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METHOD OF MAKING TEXTILE WEBS

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This invention relates to textile webs comprising a multiplicity of randomly intermingled fibers at least the major proportion of which are synthetic or artificially formed fibers having a length of from seven-sixteenths of an inch to one inch, and to a method of making such webs.

In the past, textile webs have been made by processes involving carding and/or combing operations. However, in order to produce a carded textile web consisting entirely of synthetic or artificially formed fibers, such as regenerated cellulose fibers, for example, it is desirable to use fibers having a length of at least one inch since shorter fibers are more difficult to card. Synthetic or artificially formed fibers shorter than one inch cannot be carded and/or combed successfully unless a special cloth is used on the card or a substantial proportion of longer carrier fibers are used. This has imposed limitations on the fibers which can be used in producing textile webs by procedures involving combing and carding. Moreover, in the webs coming from the carding machine, the fibers are parallelized in the direction of the longitudinal dimension of the web, and the structure of the web is inherently weak and the web is relatively easily torn apart or shredded when subjected to tension in any direction as it comes from the card, which makes it difficult to handle such webs.

Heretofore, useful textile webs consisting entirely of synthetic or artificially formed fibers having a length of $\frac{7}{16}$ " or above could not be formed by depositing such fibers from a water dispersion on the screen of a conventional paper-making machine. The synthetic or artificially formed fibers of such a length agglomerate in flocs or clumps in water and cannot be dispersed uniformly in water or aqueous media under ordinary conditions. If they are mixed or beaten with water and deposited on a paper-making screen, the web comprises thick and thin portions as a result of the presence of the clumps therein. Furthermore, a coherent web is not obtained, since the artificial or synthetic fibers do not fibrillate and do not interlock together. A product obtained by depositing water containing fibers all of which are regenerated cellulose fibers on a screen such as is used in paper-making has to be picked off the screen in fragments, regardless of the length of the regenerated cellulose fibers.

In order to produce a coherent textile web comprising synthetic or artificially formed fibers by separation of the fibers from aqueous media, an extraneous dispersing agent must be present in the dispersion. However, previously available dispersing agents which might be considered for use in making a textile web comprising synthetic or artificially formed fibers, using conventional paper-making equipment, have had one or both of two major disadvantages in that the agent is water-soluble and thus is not suitable for use when a web of high or even good wet strength is required, or it has been of a character such that it materially reduces the porosity of the textile web by partially closing the interstices between the fibers or destroys the porosity by forming a con-

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tinuous film or coating between and over the fibers and/or over the surfaces of the web.

There have been, then, two obstacles to the production of porous water-laid textile webs characterized by high wet strength and consisting of, or comprising a major proportion of, synthetic or artificially formed fibers: impossibility or extreme difficulty of dispersing the synthetic or artificially formed fibers in water in the absence of a dispersing agent for the fibers, and the lack of a water-insoluble dispersing agent for the fibers which does not reduce the porosity of the textile web.

Both problems are solved by the present invention which has as one object to provide coherent, strong, textile webs consisting of, or predominantly of, synthetic, or artificially formed fibers and characterized by high strength in the wet state. Another object of the invention is to provide a method for producing such textile webs, using conventional paper-making equipment. A further object is to provide a new bonding agent for synthetic or artificially formed fibers which occurs at the intersections of the fibers in the web in particulate, discontinuous condition, and which is also a dispersing agent for the fibers in aqueous media. A specific object is to provide coherent, strong, highly porous and absorbent water-laid textile webs all of the fibers of which are regenerated cellulose fibers.

In accordance with the invention textile webs having novel characteristics are made on paper-making equipment by mixing synthetic or artificially formed fibers having a length of from seven-sixteenths of an inch to one inch with an aqueous medium containing dispersed gel particles of a water-insoluble, alkali-soluble cellulose ether which is a dispersing agent for the fibers, separating the fibers carrying the ether from the dispersion to obtain a textile web of randomly intermingled fibers, drying and pressing the web, and at some time prior to the final drying and pressing, precipitating the cellulose ether particles on the surfaces of the fibers.

