

Oct. 18, 1927.

C. B. HAYES

1,645,858

FABRIC

Filed Nov. 22, 1924

2 Sheets-Sheet 1

Fig. 1.

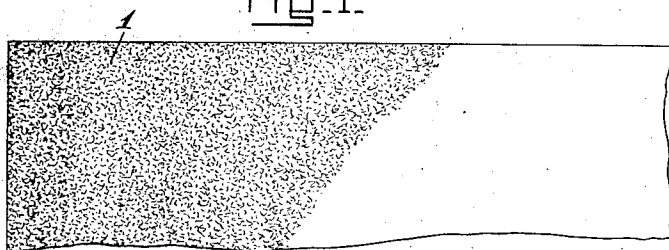


Fig. 2.

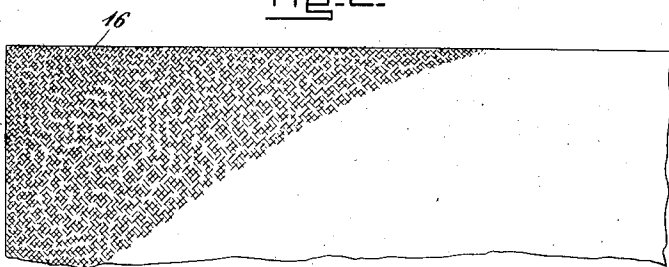


Fig. 3.

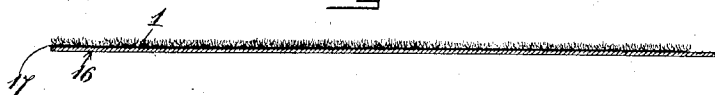
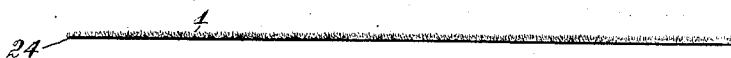


Fig. 4.



Fig. 5.



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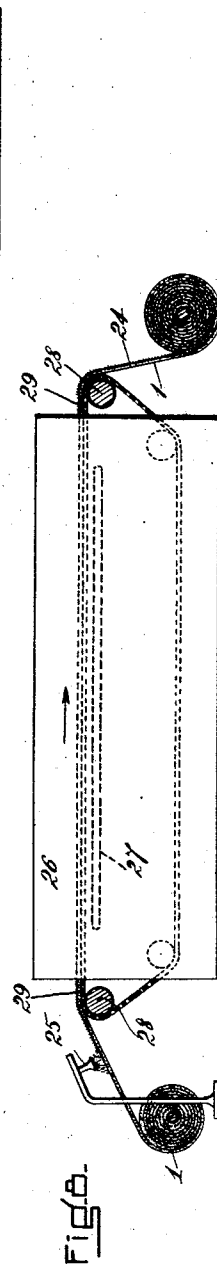
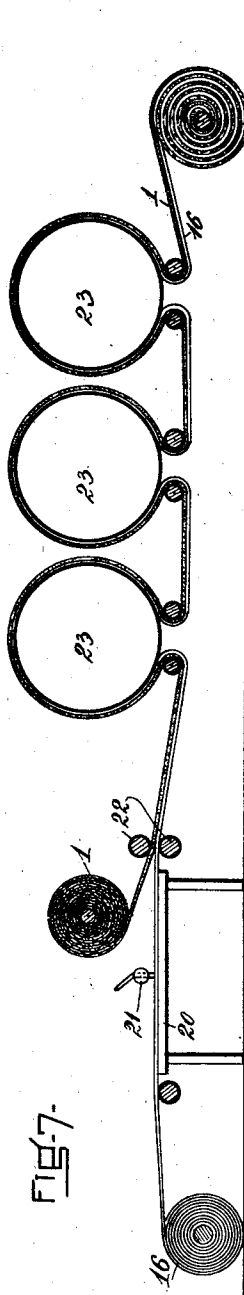
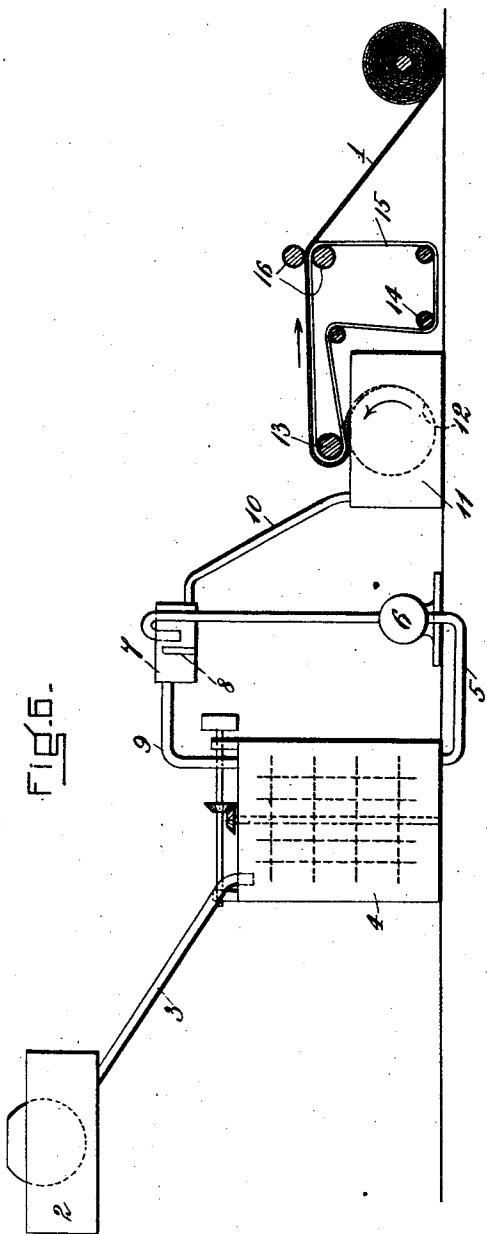
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

