428-408. XR 972,110 SR

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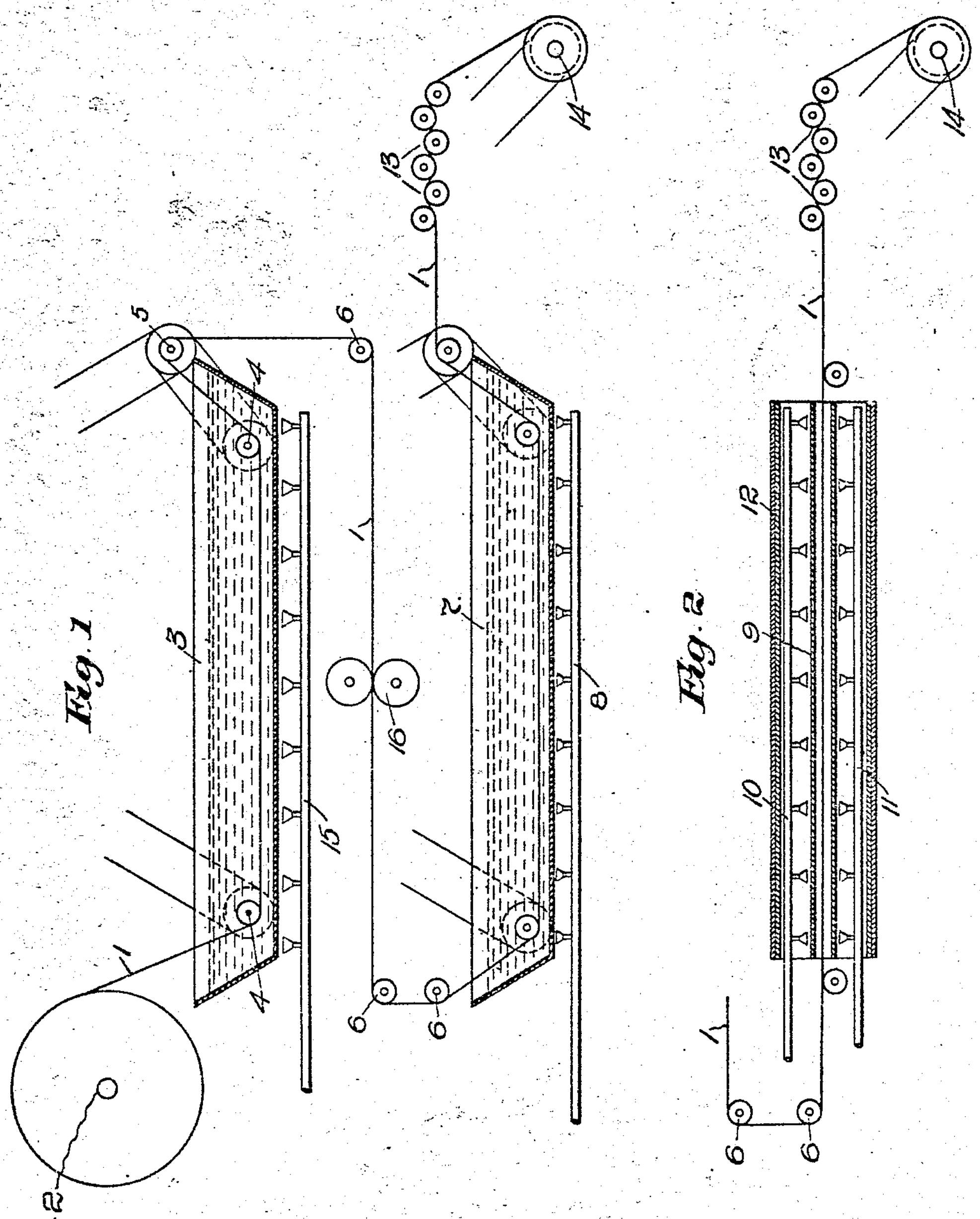
CARBONIZED FABRIC.

APPLICATION FILED AUG. 18, 1909.

972,110. Patented Oct. 4, 1910.



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UNITED STATES PATENT OFFICE.

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CARBONIZED FABRIC.

972,110. Specification of Letters Patent. Patented Oct. 4, 1910.

Application filed August 18, 1909. Serial No. 513,388.

To all whom it may concern:

Be it known that I, FREDERIC L. HORTON, a citizen of the United States, residing at Bridgeport, in the county of Fairfield and State of Connecticut, have invented an Improvement in Carbonized Fabric, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to carbonized fabrics.