In the preferred embodiment, the fibers are mixed with the aqueous alkaline dispersion of the water-insoluble, alkali-soluble cellulose ether in the beater of a paper-making machine, and the dispersion, preferably after dilution with water, is continuously fed to the screen of a conventional paper-making machine. By the practice of this invention it is possible, for the first time in the history of the art, to produce, continuously, extremely wide, coherent, strong, highly porous textile webs of indefinite length and characterized by high wet strength and resistance to tearing or shredding force applied in either the transverse or longitudinal direction, on conventional paper-making machines.

In preparing the alkaline dispersion of the water-insoluble, alkali-soluble cellulose ether, it is preferred to dissolve the ether in aqueous alkali of from 1 to 8% concentration, or in solutions of higher concentration which are subsequently diluted, and to add the solution thus obtained to water in the beater. Since the ether is insoluble in water and in aqueous alkaline solutions of less than 1% concentration, the addition of the solution to the water in the beater results in dispersion of the ether through the dilute aqueous alkaline medium in the form of extremely fine colloidal gel particles. I have found that the dispersed cellulose ether is a dispersing agent for synthetic or artificially formed fibers, which can be uniformly distributed through the ether dispersion without subjecting the mass to beating, using the beater roll merely as a mixing device. This is of outstanding importance in view of the impossibility of uniformly dispersing the synthetic or artificially formed fibers in water, in the absence of an extraneous dispersing agent, and the previous lack of a satisfactory water-insoluble dispersing agent for these fibers. The particulate water-insoluble,

alkali-soluble cellulose ethers are both dispersing agents for the fibers in aqueous media, and water-insoluble binding agents for the fibers in the finished textile web. The fibers, such as regenerated cellulose fibers for example, are distributed uniformly through the aqueous alkaline medium containing the dispersed water-insoluble, alkali-soluble cellulose ether by mixing, without the formation of clumps or flocs such as are formed if it is attempted to disperse the synthetic or artificially formed fibers in the absence of the dispersed ether or other dispersing agent. The water-laid textile webs comprising fibers all of which are synthetic or artificially formed fibers are produced without beating. If it is desired to include a small proportion of other fibers, these may be beaten prior to introduction of the synthetic or artificially formed fibers, or they may be beaten in a separate beater and introduced into the aqueous alkaline ether dispersion simultaneously with the synthetic or artificially formed fibers.

It is possible to precipitate the cellulose ether particles on the surfaces of the fibers by various methods, at various stages in the manufacture of the webs. In the presently preferred modification, however, the cellulose ether particles are precipitated on the fibers in the beater, preferably, but not necessarily, prior to diluting the fibers dispersion to the final desired fiber concentration. This precipitation is accomplished by adding any suitable acid, or acid salt, which does not decompose the ether and functions to adjust the pH of the dispersion to the acid side, to the beater, after the synthetic or artificially formed fibers have been dispersed. The precipitation results in the agglomeration of the water-insoluble, alkali-soluble cellulose ether gel particles into particles of larger than colloidal size. The particles adhere to the surfaces of the fibers in the particle form and when the dispersion is deposited on a paper-making screen, for example, the fibers are laid down in randomly intermingled condition and bonded together in that condition, at their points of intersection, by the particles of the cellulose ether. The water-insoluble, alkali-soluble cellulose ethers are not thermo-plastic and do not flow when the textile web is subjected to beat and pressure, during finishing. Therefore, the ether particles precipitated on the fibers in the beater, remain as particles in the finished textile web. The particles, occurring at the intersection of the randomly intermingled fibers, do not close or seriously obstruct the interstices between the fibers, with the result that the textile web as produced has substantially the same porosity as if the particulate cellulose ether were not present and the textile web consisted entirely of the synthetic or artificially formed fibers.

The aqueous dispersion containing the synthetic or artificially formed fibers carrying the precipitated, particulate water-insoluble, alkali-soluble cellulose ether may be formed into a textile web by the use of conventional paper-making machines of various types, such as the "Fourdrinier," or "Harper," single cylinder or "Yankee" multi-vat machine, mould, "presse pate," or the like. Thick textile webs may be obtained by passing a relatively thin textile web of fibers carrying the precipitated cellulose ether (which web has been formed on a cylinder and couched to the felt of a cylinder paper-making machine, or run from the apron onto the wire and couched to the felt of a Fourdrinier paper-making machine) between press rolls with another relatively thin textile web of fibers carrying the precipitated ether, before the webs are completely dried, repeating the procedure until a sufficient number of webs have been built up, and then subjecting the assembled plies or webs to heat and pressure.

