

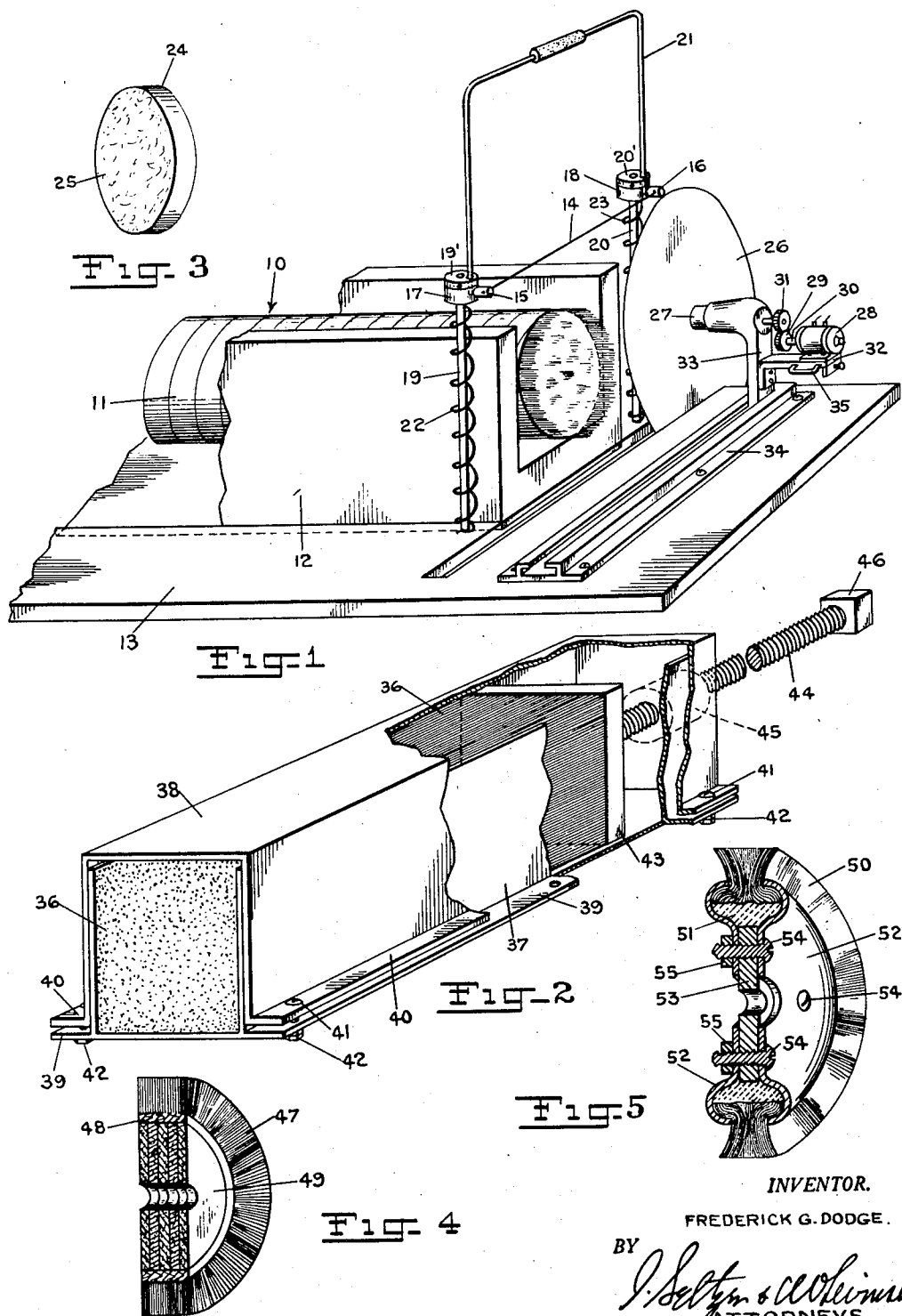
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PILE MATERIALS AND PRODUCTION THEREOF

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## PILE MATERIALS AND PRODUCTION THEREOF

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This invention relates to the preparation of pile materials and relates more particularly to the preparation of pile materials from yarns, threads, filaments or the like having a basis of a thermoplastic textile material.