The invention has for its object the production of a woven or otherwise formed fabric of fibrous material, the fibers, pores and interstices of which are partially or wholly permeated with carbonized matter. Such a carbonized product may be employed for a great variety of uses, and, while I am not limited in any respect to the uses to which the invention may be applied, among such uses may be suggested its employment as a wear-receiving material for band brakes, friction clutches, as a fire proof covering for fire hose and for other purposes, particularly where heat or wear resisting qualities or a high co-efficient of friction is sought.

In the drawings; Figure 1 shows in diagram one form of apparatus capable of producing the product described; and Fig. 2 shows a modified form of carbonizing apparatus.

In carrying out my invention, a carbonized fabric is produced, preferably by treating a suitable fabric with some carbon compound capable of being readily carbonized, and then subjecting the treated fabric to a carbonizing process. Although various means may be adopted for treating the fabric, preferably I employ a fibrous material in woven, knit or other fabricated form, so that the carbon compound may be applied in the form of a liquid bath thoroughly to saturate the fabric and permeate the fibers thereof. The fabric treated in this manner may be carbonized in any suitable way, but one of the most practical and convenient, when a fabric is employed with suitable heat resisting qualities, is to subject it to a temperature sufficiently high to carbonize the absorbed liquid carbon compound, producing thereby a fabric having incorporated therewith hard, coherent heat and wear resisting carbon having a high co-efficient of friction. The carbon and the asbestos fibers or strands, contribute, by their mutual support, to the strength of the material; the carbon being coherent and friction producing, (as distinguished from carbon, ordinarily termed graphitic, which is friction reducing), is hard and durable under abrasive pressure and the high temperatures incident thereto. These qualities especially adapt the materal for use as linings for automobile brakes and clutches.

While various materials may be employed and the process carried out in different ways and by widely different apparatus, for the sake of illustrating one of the methods of producing the material, I have shown in the drawings one form of apparatus which may be employed.

In order to provide a heat resisting fabric, so that heat may be employed for the carbonizing process and the completed fabric, moreover, may present heat resisting qualities to the highest degree, I preferably employ a fabric formed of asbestos fiber. Such fabric may be produced by a well-known process of crushing the asbestos to procure the individual fibers, which latter are then mixed with a small proportion (for example 5% by weight) of cotton, the mixed fiber being then treated to the usual steps of spinning and weaving in all substantial respects like the ordinary process of weaving cotton cloth. In producing an asbestos fabric of this kind, preferably a selection is made of the long fibers of the asbestos, since this not only produces a strong fabric, but one presenting greater flexibility when carbonized. A woven asbestos fabric of this kind may be produced of any desired thickness, width, mesh or texture, and may be woven with or without reinforcing wires or other stiffening members. Asbestos fabric thus formed is next treated with a liquid carbon compound, so that its threads and mesh are well impregnated therewith. For this purpose, any suitable compound may be employed, but preferably a carbohydrate is utilized and for practical purposes common molasses may be employed, being preferably diluted with a suitable quantity of water to cause it better to enter and permeate the fibers or the fabric. The thickness and richness of the carbonizing coating will depend largely upon the extent to which the molasses is diluted. To produce a serviceable lining for a friction brake, for example, common molasses may be diluted with 50%

by bulk of water. The molasses or other carbohydrate employed may be used free from mixture with other ingredients, but preferably, in order to prevent oxidation of the carbon during the carbonizing process, I add some reducing agent, such as a small quantity (for example $\frac{1}{2}$ of 1%) of sulfur, the latter being first dissolved in a suitable solvent, such as a suitable quantity of lye and ammonia.

The asbestos fabric, having been thoroughly permeated with the molasses solution as above described, is dried and then subjected to a carbonizing heat, applied either directly to the fabric from the flame of a torch or other burner, or by submerging the cloth in a heated bath or by other suitable means. A temperature ranging from 700° to 800° F. has been found to give excellent results, although a wide range of temperatures is possible, the time required to carbonize the compound depending not only on the temperature but on the composition and strength of the saturating compound and the thickness or body of the fabric.