CLIFFORD B. HAYES, OF NEEDHAM, MASSACHUSETTS.

FABRIC.

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The invention relates to an improved fabric or fabric material and the process of producing it.

The essential object of the invention is to provide a fabric or fabric material possessing body or thickness, and strength where such is desired, coupled with softness and pliability.

A further object of the invention is to provide a fabric or material adapted for a variety of uses and which will take the place of fabrics or materials now used but at a very much less cost; also, to provide a fabric or material in which fibres available as an inexpensive by-product serve as the raw material.

Among the purposes to which the improved fabric is especially adapted is as a doubler or plumper, between the upper and the lining of shoes. Under present practices the lining of a shoe comprises either a filled cotton woven fabric or (more often) a filled cotton woven fabric coupled with a "doubler", so called. The doubler is a woven fabric, such as flannel, inserted between the lining proper and the leather portion of a shoe and is generally "napped" on one or both sides. The purpose of the doubler is to give a plumper feeling to the leather especially under circumstances where a relatively thin leather is used in the making of a shoe. The doubler serves, also, as a cushion. Its effectiveness in this connection, however, is limited to the amount of nap that can be raised on the doubler fabric. Where a doubler is used before the assembling of the parts of a shoe has begun, the leather, lining and doubler must be cut to pattern involving separate cutting operations for each.

A certain adaptation of the present fabric is such that there is combined in a single laminated fabric the lining itself, the back filling of the lining and the doubler. In other words, it combines in one piece the lining and doubler ordinarily employed, retaining all the good qualities they individually possess and with many additional advantages, among which are the following: The cost is very much less than that of a lining and doubler, because my doubler material is less expensive than the cheapest flannel. The cutting operations are reduced from three to two as there are two patterns instead of three. For the same reason the lasting is simplified and cheapened because

there are only two thicknesses to be "pulled over" and stitched instead of three. The laminated fabric cuts more easily than an ordinary filled lining and does not dull the knives. The reason is that no mineral filling need be used since the doubler layer contributes the necessary stiffness. The present fabric will also stand up better than a filled lining and separate doubler as the friction between the lining and doubler is eliminated. Owing to its pliability, it is more conformable than a lining and doubler as ordinarily employed. A further very decided advantage and peculiar novel characteristic possessed by the present doubler material is its tendency to fluff or open up by use instead of becoming more compacted.

