Aug. 18, 1931. E. SLADE 1,819,344

BRAKE LINING AND METHOD OF MAKING THE SAME

Filed April 5, 1928

Fig. 1.

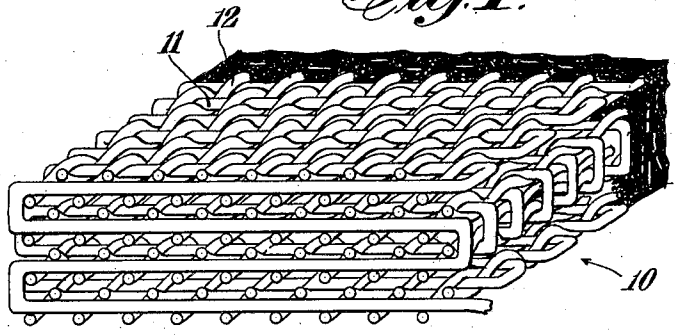
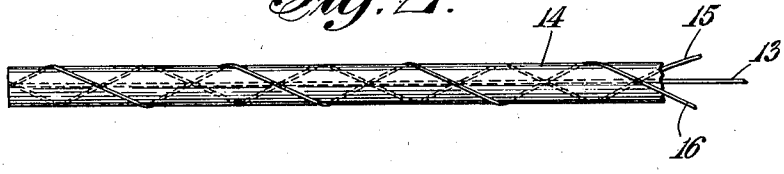


Fig. 2.



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UNITED STATES PATENT OFFICE

EDWARD SLADE, OF NEW YORK, N. Y.

BRAKE LINING AND METHOD OF MAKING THE SAME

Application filed April 5, 1928. Serial No. 267,563.

This invention relates to brake lining fabric and has for an object an improved asbestos brake lining and process of making the same.

According to this invention, the yarn from which the brake lining is woven is pre-impregnated with a waterproof heat-resisting compound which is prevented from hardening or setting until after the yarn has been woven into a fabric. After the yarn has been impregnated with the heat-resisting waterproof compound, it is treated to cure the compound without setting the same and the yarn is then woven into fabric, after which the compound is treated to harden or set the same. The resulting fabric is then compacted to form a homogeneous mass having the characteristics of a molded product.

In the preferred form of this invention, the yarn from which the fabric is woven consists of a reinforcing core enclosed in an asbestos covering, the core preferably being a soft metal wire and the covering preferably being a strip of asbestos felt paper wrapped about the core and bound by oppositely disposed binding wires. Such yarn may be produced by the yarn forming machine disclosed in the co-pending application of Edward Slade, Serial No. 37,606, filed June 7, 1925, or in the co-pending application of Edward Slade filed on even date herewith and bearing Serial No. 267,564.

Other objects, novel features and advantages of this invention will be apparent from the following specification and accompanying drawings, wherein

Figure 1 discloses a brake lining tape produced in accordance with a preferred form of the invention; and

Fig. 2 discloses the preferred form of yarn from which the tape is woven.

The tape 10 preferably is a multiple interwoven ply fabric having warp and weft strands 12 and 11, each of which comprises a wire core 13 enclosed in a strip of asbestos yarn 14 which is wrapped about the core and held in place by oppositely wound binding wires 15 and 16. The strands 11 and 12 may be produced by a machine such as disclosed in the co-pending application of Edward Slade, Serial No. 37,606, filed June 17, 1925, and the tape is woven from these strands by a suitable loom. Or the tape may be formed of yarn such as made on a machine like that disclosed in the co-pending application of Edward Slade, filed on even date herewith and bearing Serial No. 267,564, and if desired the warp or the weft strands may be bare wire.

In these machines, an asbestos strip is formed over a wire core and the binding wires applied. The yarn as it comes from the machine is wet and after being thoroughly dried, it is wound into cops of proper size for use in a loom shuttle. The cops are then subjected to a treatment thoroughly to impregnate the yarn with a waterproof heat-resisting compound. The impregnating operation is accomplished by piling the cops into wire mesh baskets and then immersing the same in a solution of a waterproofing heat-resisting compound for a sufficient length of time to permit the yarn to become thoroughly saturated with the compound. The baskets are then lifted from the compound tank and the surplus compound permitted to drain off, after which the cops are placed in an air chamber where the more highly volatile solvents of the compound are evaporated. The same baskets of cops are then placed in very hot water for several minutes to cure the compound in the yarn without hardening the same.

