be employed in a similar way to that shown and described concerning the woven band or web **20**. The braided band or web **25** will, of course, be impregnated with suitable friction binding treatment before being used to make a friction-disk.

Inasmuch as the mode of making a friction-disk from the bands **20** and **25** are essentially identical, a description will only be given of making a friction-disk from the band or web **20**.

As is schematically illustrated in Fig. 6, a precut definite length of band **20** is wound in a spiral in any suitable way, as about a mandrel **28**, to provide a number of layers or convolutions in the form of a ring, after which a loop of adhesive paper **29** or other suitable binding means can be passed around the free ends **30** and **31** of the band **20**, forming the coils of the "biscuit" or ring **32**,

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to temporarily prevent the coils or convolutions of the biscuit 32 from unwinding or becoming displaced.

The biscuit 32 is then placed between the pair of heated dies 33 and 34, as shown in Fig. 8, whereupon the dies are forcibly brought together in a direction which may be said to be axial or parallel to the axis of the biscuit, to the position shown in Fig. 9, with the result that the binding treatment, which is usually of a hard rubber or synthetic resin base, which is heat-hardenable, is softened by the heat to a pasty condition, and the entire biscuit is crushed down to form a unitary annular ring-like rough-pressed friction-disk 35 which includes irregular outer and inner flash portions 36 and 37. Whether the binding or bonding treatment is of the rubber or synthetic resin or other type, the heat which is applied first causes the treatment to soften up to a pasty condition and then brings about a chemical action which hardens the treatment so that the entire disk becomes a unitary mass with the strands extending through the mass. After the rough-pressed disk 35 has the flash portions 36, 37 trimmed off and is ground on both inner and outer edges and both opposite faces, a finished disk such as 38 illustrated in Fig. 10 is produced.

By having the width of each convolution considerably greater than its thickness, it is possible to employ a biscuit 32 whose width or height between the dies 33 and 34 is considerably greater than the depth of the annular die-cavity 39 in the lower die 33, thus permitting the employment of a biscuit 32 whose radial thickness is substantially less than the radial width of the die-cavity 39, so that the biscuit 32 can be readily placed in the die-cavity 39 without having to fit it carefully between the inner and outer radial walls of the die-cavity, thus permitting of the rapid manufacture of friction-disks at minimum cost.

By having the strands of the tube sufficiently loosely interlaced, a flattened tube is produced, and the binding treatment is able to readily and thoroughly penetrate or impregnate the band or web, and the open construction formed by the loosely-interlaced strands aid in bringing about an advantageous interlocking between the strands of adjacent convolutions in the completed friction-disk.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

1. A friction-disk formed of a spirally-wound member comprising strands loosely interlaced and forming a flattened tube of considerably greater width than thickness, the strands of the member having been treated with heat-hardenable binding material prior to the member being spirally wound, the side edges of the flattened tube forming the side edges of the convolutions of the spirally-wound member, and the spirally-wound member having been subjected to heat and axial pressure to cause the spirally-wound member to form a unitary disk.

2. A friction-disk formed of a spirally-wound member comprising strands loosely interwoven and forming a flattened tube of considerably greater width than thickness, the strands of the member having been treated with heat-hardenable binding material prior to the member being spirally wound, the side edges of the flattened tube forming the side edges of the convolutions of the spirally-wound member, and the spirally-wound member having been subjected to heat and axial pressure to cause the spirally-wound member to form a unitary disk.

3. A friction-disk formed of a spirally-wound member comprising strands loosely braided and forming a flattened tube of considerably greater width than thickness, the strands of the member having been treated with heat-hardenable binding material prior to the member being spirally wound, the side edges of the flattened tube forming the side edges of the convolutions of the spirally-wound member, and the spirally-wound member having been subjected to heat and axial pressure to cause the spirally-wound member to form a unitary disk.

4. A friction-disk formed of a spirally-wound member comprising interior strands, and exterior strands loosely interlaced and forming a flattened tube of considerably greater width than thickness, the strands of the member having been treated with heat-hardenable binding material prior to the member being spirally wound, the side edges of the flattened tube forming the side edges of the convolutions of the spirally-wound member, and the spirally-wound member having been subjected to heat and axial pressure to cause the spirally-wound member to form a unitary disk.

5. A friction-disk formed of a spirally-wound member comprising interior strands, and exterior strands closely interwoven and forming a flattened tube of considerably greater width than thickness, the strands of the member having been treated with heat-hardenable binding material prior to the member being spirally wound, the side edges of the flattened tube forming the side edges of the convolutions of the spirally-wound member, and the spirally-wound member having been subjected to heat and axial pressure to cause the spirally-wound member to form a unitary disk.

6. The method of making a friction-disk comprising: providing a member comprising strands loosely interlaced and forming a flattened tube of considerably greater width than thickness, the strands of the member having been treated with heat-hardenable binding material; spirally winding said treated member into disk-like form, with the side edges of the flattened tube forming the side edges of the convolutions of the spirally-wound member; and subjecting the spirally-wound member to heat and axial pressure to cause the spirally-wound member to form a unitary disk.

7. The method of making a friction-disk comprising: providing a member comprising strands loosely interwoven and forming a flattened tube of considerably greater width than thickness, the strands of the member having been treated with heat-hardenable binding material; spirally winding said treated member into disk-like form, with the side edges of the flattened tube forming the side edges of the convolutions of the spirally-wound member; and subjecting the spirally-wound member to heat and axial pressure to cause the spirally-wound member to form a unitary disk.

8. The method of making a friction-disk comprising: providing a member comprising strands

loosely braided and forming a flattened tube of considerably greater width than thickness, the strands of the member having been treated with heat-hardenable binding material; spirally winding said treated member into disk-like form, with the side edges of the flattened tube forming the side edges of the convolutions of the spirally-wound member; and subjecting the spirally-wound member to heat and axial pressure to cause the spirally-wound member to form a unitary disk.

9. The method of making a friction-disk comprising: providing a member comprising interior strands, and exterior strands loosely interlaced and forming a flattened tube of considerably greater width than thickness, the strands of the member having been treated with heat-hardenable binding material; spirally winding said treated member into disk-like form, with the side edges of the flattened tube forming the side edges of the convolutions of the spirally-wound member; and subjecting the spirally-wound member to heat and axial pressure to cause the spirally-wound member to form a unitary disk.

10. The method of making a friction-disk comprising: providing a member comprising interior strands, and exterior strands loosely interwoven and forming a flattened tube of considerably greater width than thickness, the strands of the member having been treated with heat-hardenable binding material; spirally winding said treated member into disk-like form, with the side edges of the flattened tube forming the side edges of the convolutions of the spirally-wound member; and subjecting the spirally-wound member to heat and axial pressure to cause the spirally-wound member to form a unitary disk.

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