The fundamental idea is the production of a doubler sheet, which in use will develop the characteristics of a fibre bat, but which in its initial state has other and apparently incongruous characteristics permitting it to be pulled over with the upper and its lining, either when free of the lining or when attached thereto to produce therewith a laminated fabric.

I start with a short staple textile fibre, substantially free of oils, waxes, gums and like adhesives, for example, cotton "shearings" substantially free from adhesive content. These fibres are too short to be formed into a satisfactory bat by carding or drawing, but may be formed with a mat or sheet resembling a compact felt or absorbent paper by special treatment in paper making machinery.

To this end I treat the fiber in a beater engine only sufficiently to produce a smooth flowing mixture which for lack of a better term may be called a "pulp", but which in the technical sense is not a paper pulp at all. In the first place the effort is to maintain the integrity of the fibers to the maximum extent possible as to length, consistently with the production of a smooth flowing stock. In other words grinding or cutting is avoided or at least minimized. In the second place there is no effect to soften or set free cellulose which would serve as a fiber binder. On the contrary the whole effort is to avoid this effect, to the end that in the finished product the fibers shall not be stuck together, but merely intimately entangled or enmeshed with each other.

It follows from the above, that when the stock above described is run on a paper ma-

chine, the result is not a paper in the true sense, but rather soft felt or short staple mat, with low tensile strength, and marked lack of cohesion between fibers.

5 To facilitate manipulation, to reduce thickness and to increase tensile strength, this felt may be rolled or pressed, but because of its lack of fiber cohesion it has the property thereafter of opening up upon flexure into a loose resilient sheet, which closely resembles a carded bat, except that the fibers are shorter and are indiscriminately laid; and which when in position as a doubler retains its integrity despite opening up.

15 After rolling and before opening up by flexure, the sheet has many of the characteristics in appearance and "feel" of an absorbent paper, and it is while it is in this condition that it may best be pulled over with the upper and its lining. It is advisable however to give the sheet additional tensile strength. Where it is to be used as a separate doubler, this may be accomplished by a surface treatment with an adhesive such as rubber latex, or by cementing to it a cheap fabric such as cheese cloth.

I prefer however to cement the doubler sheet to an unfilled lining by a strictly surface coat of non-drying, flexible cement. This is less expensive as it simplifies cutting and pulling over, and it has the decided advantage in the finished shoe that the doubler is sustained by the lining.

35 The invention can best be seen and understood by reference to the drawings where embodiments thereof are shown with diagrammatic representations of elements used in the process of making the fabric.

Figure 1 is a plan of the fabric showing one side thereof.

Fig. 2 is a plan of the fabric showing the opposite side thereof.

Fig. 3 is a cross section of the fabric.

45 Fig. 4 is a cross section of the fabric slightly modified in detail of construction.

Fig. 5 is a cross section of a further embodiment of the fabric.

Fig. 6 is a diagrammatic plan illustrative of the steps practised in making the mat later to be referred to.

Fig. 7 is a diagrammatic plan illustrative of the steps practised in applying a cloth backing to the mat, and

55 Fig. 8 is a diagrammatic plan illustrative of the steps practised when latex or milk of rubber constitutes the backing, as will later be explained.

