Aug. 8, 1950 A. S. BROWN ET AL 2,518,220

ENDLESS TRANSMISSION BELT AND METHOD OF MAKING

Filed March 3, 1948 2 Sheets-Sheet 1

Fig. 1.

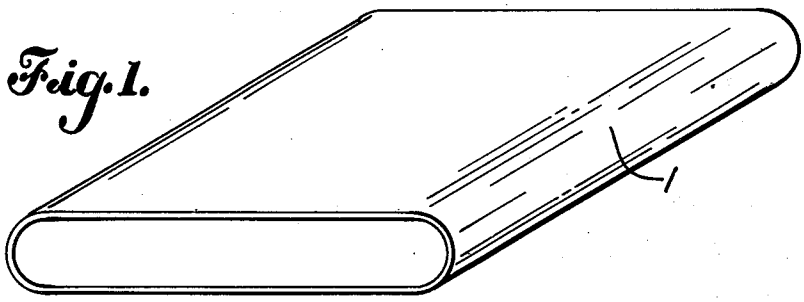


Fig. 2.

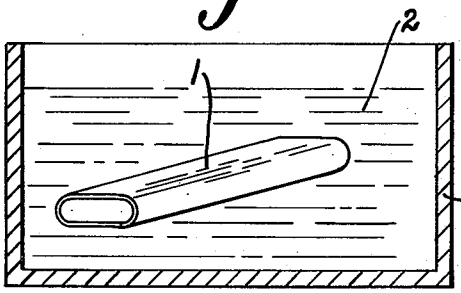


Fig. 3.

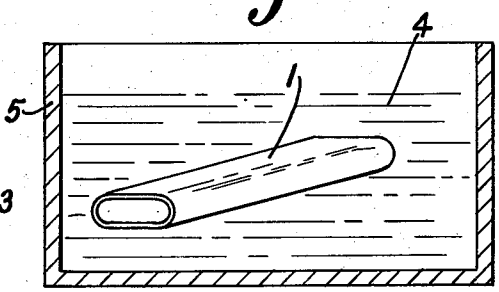


Fig. 4.

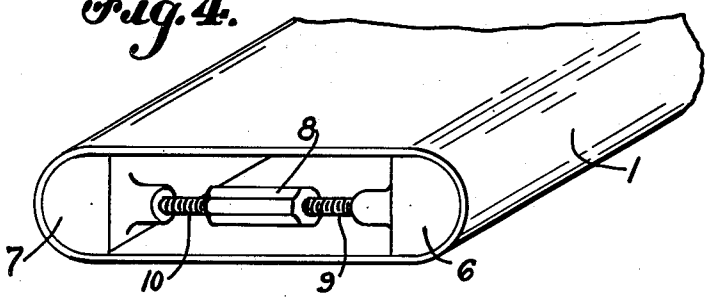
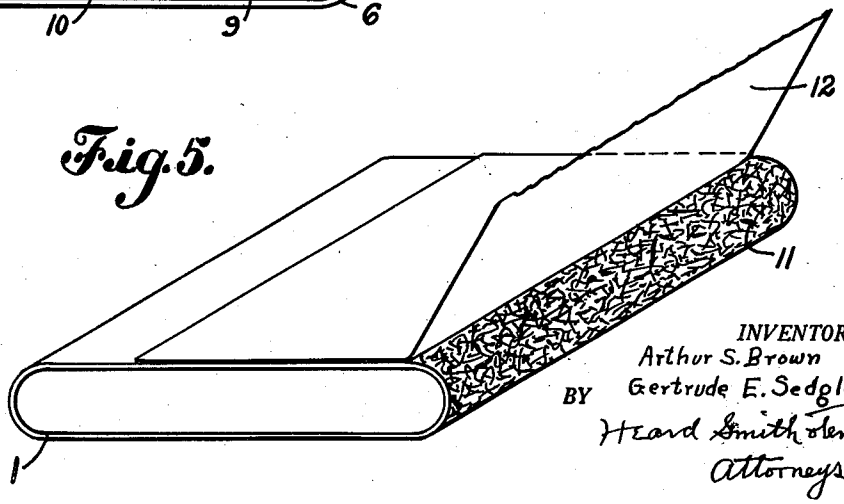


Fig. 5.