Any suitable waterproofing heat-resisting impregnating compound may be used in the treatment of the yarn. An impregnating compound which has been found to operate satisfactorily comprises a mixture of gilsonite, asphalt, China-wood oil, linseed oil and kerosene oil in approximately equal parts dissolved in benzol and gasoline as solvents. This compound is very satisfactory due to the fact that it thoroughly impregnates the yarn to make it waterproof and heat-resisting and comprises solvents which are easily volatile.

After the hot water curing process, the baskets of cops are stored in tanks of cold water if they are not to be used right away

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The cold water has the effect of keeping the yarn soft and pliable, as the compound will not set unless exposed to the open air after the curing operation. If it is desired to make use of the yarn at once, the cops are immediately immersed in a tank of thin mineral oil after they have been taken from the hot water tank. The cops are left in the thin mineral oil until they have been thoroughly soaked, after which they are packed in boxes and allowed to stand for a few hours before being used in the weaving of the fabric. Also after being taken from the cold water storage tanks, the baskets of cops are soaked in the mineral oil before being used. The mineral oil maintains the yarn and the fabric woven therefrom in plastic condition until such time as the setting of the impregnating compound is effected.

The yarn is now thoroughly impregnated with water-proofing heat-resisting compound which has been cured but which has not yet set so that the yarn is still very pliable and may be therefore readily woven. The yarn is then woven into brake lining tape on a suitable loom and may be woven in single or multiple ply of any combination desired properly to bind the various plies together. The tape is highly compacted in the process of weaving but retains its plasticity for several hours due to the mineral oil treatment. After the tape has been woven and removed from the loom, it is still plastic and is passed through a calender or the like to shape, compact and smooth it as well as squeeze out the excess moisture.

The tape is then coiled and arranged upon suitable trays by means of which it may be immersed in a second tank of compound similar to the first compound, if so desired. The second compound need not be of exactly the same density as the first, but it has similar waterproofing and heat-resisting characteristics. After the tape has been allowed to remain in the second bath for several minutes to become thoroughly impregnated with the compound, it is lifted out and allowed to drain. The trays carrying the impregnated tape are passed through an air draft where highly volatile constituents are evaporated. The trays holding the rolls of tape are then placed in a bake oven where they are heat treated for several hours at a high temperature so that the compound throughout the tape is thoroughly set. After the tape has been thoroughly set, it is passed again through a calender which brings it to the exact thickness.

The front portion of Fig. 1 shows the form of weave which may be used in the tape and the rear portion of the figure shows the appearance of the tape after it has been impregnated with the waterproof heat-resisting compound and pressure applied by means of the calenders.

During the process of weaving, the identity of the yarn is completely disguised with the result that the original shape of the strip of asbestos felt paper used to make the yarn is destroyed and the asbestos fiber completely matted together with the compound and the wire throughout the entire length of the lining and, as the wires are woven with a very close mesh, the whole mass is firmly held in place. All the voids which are to be found in the ordinary type of lining completely are filled up and the lining has the appearance of a solid piece of material, there being no visible appearance of woven mesh. This condition is further effected by the pressure to which the tape is subjected when it is passed through the sizing rolls or calenders just after it has been taken from the loom while still in plastic condition. The final structure is extremely compact and has the characteristics of a molded product rather than a woven product and is a solid homogeneous mass. The ultimate product obtained by the process herein described is a brake lining of great density and having no pores wherein moisture can accumulate. As the yarn used in the weaving of the product has been thoroughly impregnated with waterproof heat-resisting compound, each individual asbestos fiber has been coated and made non-absorbent. This makes the finished product permanent in its characteristics and it cannot swell due to moisture, a feature found objectionable in the present type of brake lining.