An object of my invention is the provision of a novel process for preparing pile materials from yarns, threads, filaments or the like having a basis of a thermoplastic material.

Another object of my invention is the provision of novel apparatus for the production of pile materials from yarns, threads, filaments or the like having a basis of a thermoplastic material.

A further object of my invention is to provide a novel pile material from yarns, threads, filaments or the like having a basis of a thermoplastic material.

Other objects of my invention will appear from the following detailed description and the accompanying drawing.

In the drawing,

Fig. 1 is a perspective view, partly broken away, showing one form of apparatus for the production of the novel pile materials of my invention;

Fig. 2 is a view in perspective, partly broken away to show certain details of construction, of suitable apparatus for holding the yarns, threads or filaments from which my novel pile materials may be made;

Fig. 3 shows a section of a pile material made in accordance with my invention; and

Figs. 4 and 5 are perspective sectional views of novel polishing, buffing and/or abrasive wheels having as a basis the novel pile materials of my invention.

Like reference numerals indicate like parts throughout the several views of the drawing.

Pile textile materials such as, for example, carpets, velvets and the like, are usually woven on looms designed particularly for the purpose of weaving such pile materials. Usually, the looms employed are not only designed to weave the pile materials in substantial widths, but said looms are costly and of complicated construction, requiring expert operation.

I have now discovered, however, that pile materials may be prepared in any desired width in a simple, rapid and economical manner. In accordance with my invention, yarns, threads, filaments, fibers, or the like, having a basis of a thermoplastic material are caused to be aligned in a bundle in substantially parallel relationship, and, while maintaining said materials in parallel relationship the latter are caused to be fused together

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at a point along the length thereof in any suitable manner, such as by the action of solvents or by employing elevated temperatures. The fusing of said thermoplastic yarns, threads, fibers or filaments, all of which are referred to in the appended claims as textile materials in filamentary form, causes said materials to become associated together to form a unitary structure and the cutting operation effects the formation of valuable and novel pile materials. These pile materials may be mounted on cloth, leather, felt, wood or any other surface and resulting product may be employed as carpeting, for upholstery materials or fabricated into cloths, discs or wheels for cleaning or polishing operations.

Referring now to the drawing and more particularly to Fig. 1, there is shown a bundle of thermoplastic filaments, aligned in parallel relationship, generally indicated by reference numeral 10 suitably enclosed in paper or cloth wrappings 11 and set in a miter box 12. The miter box is mounted on a base 13 and means are provided thereon to sever sections from said bundle by fusing and cutting operations. The novel pile materials of my invention may be formed in this manner. The means whereby said thermoplastic filaments may be fused comprises a wire 14, having a high electrical resistance, tightly strung between connecting posts 15 and 16 which are set in porcelain or glass insulators 17 and 18. Suitable leads (not shown) are provided to said connecting posts whereby a current may be passed through wire 14 to heat the same to an elevated temperature. Insulators 17 and 18 are slidably mounted on posts 19 and 20 carrying stops 19' and 20' at the head thereof and are provided with a handle 21 suitably attached thereto, passing through said stops, whereby the downward movement of the wire 14 across the filament bundle 10 may be effected. Springs 22 and 23 mounted on posts 19 and 20 are provided to return the fusing wire 14 to its original position after a filament fusing operation. In operating said fusing means the bundle 10 is shifted in the miter box 12 so that it projects therefrom any desired distance and hot wire 14 is displaced downwardly by suitable pressure on handle 21. The action of the hot wire causes the thermoplastic materials to melt as the wire moves through the filaments and when the wire has passed completely through bundle 10 it severs, as a section therefrom, all of the bundle which projects beyond the edge of miter box 12. Such a section, indicated by reference numeral 24, is shown in Fig. 3. The wrappings 11 may be stripped therefrom following the

fusing and cutting operations. The rear face 25 of the severed section 24 is fused over, as shown, by the action of the hot wire 14 and serves to hold together the filaments comprising the section. The face of the main bundle 10 from which section 24 has been severed is likewise fused over by the action of hot wire 14. A second pile-faced section may be obtained by shifting said bundle 10 so that the face thereof, which has been fused, projects from the miter box 12 the desired distance and severing the projecting section by suitable cutting means. The face of bundle 10 may also be fused over by the application of a liquid which has a solvent action on the thermoplastic filaments and a pile-faced section formed by shifting bundle 10 so that a portion projects and severing the projecting portion with the cutting means.