Instead of precipitating the dispersed cellulose ether particles on the fibers in the beater, it may be carried in the form of the colloidal gel particles on the fibers through the forming steps, and subsequently fixed on the

fibers in the textile web. For example, the ether particles may be fixed on the fibers of the web by heat, in which case fixing of the ether and final drying and pressing of the web, may be simultaneous. If the fixing is by heat only, temperatures of from 85 to 150° C. may be employed. Alternatively, the textile web comprising the fibers carrying the colloidal gel particles of the ether may be partially dried and then passed through or immersed in an aqueous acid or acid salt solution which precipitates the ether on the fibers, or the web may be subjected to a suitable acid gas or vapor such as moist sulfur dioxide to precipitate the ether. Subsequently, the web is washed free of acid, dried, and subjected to pressure. In another embodiment, the cellulose ether is dissolved in aqueous alkali, formaldehyde is added, and an acid, for instance sulfuric acid is added, the resulting acidic formaldehyde-containing cellulose ether-containing medium, being then introduced into water in the beater. This has the advantage that the cellulose ether containing medium added to the beater has an acid pH, which may be desirable, in some cases. No further acid treatment is required to precipitate the ether, when the acid (or acid salt) is mixed with the ether and formaldehyde prior to adding the mixture to the beater.

The term "water-insoluble, alkali-soluble cellulose ether" is intended to include ethers which are insoluble in water, but soluble in aqueous alkaline solutions of from 1 to 8%, preferably 4 to 8% alkali, at room temperature or at reduced temperature, for example, in solutions of a strong alkali such as sodium, potassium, or lithium hydroxide. Included are simple alkyl ethers, carboxyalkyl ethers, hydroxyalkyl ethers, mixed alkyl hydroxyalkyl ethers, mixed alkyl carboxyalkyl ethers, and the alkali metal salts of the carboxyalkyl ethers.

The proportion of water-insoluble, alkali-soluble cellulose ether added to the water in the beater may vary somewhat, but usually is such that the aqueous medium in the beater contains from 0.02% to 0.5% of the ether, on the weight of the water, the concentration of alkali in the beater being such that, prior to any addition of acid for precipitating the ether, the dispersion of the ether has a pH of from 10 to 14.

Any suitable acid or acid salt may be added to the beater, preferably as an aqueous solution, for precipitating the cellulose ether particles on the fibers. Sufficient acid or acid-forming salt is added to the beater, after the fibers are dispersed, to give a pH of 6 to 7. Examples of suitable acids are sulfuric, boric, acetic, and hydrochloric acids. Examples of suitable salts are sodium dihydrogen phosphate, sodium bisulfate, ammonium sulfate, and aluminium sulfate. As illustrative, aqueous solutions of from 0.2 to 0.4% sulfuric acid may be used. If the acid solution is added to the mass prior to final dilution, no special treatment is required to neutralize the acid, the concentration of acid being insufficient to damage any regenerated cellulose fibers present. However, if the acid is added after the dispersion has been diluted to the final, desired fiber concentration, a larger amount of acid is required to bring the mass to the desired pH and it may be desirable to add a neutralizing agent, for example an aqueous solution of sodium carbonate to neutralize the acid and adjust the pH of the dispersion to 6 to 7.

The synthetic or artificial fibers from which the textile web is formed have a length of from seven-sixteenths inch to one inch. Water-laid textile webs made in accordance with this invention and formed from synthetic or artificial fibers having a length of from seven-sixteenths inch to one-half inch, i. e., fibers of a length which cannot be carded without difficulty unless a special card cloth is used or unless a substantial amount of much longer carrier fibers are used, exhibit resistance to tearing or shredding in the transverse direction, in both the dry and wet states, which is greatly superior to the resistance of carded webs or so-called non-woven fabrics made by

processes involving a carding operation, comprising longer, cardable fibers, as a result of the randomly intermingled condition of the fibers in the water-laid web, which imparts strength to the web in the transverse direction. These water-laid webs have tensile strengths and resistance to tearing and shredding force applied in any direction which compare favorably to those properties of belt-like products obtained by depositing fibers from an inert fluid conveying medium, in which random distribution of the fibers is at a maximum, and in which the fibers are autogeneously bonded together or bonded by means of an extraneous binder.