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Aug. 8, 1950 A. S. BROWN ET AL 2,518,220

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Filed March 3, 1948 2 Sheets-Sheet 2

Fig. 6.

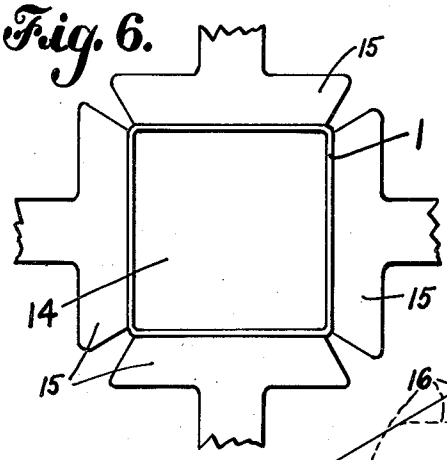


Fig. 7.

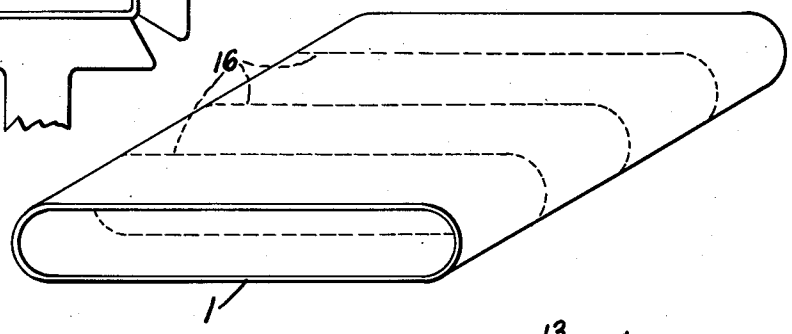


Fig. 8.

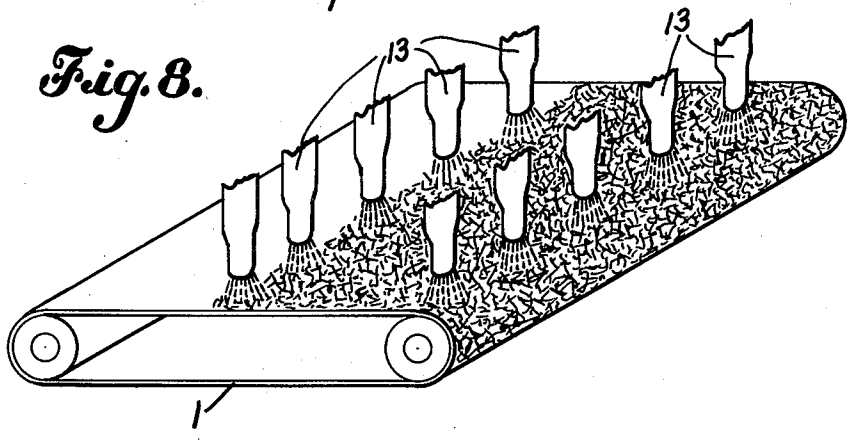
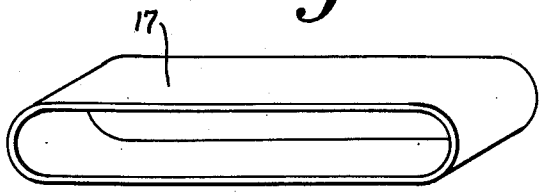


Fig. 9.