Referring to the drawings, I have shown in diagrammatic elevation an apparatus adapted to carry out the described process. The fabric 1 is drawn as required from the feed roll 2 and carried slowly through a bath of diluted molasses contained within the tank 3. The fabric, which is shown as formed in a continuous strip, passes beneath suitably driven guide rollers in the tank, the tank having a sufficient extent and the travel of the fabric being at such a rate as to cause a thorough saturation of the latter with the molasses. The saturation of the fabric is materially assisted by heating the molasses bath to a temperature preferably slightly less than the boiling point and a burner 15 is therefore employed for this purpose. From the tank the fabric strip passes over the guide roller 5 and thence about other guide rollers 6 to afford the absorbed liquid opportunity to dry. The strip then passes to the carbonizing apparatus, the latter being shown in Fig. 1 as consisting of a second tank 7 in which is provided some suitable liquid, such as linseed oil, which is capable of being raised to a high temperature. Linseed oil when employed also serves the useful purpose of water-proofing the resultant carbonized fabric. The linseed oil bath is heated to a temperature above 400° F. by a series of underlying burners 8 supplied with gaseous fuel from any suitable source. The fabric strip passes into the bath at one end of the tank, being withdrawn therefrom at the other end.

In Fig. 2, in place of the liquid containing tank 7, I have there shown a tube 9, preferably of metal, through which the fabric strip 1 is caused to travel. The tube is raised to a high temperature by means of the upper and lower burner pipes 10 and 11 which are contained within the outer tube 12, the latter preferably having an asbestos lining.

With woven material, if the weave is close or the saturating solution rich with carbon, it may be necessary to subject the carbonized fabric to a suitable action to break up the hard carbon contained in its meshes if it is desired that the completed fabric should possess any material degree of flexibility. For this purpose herein I have shown a series of steel rollers 13 arranged in staggered relation, so that the fabric is caused to pass between them in a sinuous path, these acting as breaking rollers to break up the carbon in the mesh of the fabric and to secure a flexible product. These or their equivalent may or may not be employed, according to the use to which the fabric is to be put. From the breaking rollers 13, the fabric passes to the winding-on roll or beam 14, preferably driven from any suitable source of power so as to wind thereon the carbonized fabric at a suitably slow rate of speed.

Unless specially treated to produce flexibility and especially when richly carbonized, the resultant fabric consists of a hard, definitely formed body partly or wholly permeated with carbon. Articles which have been woven or otherwise fabricated and pressed or formed into a definite shape and then carbonized as above described, or which have been formed into some definite shape after being saturated with the molasses, may be made permanently to retain such shape. As an example of the production of a predetermined formation in the carbonized product, I have shown in the apparatus of Fig. 1, means consisting of the two steel rollers 16, between which the fabric tape is caused to pass after emerging from the molasses bath and when in a semi-plastic state. These rollers may be suitably shaped to impress the thin plastic tape with any desired formation, such for example as one or more grooves or channels lengthwise of the tape. These rollers leave a permanent impression in the plastic tape, so that the latter, when it emerges from the carbonizing apparatus has the characteristic shape imparted by the rollers. While ordinarily no difficulty will be experienced in keeping the heat within such limits as to prevent the oxidation of the carbon when the tape emerges from the carbonizing apparatus, if it has a tendency immediately to turn white, thereby indicating oxidation of the carbon, it can be easily remedied by applying to the surface of the emerging tape a coating of molasses, meanwhile taking care that the temperature of the furnace is reduced.

A fabric produced as described has very high heat resisting qualities, since the carbon in the asbestos will not be destroyed under a red heat and not even when subjected to a higher heat except on coming into association with some oxidizing or other like agent. The co-efficient of friction of the material is high, and its wear resisting properties quite marked so that it may be usefully employed for a wide variety of purposes. When used as a friction material, the described fabric can be saturated with oil with only a partial loss of its gripping effect.

While I have herein described one specific form of my invention for purposes of fully explaining the same, it is not limited to the particular materials referred to, as it may be produced by other methods from other materials.

Claims.

1. A material of the character described, comprising asbestos impregnated with a coherent mass of carbon derived from a carbohydrate.

2. A material of the character described, comprising woven asbestos impregnated with a coherent mass of carbon derived from a carbo-hydrate.

3. A material of the character described, comprising asbestos impregnated with a coherent mass of carbon derived from a carbohydrate, said mass being broken up or softened.

4. A material of the character described, comprising asbestos impregnated with a coherent mass of carbon derived from a mixture of sulfur and a carbo-hydrate.

5. A material of the character described, comprising woven asbestos impregnated with a coherent mass of carbon derived from a mixture of sulfur and a carbo-hydrate.

6. A material consisting of fabricated asbestos fiber having incorporated therewith hard, coherent carbon surrounding and supporting, and supported by the fibers or strands of the asbestos, and having a friction-producing, heat- and wear-resisting character.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses:

FREDERIC L. HORTON.

Witnesses:
Raymond B. Earle,
Sidney A. Wilbur.