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H. B. FAY

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REINFORCED VULCANIZED FIBER BACKING BELT

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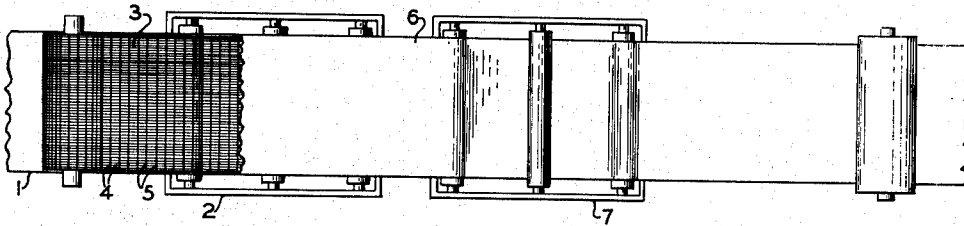


FIG. 2.

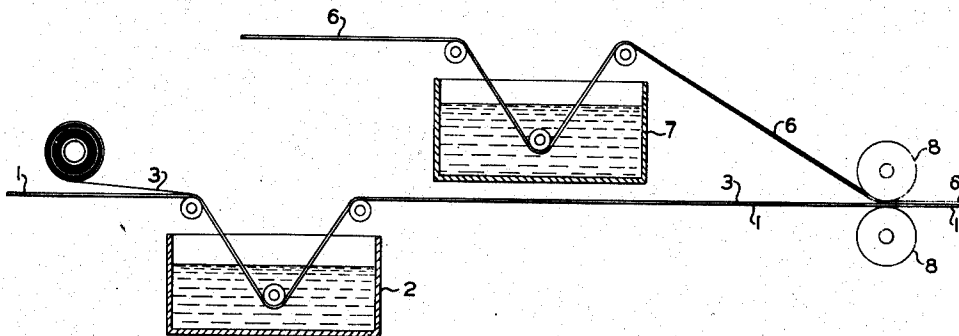


FIG. 1.

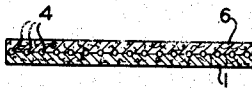


FIG. 3.

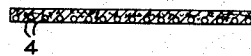


FIG. 4.

INVENTOR.
HORACE B. FAY.

BY *Fay, Macklin, Golrick,*
Willems, Chilton & Selig
ATTORNEYS

UNITED STATES PATENT OFFICE

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REINFORCED VULCANIZED FIBER BACKING
BELT

Horace B. Fay, Willoughby, Ohio

Application August 26, 1941, Serial No. 408,289

4 Claims. (Cl. 154-46)

This invention relates to reinforced vulcanized fiber and to a method of making the same.

In Carlton Patent No. 1,686,898 and Stratford Patent No. 1,684,748, there is disclosed an abrading or surfacing disk having a backing sheet made of hydrated or hydrolyzed cellulose, commercially known as "vulcanized fiber." This material is made by treating cellulose with a material capable of partially dissolving the cellulose, such for example as zinc chloride.

In manufacturing this material, old cotton rags are commonly employed as the raw material, since such rags consist of almost pure cellulose, these being pulped and formed into sheets in the ordinary manner. The sheets are then passed through a zinc chloride solution which causes the partial solution of the fibers, the outside of each individual fiber being probably partially dissolved, producing a gelatinous, and more or less adhesive, coating on each fiber. The sheets thus treated are then again passed through rolls to remove the excess zinc chloride and to compress the fibers tightly together. Final traces of zinc chloride are then removed, as by washing the sheets in water, after which the sheets are hardened and dried. Reagents, other than zinc chloride, may be employed, provided that they also partially gelatinize the fibers to produce a chemical and mechanical adhesion between the fibers during the treatment which is far more effective in cementing the entire structure together than merely the ordinary mechanical adhesion secured through pressure in the ordinary paper stock.

The result of this treatment of the material is to greatly increase the strength, the density and the rigidity, and to lower the porosity while producing a structure which has little or no tendency to split or curl, and when used in the form of a backing for surfacing disks, the tensile strength of the product is ordinarily sufficient for most abrasive purposes.

It has been proposed to use this vulcanized fiber as a backing in the form of endless belts for surfacing or abrading purposes, but it has been found that such belts, when in use, are ordinarily subjected to longitudinal stresses which exceed the tensile strength of vulcanized fiber, and which cause the belts to stretch or become elongated.

I have discovered that by incorporating flexible glass fibers in or inserting them between the plies or layers of the stock used for making vulcanized fiber, that I can make backing belts for abrading material, in which the glass fibers

increase the resistance of the belt, when thus used, to the stretching or elongation imparted to the vulcanized fiber as the result of the abrading action, and also increase the life of the vulcanized fiber belt under conditions resulting from the abrading operation.

These fibers are inserted between the layers of the stock in such a manner that they are spaced transversely of the stock and extend longitudinally thereof, and although a series of parallel unconnected fibers may be employed, the insertion of such longitudinal fibers is facilitated by incorporating them in a netting consisting of such fibers and a series of transverse fibers interwoven therewith. Since the transverse fibers in that event are used merely to hold the longitudinal fibers in properly spaced relation, and such transverse fibers do not contribute to increasing the tensile strength for endless belt purposes, the transverse fibers need not be spaced as closely as the longitudinal fibers.

Instead of a coarsely woven netting, as described, coarsely woven glass cloth, such as is now available in the market, may be employed.