The synthetic or artificial fibers may be formed from any suitable fiber-forming material such as regenerated cellulose; cellulose acetate; casein; high molecular weight synthetic linear polyamides or polyesters; copolymers of vinyl chloride and vinylidene chloride; polyethylene; polyacrylonitrile; copolymers of acrylonitrile or its homologues with one or more other polymerizable substances containing the linkage $>C=C<$, including copolymers of acrylonitrile with one or more of the following: vinyl acetate, vinyl chloride, styrene, isobutylene, vinyl- α -chloracetate, etc., especially those acrylonitrile polymers containing at least 70% acrylonitrile in the polymer molecule. The synthetic or artificial fibers may be thermoplastic and convertible to an adhesive condition by heat, so long as the temperature at which their latent adhesive properties are developed is above the temperature at which the textile web is treated to fix the particulate water-insoluble, alkali-soluble cellulose ether, if fixing is by heat, and above the temperature at which the web is dried and pressed.

By selection of the synthetic or artificial fibers having a length of from seven-sixteenths inch to one inch, and the proportion of water-insoluble, alkali-soluble cellulose ether added to the beater, the characteristics of the final textile web may be varied. Textile webs or "non-woven fabrics" which are tough, flexible, and soft to the touch may be produced, or the web may be relatively stiff and resilient. The texture of the web is also influenced by the method of precipitating the particulate ether on the fibers, since those textile webs consisting of fibers bonded by ether particles precipitated in the beater, by acid, have a crisper hand or feel than do the webs in which the fibers are bonded by ether particles precipitated on the fibers of the web by heat, for example, during drying and pressing of the web. A preferred modification contemplates a thin, tough, water-laid textile web or "non-woven fabric" formed exclusively of regenerated cellulose fibers having a length of from seven-sixteenths of an inch to one inch bonded at their points of intersection in the randomly intermingled condition resulting from formation of the web on paper-making equipment by the particulate water-insoluble, alkali-soluble cellulose ether, and characterized by high wet strength, porosity, high absorptivity for liquids, excellent retention of absorbed liquids, softness, drape, and soft, pleasing hand or feel.

The textile webs of the invention are useful for many purposes. They may be used for general textile purposes. Also, they may be used as absorbent pads for use in permanent waving, as linings for pocketbooks and the like, as disposable diaper fillers, in surgical tampons, as absorbent cleansing pads, in fabric laminates, etc. The textile webs possess excellent filtering characteristics, those formed from the synthetic resins being especially adapted to this use because of their resistance to common solvents and bacterial or mold attack. The webs have a smooth surface, and may be coated to provide coated fabrics having an absorbent reverse side. The webs can be combined with a woven gauze or other fabric of conventional type to provide an excellent base for dyeing, printing, surface coating and other special treatments. A thin water-laid web, for example one consisting of randomly intermingled regenerated cellulose fibers bonded at their points of intersection by the particulate

cellulose ether may be coated with a clear resin, for example, a melamine-formaldehyde resin, to provide a transparent web or sheet which can be used as an overlay for the printed surface sheet of laminated articles, such as tabletops, bartops, etc. which are subject to wear and marking in service because, due to its high transparency, the sheet does not obscure the printed surface sheet when it is treated with the resin and fixed to the laminate. Textile webs made in accordance with the invention may be coated with a resin and used as light weight display fabrics, shelf and table coverings, place mats, linings for luggage or instrument cases, etc. The webs may also be used as wrappers and packaging materials for various articles. For example, a water-laid textile web in accordance with the invention may be coated with polyvinyl butyral to provide a wrapper for meats. The webs may also be used for packaging particulate solid materials such as dyes, powdered food extracts, repellents such as moth crystals, powdered perfumes, etc., since although they are porous and liquid and gas permeable, solid particles do not pass through them. The webs as such may be used as protective wrappers for wound packages of filamentary material to protect the package during liquid after-treatments or during shipment, or they may be used as a base for shrinkable wrappers for packages of regenerated cellulose which wrappers are coated with a cellulosic material such as viscose or which are provided with localized deposits of viscose, or of a water-insoluble, alkali-soluble cellulose ether, or of cellulose acetate, and shrink with the package during drying thereof after the usual after-treating liquids have been applied to the package. The water-laid textile webs can be used for many of the purposes for which conventional fabrics are used, and for purposes for which a carded web or "non-woven fabric" is suitable, and have the advantage over such carded webs that they can be readily made from synthetic or artificial fibers of less than normal cardable length, and exhibit good tensile strength and resistance to tearing and shredding in both the transverse and longitudinal directions, and in both the dry and wet states.