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ENDLESS TRANSMISSION BELT AND METHOD OF MAKING

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Application March 3, 1948, Serial No. 12,886

3 Claims. (Cl. 74—232)

1

This invention relates to the manufacture of endless transmission belts. Such belts are now commonly made from a tubular fabric which is cut transversely into belts of the desired width.

The present invention has for one of its objects to provide a novel method of treating an endless tubular fabric preparatory to cutting it into the individual belts by which a non-stretchable belt having superior wearing qualities is provided. In the manufacture of fabric transmission belts it has been a common practice to use woven textile fabric which is impregnated with rubber latex or a rubber compound. The wearing quality of such a belt can be increased by eliminating from the fabric any oil which the fabric or the fibers thereof may contain, it being well known that oil has a deleterious effect on rubber. Such wearing qualities can also be increased by eliminating from the fabric any sizing material it contains prior to its impregnation with the rubber compound.

In carrying out our method to produce a belt with superior wearing qualities, we take a length of tubular woven cotton fabric and treat it so as to remove the starch or other sizing and also any oils that may be present in the cotton yarn of the fabric and that, as stated above, has a deleterious effect on the rubber with which the fabric may be subsequently treated. One way of accomplishing this is to subject the tubular fabric to an aqueous bath containing a desizing ingredient which will decompose the starch or other sizing, and also containing a wetting out agent which aids the penetration of the desizing ingredient into the cotton fibers of the yarn composing the fabric, and in addition "wets out" any oils that the fibers may contain. For the desizing agent we may use any suitable enzyme which is amylolytic or both amylolytic and proteolytic. An enzyme which has amylolytic properties will convert the starch in the fabric into soluble products which will become dissolved in the bath, while an enzyme which has both amylolytic and proteolytic properties will convert both the starch and any proteins in the fabric into soluble products which are likewise dissolved in the bath. We have found that a malt diastase constitutes a very satisfactory desizing agent. The amount of desizing agent to be added to the bath will vary with the amount of starch in the fabric, it being understood that a sufficient amount of desizing material should be used to effectively remove all the starch in the fabric, this being something that anyone versed in the art may readily determine. Any suitable wetting out agent may be used such as di-octyl sulfo succinate, isopropyl

2

naphthalene sodium sulforate, dihexyl sodium sulfo succinate, alkali soaps of fatty acids, alkali soap of sulfonated fatty acids, or alkali salts of sulfonated esters of higher fatty alcohols. We have found, however, that the wetting out agent which is known commercially as Aerasol OT produces satisfactory results.

After the fabric has been treated as above described the desized and oil-free fabric is then dried, and the dried fabric is impregnated with a rubber latex compound which may be either natural rubber latex or reclaimed rubber latex, or synthetic rubber latex, of which latter latex that known as neoprene latex is an example. The elimination of the oil in the fibers of the fabric removes therefrom a material that would have a deleterious effect on the rubber compound with which the fabric is impregnated, and the desizing of the fabric increases its capacity to absorb the rubber latex.

In order to increase the penetration of the latex compound into the fabric, we may add to such compound a suitable wetting agent such as above referred to.

The desized, oil-free, latex-treated tubular fabric is then partially dried and while still in the partially dried state, it is stretched transversely to a pre-determined size, i. e., to the size of the belt which is to be made from said fabric. This stretching of the fabric can be carried out in any suitable or usual way, but preferably by inserting into the tubular fabric an expansible stretching frame which can be expanded to accomplish the stretching operation.

While the fabric is still in its stretched condition on the stretching frame, it will be subjected to a further drying operation to completely dry it.

The dried, desized, oil-free, latex-impregnated, tubular fabric is then provided with a thin coating of rubber-like material which is vulcanized thereto. Such rubber coating may be applied to one side only of the tubular fabric or to both sides, and it may be applied in various ways within the scope of the invention.