The fibers, netting or cloth may be placed on the sheets before they are passed through the zinc chloride solution or after they have passed through such solution. In the first case, the spaces or openings between the fibers are sufficiently large that the fibers do not appreciably interfere with the treatment of the sheets by the zinc chloride solution, and in both cases, the glass fibers are not in any way attacked or altered by such solution.

The spacing of the fibers will depend, of course, on the thickness or diameter thereof. Since, however, fibers made of glass have a tensile strength approximating that of steel wire of the same diameter, fibers of less than .001" have been found to be satisfactory for most purposes. Glass fibers of a thickness of .001" or less can be flexed without breaking, and where the term "flexible" is used herein, it is to be understood that the term comprises fibers of these dimensions.

In the accompanying drawing, I have illustrated more or less diagrammatically one method which may be employed for incorporating the glass fibers, netting or cloth in the stock during the manufacture of the vulcanized fiber.

In said drawing:

Fig. 1 is an illustration in elevation of the process;

Fig. 2 is an illustration in plan of the process;

Fig. 3 is a fragmentary cross-sectional view of a

sheet of reinforced vulcanized fiber made according to the process, as illustrated in Figs. 1 and 2; and

Fig. 4 is a view similar to Fig. 3, but showing a modified form of product.

Referring more particularly to Figs. 1 and 2, 1 represents a ply or layer of paper stock after having been pulped, and as it comes from a Fourdrinier machine.

The layer 1 proceeds through a tank 2 containing zinc chloride solution, but before passing through such solution, a netting 3 of glass fibers is applied to the upper surface of the ply or layer 1, such netting consisting of longitudinal fibers 4 which are relatively closely spaced and transverse fibers 5 which are spaced farther apart than the fibers 4.

A second ply or layer 6 of pulped paper stock from another Fourdrinier machine is passed through a tank 7 containing zinc chloride solution, and this ply, after being treated with the solution, is then laid upon the upper surface of the ply 1, so that the netting 3 of glass fibers is interposed between the plies.

The plies 1 and 6, with the netting 3 of glass fibers interposed therebetween is then subjected to the usual treatment for manufacturing vulcanized fiber, which includes passage through rolls 8 to remove the excess zinc chloride and compress the fibers tightly together, washing of the sheets in water, hardening and drying. During this treatment, the glass fibers are not in any way affected.

The vulcanized fiber, thus made, may be formed into endless belts by any of the usual methods used in the formation of such belts, and such belts may then have abrasive material applied thereto, as by the methods described in the aforesaid Carlton and Stratford patents. A transverse section through such a belt is shown in Fig. 3.

The product shown in Fig. 4 is made by first laying the glass fiber netting on a Fourdrinier screen and then spreading the stock from which the vulcanized fiber is made on such netting, the fibers of such stock enveloping or partially enveloping the fibers of such netting. The only difference between this product and that shown in Fig. 3 is that the glass fibers are on the outside of or closely adjacent to the outer surface of the vulcanized fiber sheet instead of being interposed between plies thereof. In the product shown in Fig. 4, the abrasive material is preferably applied to the upper surface.

Backing belts for abrading material, endless belts and other articles made from the products which have been described are characterized by high tensile strength, and are to a great extent capable of resisting stretching and elongation. Backing belts for abrading material, in particular, when made from such products are characterized by increased resistance to the stretching or elongation imparted to the vulcanized belt as a result of the abrading action, as well as an increased life under conditions resulting from the abrading operation.

This application is a continuation-in-part of my copending application, Serial No. 259,693, filed March 3, 1939.

Other forms may be employed embodying the features of my invention instead of the one here explained, change being made in the form or construction, provided the elements stated by any of the following claims or the equivalent of such stated elements be employed, whether produced by my preferred method or by others embodying steps equivalent to those stated in the following claims.

I therefore particularly point out and distinctly claim as my invention:

1. As a new article of manufacture, a backing belt for abrading material, said belt consisting of layers of vulcanized cellulose fiber and flexible glass fibers, said flexible glass fibers being embedded in and extending generally longitudinally through the vulcanized fiber layers, said glass fibers increasing the resistance of the belt, when thus used, to the stretching or elongation imparted to the vulcanized fiber as the result of the abrading action, said glass fibers also increasing the life of the vulcanized fiber belt under conditions resulting from the abrading operation.

2. As a new article of manufacture, a backing belt for abrading material, said belt consisting of layers of vulcanized cellulose fiber and flexible glass fibers, said flexible glass fibers being not over about .001" in thickness and being embedded in and extending generally longitudinally through the vulcanized fiber layers, said glass fibers increasing the resistance of the belt, when thus used, to the stretching or elongation imparted to the vulcanized fiber as the result of the abrading action, said glass fibers also increasing the life of the vulcanized fiber belt under conditions resulting from the abrading operation.

3. As a new article of manufacture, a backing belt for abrading material, said belt consisting of a plurality of layers of vulcanized cellulose fiber and a layer of flexible glass fibers embedded therebetween and extending generally longitudinally of the belt, said glass fibers increasing the resistance of the belt, when thus used, to the stretching or elongation imparted to the vulcanized fiber as the result of the abrading action, said glass fibers also increasing the life of the vulcanized fiber belt under conditions resulting from the abrading operation.

4. As a new article of manufacture, a backing belt for abrading material, said belt consisting of a layer of vulcanized cellulose fiber and a layer of flexible glass fibers embedded in one surface thereof and extending generally longitudinally of the vulcanized fiber layer, said glass fibers increasing the resistance of the belt, when thus used, to the stretching or elongation imparted to the vulcanized fiber as the result of the abrading action, said glass fibers also increasing the life of the vulcanized fiber belt under conditions resulting from the abrading operation.

HORACE B. FAY.