The following examples are illustrative of the production of water-laid textile webs, in accordance with the invention. In the examples, "standard viscosity" is the viscosity of a solution of the ether containing 85% water, 6% cellulose ether, and 9% sodium hydroxide by weight, measured at 25° C., and expressed as a multiple of the viscosity of glycerol, also measured at 25° C.

Example I

A water-insoluble, alkali-soluble hydroxyethyl cellulose having a standard viscosity of 6, and an average degree of substitution of 0.20 ethylene oxide group per glucose unit is dissolved in 8% sodium hydroxide to obtain a 6% solution of the ether, and the solution is mixed with water in the beater of a paper-making machine to obtain a dilute aqueous alkaline dispersion containing 0.2% (based on the weight of the water) of the ether in the form of very fine colloidal gel particles. 1.5% (based on the weight of the water) of regenerated cellulose fibers cut to a length of $\frac{7}{16}$ inch are added. After thorough mixing (but without subjecting the mass to a beating action) sufficient concentrated sulfuric acid of 1.84 specific gravity is added to give a final dispersion having a pH of 6-7. The acid agglomerates the dispersed colloidal ether particles into larger than colloidal gel particles which adhere to the surfaces of the fibers in the particle form. The dispersion is then diluted with water to 0.2%-0.002% fiber content and sheeted on a Fourdrinier paper machine. The textile web thus formed is passed over drying cans at 145° C. and then to the calender rolls, between which it is subjected to a pressure of 1000 lbs./sq. in. The final pressed or calendered web is a soft, light weight, readily wettable, porous textile web consisting of randomly intermingled regenerated cellulose fibers bonded at their points of intersection by particles of the acid-precipitated water-insoluble,

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alkali-soluble cellulose ether. The random distribution of the fibers in the web is readily discernible by the naked eye. This textile web exhibits high dry and wet strengths, and excellent resistance to tearing or shredding.

Example II

A web produced as in Example I is coated with a clear melamine-formaldehyde resin precondensate and dried. The resulting coated web is clear and transparent.

Example III

Example I is repeated except that the regenerated cellulose fibers have a length of one-half inch. A textile web characterized by excellent dry and wet strength and resistance to tearing and shredding force is obtained.

Example IV

A water-insoluble, alkali-soluble hydroxyethyl cellulose having a standard viscosity of 2, and an average degree of substitution of 0.36-0.40 ethylene oxide group per glucose unit, is dissolved in 8% sodium hydroxide to produce a 6% solution of the ether. The solution is mixed with water in the beater of a paper-making machine. There is thus obtained a dilute aqueous alkaline medium containing 0.2% (on the weight of the water) of the ether in the form of extremely fine colloidal gel particles. Regenerated cellulose fibers having a length of one-half inch are added, in an amount of 1.5% (on the weight of the water) and uniformly distributed through the dispersion, using the beater roll as a mixer. The dispersion is diluted with water to 0.02% fiber content, and sheeted on a Fourdrinier machine. The textile web thus obtained is passed between rolls heated to a temperature of 85 to 150° C., to precipitate the particulate hydroxyethyl cellulose and dry the web. The web is then finished by passing it between calender rolls at a pressure of 1000 lb./sq. in.

Example V

A textile web is prepared as in Example IV. The web is partially dried in air, passed through aqueous sulfuric acid to precipitate the particulate hydroxyethyl cellulose, passed through a water-bath to remove acid, and then passed over drying cans at 145° C. The web is then calendered at a pressure of 1000 lb./sq. in.

