A. T. COLLIER.

FABRIC CONTAINING INDIA RUBBER AND THE LIKE.

APPLICATION FILED APR. 24, 1914.

1,149,897. Patented Aug. 10, 1915.

Fig. 1.

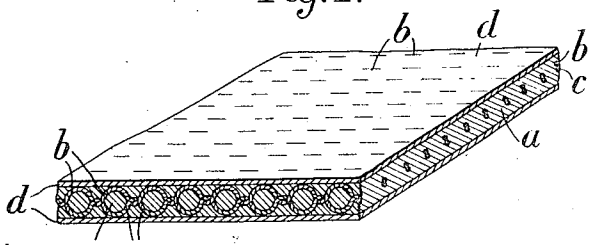


Fig. 1a

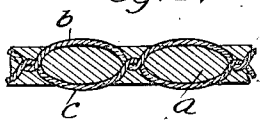


Fig. 2.

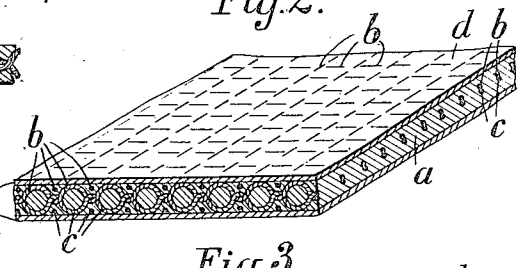
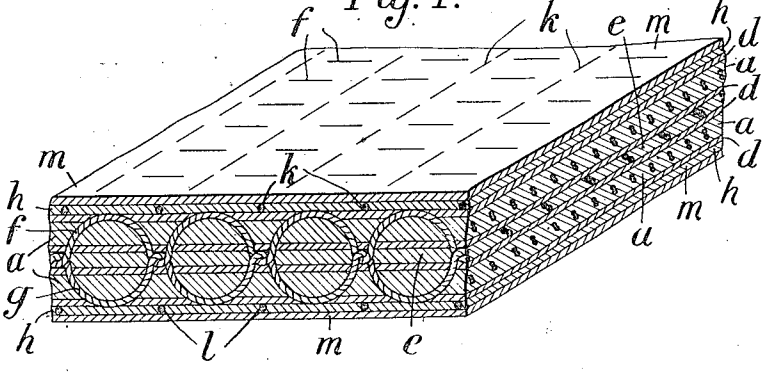


Fig. 1b



Fig. 3.

Fig. 4.



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FABRIC CONTAINING INDIA-RUBBER AND THE LIKE.

1,149,897. Specification of Letters Patent. Patented Aug. 10, 1915.

Application filed April 24, 1914. Serial No. 834,254.

To all whom it may concern:

Be it known that I, ARTHUR THOMAS COLLIER, a subject of the King of Great Britain, residing at Broomhill, Victoria street, St. Albans, in the county of Hertfordshire, England, have invented an Improved Fabric Containing India-Rubber and the like, of which the following is a specification.

This invention consists in the manufacture of fabric from india rubber or other vulcanizable material in combination with interengaging threads, inserted by means of a sewing machine.

It is known to combine layers of woven canvas and like material with layers of india rubber, for example in the covers of pneumatic tires or in belting for the transmission of power, but in such constructions there is a constant rubbing action between the warp and weft threads of the canvas which rapidly deteriorates and ultimately destroys the strength of the fabric. Moreover there is no provision for allowing sufficient stretching of the outer layers of canvas so that puckering of the inner layers must take place when bending.

According to my invention, amorphous vulcanizable material is provided before vulcanization with rows of stitches in such a manner that the loops of the stitches inclose only amorphous vulcanizable material, which is afterward vulcanized. By thus introducing interlocking threads in the india rubber I give to it the required tensile strength without interfering materially with the flexible properties of the fabric. For this purpose I take a sheet of amorphous unvulcanized rubber and by means of a sewing machine run a series of lines of threads parallel to each other along the sheet. These lines are as close together as may be necessary for the strength of the material required. In some cases I cross sew the rubber sheet either in straight lines or curves; I then if desired cover the stitched layer on either side with a layer of unstitched vulcanizable material, and finally vulcanize the whole in any known manner. If thicker and stronger fabrics are required, I combine two or more such stitched layers of amorphous vulcanizable material and stitch the same together either in direct contact or with a layer of unstitched amorphous vulcanizable material between them. This stitching is preferably done with thicker threads and with larger stitches than those adopted for the single layer, and these stitches may be done in two or more directions either in straight or curved lines for the purpose of taking stresses in different directions. Moreover since as a general rule larger stitches in the same thickness of fabric produce more rigidity or less elasticity than short stitches, it is desirable to adapt the length of stitch used to the degree of flexibility required; and further the elasticity of the smaller stitching should be approximately the same as the larger stitching. Before repeating the stitching in a different direction I prefer to add a layer of vulcanizable material on each side of the previously stitched material. After the stitching of the several layers together I then if desired add a top and bottom layer of vulcanizable unstitched material to the required thickness and finally vulcanize the whole in any suitable known manner. When using this material for pneumatic tires for road vehicles or for other curved work I shape the inner layers to the required curvature before stitching them together in order that the stitches may have normal tension without distortion in the finished tire.