Referring to the drawings:—

60 The doubler fabric (or layer in the case of a laminated fabric) comprises a mat or felt of fibres 1. This is composed essentially of short-stapled textile fibres of the kind ordinarily employed in textile manufactures but rendered substantially free from gums, resins and oily substances. In other words,

by "textile fibres" is meant fibres of the kind ordinarily employed in weaving, examples of which are cotton and wool. Cotton appears to work better than wool in the present connection though the two might well be combined. Of course some textile fibres may be better than others, the practicability of using any particular textile fibre being understandable in the light of the result desired to be attained. That is, the textile fibres should be short fibres, substantially devoid of adhesive content and which can be promiscuously interlaced and compressed into a coherent sheet capable of loosening and thereby developing increased thickness and softness with retained integrity as a coherent sheet upon continued flexure as when used in a shoe. Wood pulp, which can hardly be termed a textile fibre, would not satisfy this requirement for if the pulp could be made to possess in a coherent sheet the capability of developing increased thickness and softness upon flexure as when used in a shoe, yet when the sheet of pulp or paper was subjected to any such flexure as would increase its thickness and softness as when used in a shoe, its integrity as a coherent sheet would no longer be maintained and the sheet would go to pieces. On this account wood pulp could not be used in the present connection. By this is not meant that no wood pulp at all could be used in making the sheet. While it is desirable that no wood pulp be used, yet some might be used as an adulterant provided such amount of textile fibre be used as will give character to the sheet as aforesaid and enable the sheet to maintain its integrity as a coherent sheet on flexure as when used in a shoe. It is permissible also, though not necessary, that some of the fibres constituting the mat be finely comminuted or reduced even to a powder. In practice "shearings", so called, from bleached cotton fabrics have been employed with great success. These shearings are a short fibre waste material. The bleaching has rendered the shearings or fibres substantially free from gums, resins and oily substances and hence free of any pronounced cohesive tendency.

That mat is formed as follows (see Fig. 6): The stock is first placed in a beating engine 2 of the type customarily employed in the beating of wood fibre into pulp. The stock is beaten in this engine until the fibres are reduced into the form of a soft pulpy mass, which tends to individualize the fibres, soften them and otherwise impart to them such character as will permit of their later formation into a mat. The beating process will depend as to length of time upon the particular type of machine employed and the material, but in practice will take from one to two hours. In any event, the beating of the fibres should be carried on only so long as to insure the stock running smooth and

even in the sheet afterwards to be formed without destroying the integrity of the fibres. The beating step is by no means so thorough as that used in paper manufacture, and in fact is only sufficient to produce a smooth flowing stock. In this way the tendency of fibers in the finished product to cohere is minimized.

From the beating engine the stock is delivered through a pipe connection 3 into a receiving or storage tank 4 in which the stock is preferably kept agitated. The stock is drawn from the bottom of this tank by way of a pipe connection 5 and delivered by a pump 6 in such connection into a gravity-feed box 7 like that ordinarily employed in paper-making, and which is provided with a partition 8 therein by which the height of the content is controlled. Any excess of content in this box is delivered back to the storage tank 4 by way of a pipe connection 9. From the feed box the stock is directed through a pipe connection 10 into a tank 11 within which operates a cylinder 12 having a periphery of wire gauze. Water is made to pass through the cylinder and a mat of fibre made to adhere to the surface thereof by the action of external pressure from the mass in the tank precisely as in paper-making.

Arranged adjacent the cylinder 12 is a couch roll 13 around which and other associated idler rolls 14 is passed an endless felt 15. The felt passes between squeeze rolls 16 and is driven in the direction indicated by the arrow by power applied to the squeeze rolls, power being applied in any suitable manner. Thus arranged, following the ordinary operations incidental to paper-making, as the felt is rotated the fibrous mat upon the cylinder 12 will be picked off by the felt and carried by it through the squeeze rolls where the water will be extracted from the mat when the mat will become capable of being wound into a roll for further use as requirement is made therefor.

The fibres thus treated become nested together into a coherent mat or sheet of any desired thickness of body and possessing great softness and pliability but with little tensile strength, and little adhesion of fibre to fibre.

Inasmuch as the fibres are substantially free from gums, resins and oily substances, which would tend to make them adhere to each other, and inasmuch as the water simply acts to nest the fibres together, a more or less temporary binding of the fibres is at the most effected, the bond between the fibres being easily broken permitting loosening or fluffing of the fibres or mat when subjected to flexure or other moderate strains.