Example VI

A water-insoluble, alkali-soluble hydroxyethyl cellulose ether having a standard viscosity of 6, and an average degree of substitution of 0.36-0.40 ethylene oxide group per anhydroglucose unit is dissolved in 8% aqueous sodium hydroxide. Ten parts of the solution are diluted by stirring with 14 parts of ice and 24 parts of cold water. Six parts of formaldehyde (as 37% commercial formalin) are added, at a temperature below 46° F. To this, are added 6 parts of 20% sulfuric acid, the pH being adjusted to 2.0. The resulting mixture is added to cold water in the beater of a paper-making machine, a dispersion having a pH of 2.0 being finally obtained. After the mixture has been stirred, 1.5% of regenerated cellulose fibers having a length of seven-sixteenths of an inch are added, and distributed through the medium by mixing, using the beater roll as a mixer. The dispersion is diluted to 0.2% fiber content, and sheeted on a Fourdrinier machine to produce a textile web in which the randomly distributed regenerated cellulose fibers are bonded at their points of intersection by the precipitated cellulose ether particles.

Since variations and modifications may be made in practicing the invention as described in specific detail herein, without departing from its spirit and scope, it is to be understood that the invention is not to be limited except as defined by the appended claims.

I claim:

1. A method of making coherent, strong, textile webs from fibers all of which are extruded synthetic, artificially formed, non-fibrillating organic fibers having a length of

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from seven-sixteenths of an inch to one inch which comprises mixing such fibers with an aqueous alkaline medium of less than 1% alkali concentration and containing, as a fiber dispersing agent, dispersed colloidal gel particles of a water-insoluble hydroxyethyl cellulose to disperse the fibers through the medium without subjecting them to beating, the hydroxyethyl cellulose being soluble in aqueous alkaline solutions of between 1% and 8% alkali concentration, separating the fibers carrying the hydroxyethyl cellulose particles from the aqueous alkaline medium to obtain a textile web of randomly intermingled fibers, drying the web and, at some time between mixing of the fibers with the aqueous alkaline medium and final finishing of the web, precipitating the hydroxyethyl cellulose on the surfaces of the fibers.

2. The method according to claim 1 characterized in that the water-insoluble alkali-soluble hydroxyethyl cellulose particles are fixed on the surfaces of the fibers by heat applied to the textile web.

3. The method according to claim 1 characterized in that the water-insoluble alkali-soluble hydroxyethyl cellulose particles are precipitated on the surfaces of the fibers under acidic conditions.

4. A method of making coherent, strong, textile webs from fibers all of which are extruded synthetic, artificially formed, non-fibrillating organic fibers having a length of from seven-sixteenths of an inch to one inch which comprises mixing such fibers with an aqueous alkaline medium of less than 1% alkali concentration and containing, as a fiber dispersing agent, dispersed colloidal gel particles of a water-insoluble hydroxyethyl cellulose to disperse the fibers through the aqueous alkaline medium without subjecting them to beating, the hydroxyethyl cellulose being soluble in aqueous alkaline solutions of between 1% and 8% alkali concentration, acidifying the medium to precipitate the hydroxyethyl cellulose on the surfaces of the fibers in the form of particles of larger than colloidal size, diluting the acidified medium with water, continuously feeding the diluted medium to the screen of a paper-making machine to form a textile web of randomly intermingled fibers carrying the discrete precipitated hydroxyethyl cellulose particles, and drying the web to obtain a web in which the fibers are bonded at their points of intersection by the discrete hydroxyethyl cellulose particles.

5. A method of making coherent, strong, textile webs from fibers all of which are extruded synthetic, artificially formed, non-fibrillating organic fibers having a length of from seven-sixteenths of an inch to one inch which comprises mixing such fibers with an aqueous alkaline medium of less than 1% alkali concentration and containing, as a fiber dispersing agent, dispersed colloidal gel particles of a water-insoluble hydroxyethyl cellulose to disperse the fibers in the medium without subjecting them to beating, the hydroxyethyl cellulose being soluble in aqueous alkaline solutions of between 1% and 8% alkali concentration, diluting the medium with water, continuously feeding the diluted medium to the screen of a paper-making machine to form a textile web of randomly intermingled fibers carrying discrete particles of the hydroxyethyl cellulose and heating the web to simultaneously dry the web and fix the discrete hydroxyethyl cellulose particles on the surfaces of the fibers in situ in the web.