Any suitable thickness of thread may be employed, but generally coarser threads are used for thicker material, and also it is preferable to use thread which is not too tightly twisted so that should the sewing needle pass through the same it will do so without destroying the thread. I may use thread coated with rubber solution in order to insure that the stitches shall adhere to the fabric. Such impregnation of the threads may be done *in vacuo*.

By amorphous unvulcanized rubber I mean any dough rubber compound, or substitute, or indeed any homogeneous or substantially homogeneous material capable of vulcanization, for example, the material described in the specification of my former U. S. Letters Patent No. 1,000,781, dated August 15, 1911; and by thread, I include thread of cotton or any other fibrous material; in certain cases I can use wire of iron, steel, copper, etc.

In the accompanying drawings:—Figure 1 is a perspective view partly in section showing what I may term a single unit of fabric made according to my invention, the stitching being in one direction only. Fig. 1ª represents a section of a unit similar to

that shown in Fig. 1, but before vulcanization. Fig. 1[b] represents the same after vulcanization. Fig. 2 illustrates a unit of fabric with stitching in two directions. Fig. 3 is a view of a fabric made up of two units stitched together. Fig. 4 illustrates a two unit fabric with stitching in two directions.

In Fig. 1, *a* denotes the india rubber or other vulcanizing material which is to be stitched; *b*, *c* the threads forming the stitching; and *d*, *d* the upper and lower layers of unstitched vulcanizable material. After the layer *a* has been stitched it is placed between the upper and lower layers *d*, *d* and the several layers are vulcanized together to form a coherent whole. The stitches are shown round but in some cases they may be oval. In some cases the layers *d*, *d* may be omitted.

In Fig. 2 I have shown a construction which differs from that in Fig. 1 only in that the rows of stitching indicated by the broken lines run in two directions instead of in one only.

In Fig. 3 two constituents each compounded as in Fig. 1 are laid one on each side of a layer of unstitched vulcanizable material *e* and stitched together by the larger stitching *f*, *g* and then covered on top and bottom by unstitched vulcanizable material *h* and finally vulcanized together.

Fig. 4 differs from Fig. 3 in that after the layers *h* are added, the whole is again stitched with larger stitches *k*, *l* running across the stitches *f*, *g* and further top and bottom unstitched layers *m* are added to cover the stitches, the whole being finally vulcanized together. Or the second stitching may be done before the layers *h*, *h* are added.

I claim:—

1. As an article of manufacture, a sheet of vulcanizable material reinforced by independent lines of stitches sewed therein, such material being unvulcanized and homogeneous throughout the thickness of the sheet, the reinforced sheet being flexible and inelastic in the direction of the length of the lines of stitches.

2. As an article of manufacture, a sheet of vulcanizable material reinforced by a series of independent lines of stitches sewed therein and by independently applied lines of stitches intersecting the lines of the series first mentioned, such material being unvulcanized and homogeneous throughout the thickness of the sheet, the reinforced sheet being flexible and inelastic in the direction of the length of the lines of stitches.

3. As an article of manufacture, a sheet of vulcanizable material reinforced by independent lines of stitches sewed therein, such material being homogeneous throughout the thickness of the sheet, the sheet being inelastic in the direction of the length of the lines of stitches and covered on its opposite sides by material vulcanized thereon.

4. A fabric made from a plurality of sheets of vulcanizable material each of which has lines of stitches inserted in it while unvulcanized, said sheets being then stitched together with a layer of vulcanizable unstitched material between adjacent stitched layers, the whole being afterward vulcanized together.

5. A fabric made from a plurality of sheets of vulcanizable material each of which has lines of stitches inserted in it while unvulcanized, said sheets being then stitched together with a layer of vulcanizable unstitched material between adjacent stitched layers and top and bottom covering layers of unstitched material, the whole being finally vulcanized together.

6. A fabric made from a plurality of sheets of vulcanizable material each of which has lines of stitches inserted in it while unvulcanized, said sheets being then stitched together and the whole afterward vulcanized, the threads which unite the several layers being thicker and the stitches larger than those used in the individual layers.

7. A fabric made from a plurality of sheets of vulcanizable material each of which has lines of stitches inserted in it while unvulcanized, said sheets being then stitched together and the whole afterward vulcanized, the stitches being made of thread coated with rubber solution for the purpose set forth.

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