In the process of producing brake lining as herein described from asbestos felt paper, the binding material or starch used in the producing of the paper from asbestos pulp is mostly removed and is not appreciably present in the finished product. The starch or the like is partly separated from the asbestos paper when the latter passes through the yarn-forming machine. The starch comes to the surface of the yarn in fine scale so that, when the dry yarn is wound into cops before being impregnated, the same is sloughed off in the winding operation. When the yarn is being treated with the impregnating compound and carried through the curing process in the hot water and mineral oil, the majority of the balance of starch in the asbestos paper is loosened and comes to the surface of the treated yarn so that, as the strands of yarn are woven into the fabric on the loom most of this residue of starch is squeezed out and is automatically scraped off the woven material with the surplus compound which the starch absorbs.

Brake lining formed according to this process is of very great density and compactness and has a high coefficient of friction

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and a low wear factor. After it has been riveted to a brake band or shoe, it cannot be easily displaced because of its density and the compact arrangement of the interlacing wires.

It is to be understood that the pre-impregnating process herein described and the resulting compacted brake lining fabric composed of a homogeneous mass of wire and asbestos material having the characteristics of a molded product are not limited to the particular stuff or form of material described but the scope of the invention is limited only as defined in the claims appended hereto. In particular, while it is preferred to use in the pre-impregnating process a yarn composed of wire and asbestos felted paper of the character described and the best results in the finished brake lining product are thereby achieved, still many of the advantages of the invention may be secured in connection with the manufacture of brake lining composed of yarn made of spun fiber asbestos material and other forms of asbestos yarn heretofore known.

I claim:

1. The process of making brake lining which comprises immersing asbestos yarn in an impregnating compound solution, curing the compound without setting the same, treating said yarn to maintain it in plastic condition, weaving the same into a fabric, and subsequently treating the fabric to set the impregnating compound.

2. The process of making brake lining which comprises immersing asbestos yarn in an impregnating solution, curing the impregnating compound without setting the same, treating said yarn to maintain it in plastic condition and weaving the same into fabric, treating the fabric to set the compound, and subjecting the fabric to pressure to compact the same.

3. The process of making brake lining which comprises impregnating asbestos yarn with a waterproof heat-resisting compound, curing the compound without hardening, treating said yarn to maintain it in plastic condition, weaving the yarn into tape and subsequently setting the compound and compacting the tape.

4. The process of making brake lining which comprises enclosing a wire in a strip of asbestos paper to form yarn, impregnating the yarn with waterproof heat-resisting compound, curing the compound without hardening, treating said yarn to maintain it in plastic condition, weaving the yarn into fabric and treating the fabric to compact the same and set the compound.

5. The process of making brake lining which comprises pre-impregnating a yarn composed of wire and asbestos material with a waterproof heat-resisting compound, treating the yarn to cure the compound without setting the same, treating said yarn with mineral oil to maintain it in plastic condition, weaving the yarn into tape, treating the tape to set the impregnating compound and subjecting the tape to pressure to compact the same.

6. The process of making brake lining which comprises immersing asbestos yarn in a solution of a mixture of gilsonite, asphalt and oil, evaporating the more volatile constituents of the solvent, treating the yarn to cure the impregnating compound without setting the same, treating said yarn to maintain it in plastic condition, weaving the yarn into fabric and subsequently treating the yarn to set the compound and to compact the fabric.

7. The process of making brake lining which comprises pre-impregnating a yarn composed of wire and asbestos material in a solution of a waterproof heat-resisting compound, evaporating the solvents for such compound, treating the impregnated yarn to maintain it in plastic condition, weaving the yarn into tape, immersing the tape in a solution of a waterproof heat-resisting compound, baking the tape to evaporate the solvent and set the compound, and calendering the tape.

8. The process of making brake lining which comprises pre-impregnating a yarn composed of wire and asbestos material in a solution of a waterproof heat-resisting compound, evaporating the more volatile constituents of the solvent of such compound while preventing setting of the compound, treating said compound to maintain it in plastic condition, weaving the yarn into tape, immersing the tape in a solution of a waterproof heat-resisting compound, baking the tape completely to evaporate the solvents and set the compound.