6. A method of making coherent, strong, textile webs from fibers all of which are extruded synthetic, artificially formed, non-fibrillating organic fibers which comprises adding formaldehyde to a dilute aqueous alkaline medium containing a water-insoluble, alkali-soluble hydroxyethyl cellulose, acidifying the medium, diluting the acidified medium with water, mixing extruded synthetic, artificially formed, non-fibrillating fibers having a length of from seven-sixteenths of an inch to one inch with the diluted acidified aqueous medium to disperse the fibers through the medium without subjecting them to beating, continuously feeding the dispersion to the screen of a paper-

making machine to obtain a textile web of randomly intermingled fibers carrying the hydroxyethyl cellulose and drying the web.

7. A method of making coherent, strong, water-laid textile webs from fibers all of which are extruded synthetic, artificially formed, non-fibrillating organic fibers having a length of from seven-sixteenths of an inch to one inch which comprises mixing such fibers with an aqueous alkaline medium of less than 1% alkali concentration and containing, as a fiber dispersing agent, dispersed colloidal gel particles of a water-insoluble hydroxyethyl cellulose to disperse the fibers through the medium without subjecting them to beating, the hydroxyethyl cellulose being soluble in aqueous alkaline solutions of between 1% and 8% concentration, diluting the aqueous alkaline medium with water, continuously feeding the diluted medium to the screen of a paper-making machine to form a textile web of randomly intermingled fibers carrying discrete colloidal gel particles of the hydroxyethyl cellulose on their surfaces, partially drying the web, passing the web through an acidic medium to precipitate the hydroxyethyl cellulose on the surfaces of the fibers in the form of particles of larger than colloidal size, washing the web, and drying the web.

8. A method of making coherent, strong, textile webs from fibers all of which are extruded synthetic, artificially formed, non-fibrillating organic fibers having a length of from seven-sixteenths of an inch to one inch which comprises mixing such fibers with an aqueous alkaline medium of less than 1% alkali concentration, said medium having a pH between 10 and 14, and containing by weight, based on the weight of the water of the medium, between 0.02% and 0.5% of a water-insoluble hydroxyethyl cellulose in the form of dispersed colloidal gel particles to disperse the fibers through the aqueous medium without subjecting them to beating, the hydroxyethyl cellulose being soluble in aqueous alkaline solutions of between 1% and 8% alkali concentration, separating the fibers carrying discrete particles of the hydroxyethyl cellulose from the aqueous medium to obtain a textile web of randomly intermingled fibers, drying the web and, at some time between mixing of the fibers with the aqueous alkaline medium and final finishing of the web, precipitating the hydroxyethyl cellulose particles on the surfaces of the fibers.

9. A method of making coherent strong textile webs from fibers all of which are extruded synthetic, artificially formed, non-fibrillating organic fibers having a length of from seven-sixteenths of an inch to one inch which comprises mixing such fibers with an aqueous alkaline

medium of less than 1% alkali concentration, said medium having a pH between 10 and 14, and containing by weight based on the weight of the water of the medium, between 0.02% and 0.5% of a water-insoluble hydroxyethyl cellulose in the form of dispersed colloidal gel particles to disperse the fibers in the aqueous alkaline medium without subjecting them to beating, the hydroxyethyl cellulose being soluble in aqueous alkaline solutions of between 1% and 8% alkali concentration, acidifying the aqueous alkaline medium to adjust the pH thereof to between 6 and 7 and precipitate the hydroxyethyl cellulose on the surfaces of the fibers in the form of particles of larger than colloidal size, diluting the acidified medium with water, continuously feeding the diluted medium to the screen of a paper-making machine to form a textile web of randomly intermingled fibers carrying the discrete precipitated hydroxyethyl cellulose particles, and drying the web to obtain a web in which the fibers are bonded at their points of intersection by the discrete hydroxyethyl cellulose particles.

10. The method according to claim 9 characterized in that the fibers are regenerated cellulose fibers.

11. As a new article of manufacture, a coherent strong, porous textile web consisting of a multiplicity of randomly intermingled discontinuous fibers all of which are extruded synthetic, artificially formed, non-fibrillating organic fibers having a length of from seven-sixteenths of an inch to one inch and bonded at their points of intersection into a web by a water-insoluble, alkali-soluble hydroxyethyl cellulose essentially all of which occurs in the web in the form of discrete particles of larger than colloidal size.

12. A new article of manufacture as defined in claim 11 wherein the fibers are regenerated cellulose fibers.

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