While the mat in itself possesses valuable potential properties as an article of manufacture, its full utility is developed when there

is provided some means for imparting tensile strength. This preferably takes the form of a backing 16 of textile fabric of appreciable tensile strength, preferably cotton, to which the mat is secured. When the fabric is to be used for the purpose of a shoe lining, the backing 16 consists of the cotton lining material ordinarily employed but preferably not filled and starched. If the fabric is to be used for the purpose of a doubler separate from the lining, then the backing preferably consists of some strong though loosely woven low cost cotton fabric for example cheese cloth.

The mat is preferably applied to but one side of the backing, but may be applied to both sides (see Fig. 4).

17 represents the bond by which the mat and backing are connected into a single piece and which bond preferably acts also as a filler for the backing when the fabric is being used for the lining of a shoe. The bond may consist of any suitable adhesive. An adhesive having a starch base may be used, preferably one which possesses more or less elasticity drying. Adhesives of this type are well known to those skilled in the art. An ordinary starch paste containing glycerine has been used with complete success.

The method employed for securing the mat to the backing is as follows (see Fig. 7): Arranged in operative association with a pasting table 20 is a roll of the mat 1 and also a roll of the backing or cloth 16 employed in the making of the fabric. The backing 16 is directed over the face of the pasting table, being impelled or drawn as will later be explained. As the backing proceeds over the face of the table the adhesive is applied to it by means of a doctor 21. This adhesive, as explained above, is one having preferably a starch base and possessing, also, the property of acting as a filler for the backing. It is applied in the form of a film. Arranged just beyond the pasting table are a pair of press rolls 22. The backing and mat pass between these rolls in face contact with each other, and the adhesive effects a permanent bond but does not penetrate the mat to any substantial depth. These rolls also compact the mat.

From the press rolls 22 the fabric is directed over a series of drying drums 23. Power is applied to these drying drums in any suitable manner and the power thus applied to the drying drums impels or draws both the backing and mat during the prior steps of connecting them. During the progress of the fabric around the drying drums the backing acts as a carrier for the mat.

After the fixing of the backing the mat may be napped, if desired, or its fibre loosened or fluffed up by rolling, beating or brushing, and in this connection the nap-

ping of the mat will not interfere with the tensile strength of the fabric which resides in the unnapped backing. This is in contrast to the ordinary napped fabric where strength is sacrificed to nap inasmuch as the nap is raised upon and from the fibres which give strength to the fabric. In consequence the amount of nap and thickness are limited in the ordinary fabric, while they are substantially unlimited in the present fabric in so far as sacrificing the strength of the fabric is concerned. Such napping is however unnecessary and commonly undesirable, as the mat or felt layer will open up readily by flexure in use.

In its application to a shoe the laminated fabric is so laid that the mat will lie next to the leather. It has been found that as the shoe is worn the mat will fluff or open up, assuming a bat-like form, instead of becoming more compacted nor does it lose its character as a coherent sheet fixed to the backing.

Other means may be employed to give tensile strength to the mat and the means will depend to a certain extent upon the purpose for which the mat is being used. The mat is made especially effective for many purposes including that of a lining for shoes by an application of latex or milk of rubber to one of its sides (see Fig. 5). The latex is preferably applied to the mat by spraying, only a sufficient amount of the latex being applied to bind the ends of the nested fibres. The latex imparts a very considerable tensile strength to the fabric, but nevertheless leaves the unsprayed side of the mat soft and fluffy.

When the backing of cloth is applied to the mat by means of an adhesive as previously described this may be accomplished directly after the water has been pressed out of the wet mat by the squeeze rolls and prior to drying.

The latex is applied preferably to a dry mat. The mat may be dried by running over drying rolls 23 immediately after the water has been extracted from it by the squeeze rolls. The spraying of the latex is preferably accomplished by means of spraying nozzles or guns capable of directing the latex onto the side of the mat in a very thin spray or mist.