One way of providing the dried, desized, oil-free latex-impregnated, tubular fabric with the thin rubber coating is to first apply to the outside face of the fabric a coat of rubber-like cementitious material that has a solvent action on the latex compound with which the fabric is impregnated, and after such coating of cementitious material has been dried to a tacky state, then apply to the cement coated face of the tubular fabric a wafer thin sheet of rubber having a thickness on the order of .010". Such wafer thin

sheet of rubber may be either natural rubber or synthetic rubber. When the rubber cement is thoroughly dried, the rubber coated tubular fabric is cured or vulcanized under pressure, after which it is cut transversely into belts of the desired width. Each belt thus made is an endless seamless belt which comprises a non-stretchable desized and oil-free fabric body that is impregnated with the latex compound and an outer coating of rubber having a thickness on the order of .010" which is vulcanized thereto. The thin rubber coating seals all the interstices between the threads of the fabric on the exterior face thereof, but it is so thin it does not obscure the texture of the fabric.

Another way of making a belt embodying our invention is to desize a length of woven tubular fabric, impregnate it with rubber latex, stretch it, and apply to its exterior face a wafer thin coating of rubber as above described, and then to turn the tubular fabric inside out and apply a thin coating of rubber-like material, and a wafer thin sheet of rubber to the other face of said fabric, the double coated fabric being then vulcanized under pressure. A belt made from a tubular fabric treated this way will have a body of latex-impregnated fabric, both sides of which have the wafer thin rubber coating vulcanized thereto.

Still another way of making a belt from a woven tubular fabric which comes within our invention is to treat the fabric so as to desize it and remove any oils that may be present in the fibers of the fabric and then to impregnate the fabric with the latex compound as above described. The desired thin rubber coating may be applied to one or both surfaces of the fabric by applying thereto one or more coats of a latex compound which will have a solvent action on the latex compound with which the fabric is impregnated so that the latex compound or rubber compound which is applied to the surface of the tubular fabric will become welded and integrally united with the latex compound with which the fabric is impregnated. Such latex compound can be applied to the surface of the latex impregnated tubular fabric either by brushing it thereon or by means of a spray, and the application of one or two coats of such latex compound to the surface of the fabric will provide it with the desired rubber coating having a thickness on the order of .003" to .020". The neoprene latex compound is eminently satisfactory for this purpose.

Such latex compound can be applied to one side only or to both sides of the fabric. In either case after the applied latex compound has become dry, the coated fabric is then preferably again stretched to size on a suitable frame and vulcanized under pressure, after which the tubular fabric may be cut into belts of any desired width.

A belt made in accordance with our invention is a non-stretchable belt having a body of latex-impregnated fabric and having at least one side coated with a thin wafer-like coating of rubber or rubber-like material having a thickness on the order of .003" to .020".

If a stitched belt is desired, the tubular fabric may be provided with lines of stitching extending circumferentially therearound before it is cut into individual belts, or each individual belt may be provided with one or more lines of stitching extending longitudinally thereof.

In the drawings which illustrate more or less diagrammatically the method of making the endless transmission belt Fig. 1 is a perspective view illustrating a section of tubular woven fabric from which the belts are made.

Fig. 2 illustrates the step of removing the sizing and oil from the fabric.

Fig. 3 represents the step of impregnating the fabric with rubber latex.

Fig. 4 illustrates the operation of stretching the latex impregnated belt.

Fig. 5 is illustrative of the operation of applying the thin rubber coating to the latex impregnated fabric.

Fig. 6 illustrates the operation of subjecting the tubular fabric to pressure after the thin rubber coating has been applied.

Fig. 7 illustrates the manner in which the tube section is made into individual belts.

Fig. 8 illustrates the method of applying the thin rubber coating to the fabric by means of a spraying operation.

Fig. 9 is a perspective view of an individual belt.

In Fig. 1, 1 indicates a length of tubular fabric from which belts embodying our invention are made. The desizing operation may be accomplished by immersing the length 1 of fabric in a bath 2 of the desizing material, an example of which is malt diastase as stated above. This bath is shown as contained in a vat or tub 3.