The cutting means provided comprises a rotating circular knife 26 mounted on a shaft 27, which is rotated by means of a motor 28 through a gear 29 mounted on the drive shaft 30 of said motor and meshing with a gear 31 mounted on shaft 27. Motor 28 is set on a bracket 32 fixed to the side of a bearing post 33 on which the circular knife 26 is mounted. The post 33 is set in a slotted guide 34 mounted on base 13 and the knife may be drawn along said guide across the projecting face of the bundle 10 for the cutting operation by means of a handle 35 attached to bracket 32. The severance of the projecting section by means of knife 26 now leaves an unfused face on bundle 10, and another section of pile material may be severed by moving bundle 10 forward and again depressing hot wire 14. The hot wire and circular cutting knife may be operated alternately, as described, or, if desired, the filament bundle 10 may be moved forward a distance equal to twice the desired thickness of a single section and the motion of the knife and hot wire coordinated for simultaneous operation. In this manner two pile sections may be cut from bundle 10 at once, each section having a fused back and a pile face, the pile faces, of course, being formed at the point where knife 26 severs the bundle. A heated knife (not shown) may be employed in place of the hot wire 14 for a simultaneous cutting and fusing operation.

In lieu of wrapping the filament bundle 10, and advancing it manually as heretofore described in connection with the modification shown in Fig. 1, other means may be provided for holding the filaments in parallel relationship and advancing them to the cutting and fusing means. Referring to Fig. 2 wherein one such alternative means is shown, the filaments, indicated by reference numeral 36, are set in the base of a sectional box comprising telescoping sections 37 and 38. Box section 37 is provided with flanges 39 and cover section 38 is provided with flanges 40, which flanges are held together by threaded bolts 41 to put pressure on the filaments contained in the box. The degree of compression exerted on the filaments may be adjusted as desired by means of nuts 42 on said bolts. The parallel filaments are forced out of the box any desired distance by means of a piston head 43 having a threaded shaft 44 bearing on back of said piston head, which shaft is threaded through a collar 45 integral with the rear of section 37. Shaft 44 is provided with a head 46 by means of which it may be turned as by a suitable wheel mounted thereon (not shown), or by a wrench or the like, to cause the piston head 43 to advance the parallel filaments into the path of the cutting and fusing

means. It will be understood, of course, that various other modifications may be employed for maintaining the thermoplastic filaments in parallel relationship and causing them to advance into the path of the cutting and fusing means, as desired.

Especially advantageous results are obtained when the novel pile materials of my invention are employed in the form of cutting, abrading or polishing wheels as shown in Figs. 4 and 5. The polishing wheel of Fig. 4 comprises a pile material 47 adhesively fixed to a backing material 48 and the latter is mounted on a wheel 49 which may be of any suitable material such as wood, metal, plastic, and the like. The wheel may be mounted on a rotatable shaft (not shown) which may be rotated in any convenient manner. Alternatively, the polishing wheel may be of a somewhat different construction, as shown in Fig. 5. The polishing wheel shown in Fig. 5 comprises a pile material 50, prepared in accordance with my invention, adhesively united to a backing material 51. The pile material and backing are held rigidly between a pair of shaped annular members 52. Said annular members are supported by a central wheel 53 and are held thereon as by bolts 54 and nuts 55. By this construction the pile material 50 may be easily replaced when worn or may be substituted by a pile material of different properties or characteristics, as occasion demands.