9. The process of making brake lining which comprises pre-impregnating a yarn composed of wire and asbestos material in a solution of waterproof heat-resisting compound, evaporating the more volatile constituents of the solvent for said compound while preventing setting of the compound, immersing the impregnated tape in mineral oil to maintain the same in plastic condition, weaving the impregnated yarn into tape, immersing said tape in a solution of a waterproof heat-resisting compound, baking the immersed tape completely to evaporate the solvent for the compound and to set the same, and subsequently calendering said tape.

10. The process of making brake lining which comprises pre-impregnating a yarn composed of wire and asbestos material in a solution of waterproof heat-resisting compound, evaporating the more volatile constituents of the solvent of such compound, immersing the impregnated yarn in hot

water to cure the compound without hardening the same, immersing the yarn in a thin mineral oil to maintain its plasticity, weaving the yarn into tape, immersing the tape in a solution of a waterproof heat-resisting compound, completely evaporating the solvent for said compound and setting the same by baking, and subsequently calendering the baked tape.

11. The process of making brake lining which comprises pre-impregnating a yarn composed of wire and asbestos material in a solution of a waterproof heat-resisting compound, evaporating the more highly volatile constituents of the solvent, immersing the yarn in hot water to cure the compound without hardening it, treating said compound to maintain it in plastic condition, weaving the impregnated yarn into tape, immersing the tape in a solution of a waterproof heat-resisting compound, thoroughly evaporating the solvent of the compound, baking the tape to set said compound, and subsequently calendering the same.

12. A brake lining fabric comprising interwoven warp and weft strands, each strand being composed of an asbestos paper sheath folded lengthwise about a metal core and binding wires oppositely wound thereabout, said asbestos being impregnated with heat-resisting waterproof compound prior to being woven and the fabric being compacted to produce a smooth exterior surface.

13. The process of making brake lining which comprises enclosing a metal core in an asbestos strip to form yarn, impregnating the yarn with a solution of water-proof heat-resisting compound, evaporating the more volatile constituents of the solvent, curing the compound without setting the same, weaving the yarn into tape and subsequently treating the tape to set the impregnating compound and to compact the tape.

14. The process of making brake lining which comprises impregnating an asbestos yarn with a solution of water-proof heat-resisting compound, evaporating the more volatile constituents of the solvent, curing the impregnating compound without setting the same, weaving the yarn into a fabric and subsequently treating the fabric to set the impregnated compound.

15. The process of making brake lining which comprises impregnating asbestos yarn with a solution of water-proof heat-resisting compound, evaporating the more volatile constituents of the solvent, curing the compound without setting the same, treating said yarn to maintain it in plastic condition, weaving the yarn into fabric and subsequently treating the fabric to set the impregnating compound.

16. A brake lining fabric composed of warp and weft strands, each strand being composed of a strip of asbestos paper rolled lengthwise about a metal core of substantially the same length, and binding wires oppositely wound around said paper to bind the same to the core.

17. A brake lining fabric composed of interwoven warp and weft strands, each strand being composed of metal core enclosed in a strip of asbestos paper substantially co-extensive in length therewith and being rolled lengthwise around the same, and a binding wire wrapped around said paper strip.

18. A brake lining fabric comprising interwoven warp and weft strands, each strand being composed of a metal core enclosed by a strip of asbestos paper substantially co-extensive in length therewith and rolled lengthwise about the same, and a binding wire wrapped about said paper, said paper being preimpregnated with a heat resisting water-proof compound and the fabric being compacted to produce a smooth exterior surface.

19. A brake lining fabric comprising interwoven warp and weft strands, each strand comprising a strip of asbestos paper rolled lengthwise about a metal core of substantially the same length, and binding wires oppositely wound around said paper, said asbestos paper being preimpregnated with heat resisting water-proof compound and the fabric being compacted to produce a smooth exterior surface.

In testimony whereof, I have signed my name to this specification.

EDWARD SLADE.