The operation of impregnating the desized and oil-free fabric 1 with rubber latex may be accomplished as indicated in Fig. 3 in which the desized and oil-free section of fabric 1 is immersed in a bath 4 of rubber latex which bath is contained in a suitable vat 5.

As an illustration of simple means for stretching the latex impregnated tubular fabric 1 there is shown in Fig. 4 a stretching device which comprises two members 6 and 7 situated within the tubular fabric and a spreading member located between said members 6 and 7 for spreading them apart. This spreading member may be in the form of a nut 8 which has a screw threaded engagement with screw threaded stems 9 and 10 which project inwardly from the stretching members 6 and 7.

One of the stems has a right hand screw thread and the other a left hand screw thread and by turning the nut 8 in the proper direction the members 6 and 7 will be spread apart, thereby stretching the tubular fabric to the desired extent.

Our method of applying the thin rubber coating to the stretched latex-impregnated tubular fabric 1 is illustrated in Fig. 5 wherein the latex-impregnated tubular fabric 1 is shown as having a coating of cementitious material 11 applied to exterior surface, after which a wafer thin sheet 12 of rubber having a thickness on the order of .010" is applied to the coated surface of the fabric 1.

An alternative method of applying this wafer thin coating of rubber to the surface of the latex-impregnated tubular fabric is illustrated in Fig. 8 wherein the rubber coating is sprayed on to the surface of the latex-impregnated tubular fabric 1 by means of spray jets 13.

In Fig. 6 there is shown a device for vulcanizing the tubular fabric 1 after the wafer thin coating of rubber has been applied thereto. This device comprises a central matrix 14 of a size to fill the tubular fabric, the latter being placed around the matrix, and a plurality of presser elements 15 for subjecting the tubular fabric 1 to pressure. The matrix and the presser elements may both be heated sufficiently to effect the vulcanizing operation.

The final step of making the individual belts

from the tubular fabric 1 is illustrated in Fig. 7, the dotted lines 16 indicating the manner in which the tubular fabric may be cut transversely to provide individual belts. An individual belt which has been cut from the treated fabric shown in Fig. 7 is illustrated at 17 in Fig. 9.

We claim:

1. The method of making an endless transmission belt which consists in treating a length of tubular woven cotton fabric to remove any sizing and oils present in the cotton yarns of the fabric, thereby to free it from oily ingredients which have a deleterious effect on rubber latex compound with which the fabric may subsequently be impregnated, drying the desized and oil-free tubular fabric, impregnating the dried, oil-free tubular fabric with a rubber latex compound, stretching the impregnated tubular fabric transversely to a predetermined size, applying to the exterior face of said stretched tubular fabric a coating of rubber material having a thickness on the order of .010", vulcanizing the rubber coated tubular fabric, and then cutting said tubular fabric transversely into belts of any desired width.

2. The method of making an endless transmission belt which consists in treating a length of tubular woven cotton fabric to remove any sizing and oils present in the cotton yarns of the fabric, thereby to free it from oily ingredients which have a deleterious effect on rubber compound which may subsequently be associated with the fabric, drying the desized and oil-free tubular fabric, impregnating the dried tubular fabric

with a neoprene latex compound, stretching the impregnated tubular fabric transversely to a predetermined size, applying a thin coating of neoprene cement to the exterior of the tubular fabric, applying a thin coating of rubber compound to the cement coated surface of the tubular fabric, vulcanizing the rubber coating to the tubular fabric and then cutting said fabric transversely into belts of any desired width.

3. An endless seamless belt having a body of woven textile fabric which is impregnated with rubber latex compound and is free from sizing and oils that have a deleterious effect on such rubber latex compound, one side at least of said body being coated with a thin wafer-like coating of rubber having a thickness on the order of .010".

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