Any suitable thermoplastic materials may be employed in accordance with my invention. The thermoplastic yarns, threads, filaments or fibers may have a basis of a derivative of cellulose, for example, cellulose esters such as cellulose acetate, cellulose propionate, cellulose butyrate, cellulose aceto-propionate, and cellulose aceto-butyrate, or cellulose ethers such as ethyl cellulose or benzyl cellulose. Other thermoplastic textile materials which may be employed in accordance with my invention are, for example, synthetic linear polyamide condensation products, such as polyhexamethylene adipamide and the like, polyvinyl esters, polyvinyl alcohols, copolymers of vinyl halides and vinyl esters, polymerized vinylidene chloride, polymerized acrylic acid or derivatives thereof, such as polymerized methyl methacrylate.

Non-thermoplastic textile materials such as cotton, silk, wool, linen or regenerated cellulose may be associated with the thermoplastic textile materials and incorporated in the pile materials formed. The non-thermoplastic materials are held firmly in the body of the pile material by the fusion of the thermoplastic components thereof.

The yarns, threads, fibers, filaments or the like may be prepared in any convenient manner. The thermoplastic material may be dissolved in a suitable volatile solvent and the resulting solution extruded through orifices into an evaporative medium as in the dry method of spinning or into a suitable coagulating bath as in the wet method of spinning. The thermoplastic material may be rendered fluid by being heated to an elevated temperature and while in a fluid or semi-fluid state may be extruded under pressure through suitable orifices to form filaments. These filaments may then be associated together to form yarns or threads adapted to be employed in accordance with my invention.

The pile materials may be prepared in any desired color or pattern by selecting suitably colored filaments, and arranging them in the desired pat-

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tern in the filament bundle. The filaments may be dyed, or they may be colored by incorporating a pigment in the solution or plastic material from which the filaments are formed and subjecting the colored solution or plastic material to a spinning or extruding operation. If desired, in place of pigments, finely divided abrasive materials such as carborundum, emery, and the like, may be incorporated in the solution or dope from which the filaments are spun and in this way pile materials of highly desirable abrasive, polishing and/or cutting characteristics may be produced.

While I preferably employ filaments having a basis of a thermoplastic material such as, for example, an organic ether or ester of cellulose, in the preparation of my novel pile materials, excellent polishing materials may be prepared if said organic ester of cellulose materials are subjected to a saponification treatment after having been fused and cut. By such treatment pile materials having a basis of regenerated cellulose are obtained. Such regenerated cellulose materials are advantageously employed where a thermoplastic material would be undesirably effected by heat, or where organic solvents having a solvent effect on said thermoplastic materials may be present.

It is to be understood that the foregoing detailed description is given merely by way of illustration and that many variations may be made therein without departing from the spirit of my invention.

Having described my invention, what I desire to secure by Letters Patent is:

1. Process for the production of pile materials, which comprises associating a thermoplastic material in filamentary form in substantially parallel relationship to form a bundle, causing said filamentary thermoplastic materials to become fused to each other at points along the length of said bundle so as to cause said filamentary thermoplastic material to form at the area of fusion a substantially unitary structure consisting of said thermoplastic material, and then cutting said bundle at a point intermediate said fused portions without fusing said thermoplastic materials.

2. Process for the production of pile materials, which comprises associating a thermoplastic material in filamentary form in substantially parallel relationship to form a bundle, causing said filamentary thermoplastic materials to become fused to each other at points along the length of said bundle by subjecting said filamentary materials to the action of an elevated temperature so as to cause said filamentary thermoplastic material to form at the area of fusion a substantially unitary structure consisting of said thermoplastic material, and then cutting said bundle at a point intermediate said fused portions without fusing said thermoplastic materials.

3. Process for the production of pile materials, which comprises associating a thermoplastic material in filamentary form in substantially parallel relationship to form a bundle, causing said filamentary thermoplastic materials to become fused to each other at points along the length of said bundle by subjecting said filamentary materials to the action of an organic liquid having a solvent action thereon so as to cause said filamentary thermoplastic material to form at the area of fusion a substantially unitary structure consisting of said thermoplastic material, and then cutting said bundle at a point inter-

mediate said fused portions without fusing said thermoplastic materials.