In Fig. 8 there is shown a diagrammatic illustration of the manner in which the latex is applied and its drying subsequently effected. 25 represents the spraying gun or nozzle, a battery of these guns or nozzles being preferably employed. Just forward of the nozzles or guns is a hothouse or chamber 26 having steam coils 27 within it for heating it. An endless carrier belt 27, preferably of wire screening of large mesh, guided by rolls 28 and driven in any suitable manner, presents a top carrying surface 29 extending

through the hothouse or chamber with inner and outer ends located outside the chamber. Arranged adjacent the front end of the chamber is a roll of the mat 1 and the mat from this roll is passed upwardly beneath the battery of nozzles or spraying guns 25 and thence onto the top surface 29 of the endless carrier belt. This carries the mat through the hothouse or chamber where the latex is dried and delivers it to the outer end of the chamber where the fabric is rolled up.

Having thus fully described my invention, I claim and desire to secure by Letters Patent of the United States:—

1. As an article of manufacture, a fabric lining material specially adapted for use as a lining for shoes composed of short textile fibres substantially devoid of adhesive content, promiscuously interlaced and compressed into a coherent sheet capable of loosening and thereby developing increased thickness and softness with retained integrity as a coherent sheet upon continued flexure as when used as specified in a shoe.

2. As an article of manufacture, a fabric lining material specially adapted for use as a lining for shoes composed of short textile fibres substantially devoid of adhesive content, promiscuously interlaced and compressed into a coherent sheet capable of loosening and thereby developing increased thickness and softness with retained integrity as a coherent sheet upon continued flexure as when used as specified in a shoe, and a superficial binding layer of flexible adhesive material serving to connect such portions of the fibre content of the sheet as extend to the coated surface.

3. As an article of manufacture, a laminated fabric lining material specially adapted for use as a lining for shoes, comprising in combination, a wear-resisting backing, a paper-like felt composed of short textile fibres substantially devoid of adhesive content, promiscuously interlaced and compressed into a coherent sheet capable of loosening and thereby developing increased thickness and softness with retained integrity as a coherent sheet upon continued flexure as when used as specified in a shoe; and a flexible adhesive connecting one surface of said felt with said backing.

4. As an article of manufacture, a laminated fabric lining material specially adapted for use as a lining for shoes, comprising in combination a wear-resisting backing, a paper-like felt composed of short fibres substantially devoid of adhesive content, promiscuously interlaced and compressed into a coherent sheet capable of developing increased thickness and softness, with retained integrity as a coherent sheet upon continued flexure as when used as specified in a shoe, and a flexible adhesive connecting one surface of said felt with said backing, said ad-

hesive being of a character adapted to maintain its flexibility and devoid of substantial tendency to permeate said paper-like felt.

5 5. A doubler for shoes and the like consisting of a felted mass of short, non-adhesive cotton fibers compressed into a thin, coherent sheet and characterized by the property of developing increased thickness and softness, without loss of its integrity as
10 a coherent sheet upon continued flexure as when used as specified in a shoe.

6. A laminated fabric for use as a combined lining and doubler in shoes and the like comprising in combination a textile fabric lining, and a felted mass of short, non-
13 adhesive cotton fibers compressed into a thin, coherent sheet, but capable of developing increased thickness and softness, without loss of its integrity as a coherent sheet upon continued flexure as when used as specified in a
20 shoe, and means connecting said lining and

said felted mass in face contact with each other permitting of the felted mass developing increased thickness and softness upon continued flexure as aforesaid.

25 7. A laminated fabric for use as a combined lining and doubler in shoes and the like comprising in combination a textile fabric lining, and a felted mass of short, non-adhesive cotton fibers compressed into a thin, coherent sheet, but capable of developing the
30 texture of a cotton bat, with increased thickness and softness while maintaining its integrity as a coherent sheet upon continued flexure as when used as specified in a shoe, and a flexible adhesive connecting said lining
35 and said felted mass, said adhesive being of a type adapted to maintain superficial engagement of the fibers of the felted mass, substantially without tendency to permeate
40 the body of the mass.

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