4. Process for the production of pile materials, which comprises associating an organic derivative of cellulose material in filamentary form in substantially parallel relationship to form a bundle, causing said filamentary organic derivative of cellulose materials to become fused to each other at points along the length of said bundle so as to cause said filamentary thermoplastic material to form at the area of fusion a substantially unitary structure consisting of said thermoplastic material, and then cutting said bundle at a point intermediate said fused portions without fusing said thermoplastic materials.

5. Process for the production of pile materials, which comprises associating an organic derivative of cellulose material in filamentary form in substantially parallel relationship to form a bundle, causing said filamentary organic derivative of cellulose materials to become fused to each other at points along the length of said bundle by subjecting said filamentary materials to the action of an elevated temperature so as to cause said filamentary thermoplastic material to form at the area of fusion a substantially unitary structure consisting of said thermoplastic material, and then cutting said bundle at a point intermediate said fused portions without fusing said thermoplastic materials.

6. Process for the production of pile materials, which comprises associating an organic derivative of cellulose material in filamentary form in substantially parallel relationship to form a bundle, causing said filamentary organic derivative of cellulose materials to become fused to each other at points along the length of said bundle by subjecting said filamentary materials to the action of an organic liquid having a solvent action thereon so as to cause said filamentary thermoplastic material to form at the area of fusion a substantially unitary structure consisting of said thermoplastic material, and then cutting said bundle at a point intermediate said fused portions without fusing said thermoplastic materials.

7. In apparatus for the production of pile materials having a basis of thermoplastic filaments, the combination with means for holding a plurality of thermoplastic filaments in substantially parallel relationship, of means maintained at an elevated temperature adapted to be brought in contact with said filaments, whereby the latter are simultaneously fused and severed at the point of contact with said heated means, and cutting means spaced from the fusing means for severing said filaments at a point intermediate said fused portions without fusing said filaments.

8. In apparatus for the production of pile materials having a basis of thermoplastic filaments, the combination with means for holding a plurality of thermoplastic filaments in substantially parallel relationship, of a wire maintained at an elevated temperature and adapted to be brought in contact with said filaments, whereby the latter are simultaneously fused and severed at the point of contact with said wire, and cutting means spaced from the fusing means for severing said filaments at a point intermediate said fused portions without fusing said filaments.

9. In apparatus for the production of pile materials having a basis of thermoplastic filaments, the combination with means for holding a plurality of thermoplastic filaments in substantially parallel relationship, of means maintained at an

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elevated temperature adapted to be brought in contact with said filaments, whereby the latter are simultaneously fused and severed at the point of contact with said heated means, means cooperating with said holding means whereby the substantially parallel filaments may be moved relative to the fusing and cutting means, and cutting means spaced from the fusing means for severing said filaments at a point intermediate said fused portions without fusing said filaments.

10. In apparatus for the production of pile materials having a basis of thermoplastic filaments, the combination with means for holding a plurality of thermoplastic filaments in substantially parallel relationship, of a wire maintained at an elevated temperature and adapted to be reciprocated along a straight line path, and means cooperating with said holding means for moving the filaments relative to said heated wire, whereby the filaments are moved into the path of the heated wire and are simultaneously fused and severed at the point of contact therewith, and cutting means spaced from the fusing means for severing said filaments at a point intermediate said fused portions without fusing said filaments.

11. A pile material comprising a plurality of thermoplastic filaments aligned in substantially parallel relationship and autogenously fused together at one end only thereof so as to cause said filamentary thermoplastic material to form at the area of fusion a substantially unitary structure consisting of said thermoplastic material whereby a textile material of a pile construction is obtained.

12. A pile material comprising a plurality of thermoplastic filaments having a basis of an organic derivative of cellulose aligned in substantially parallel relationship and autogenously fused together at one end only thereof so as to

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cause said filamentary thermoplastic material to form at the area of fusion a substantially unitary structure consisting of said thermoplastic material whereby a textile material of a pile construction is obtained.

13. A pile material comprising a plurality of thermoplastic filaments having a basis of cellulose acetate aligned in substantially parallel relationship and autogenously fused together at one end only thereof so as to cause said filamentary thermoplastic material to form at the area of fusion a substantially unitary structure consisting of said thermoplastic material whereby a textile material of a pile construction is obtained.

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