Dec. 29, 1959 E. BOBKOWICZ 2,919,217

TEXTILE WEBS

Filed June 5, 1953

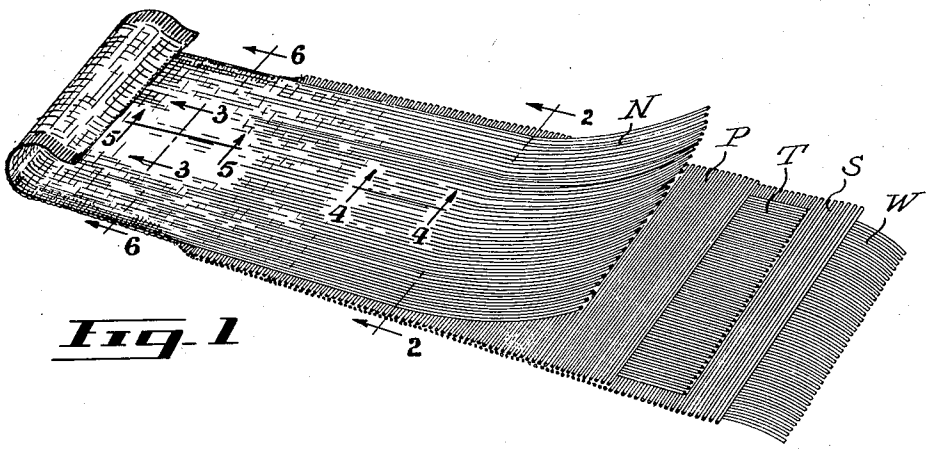


Fig. 1

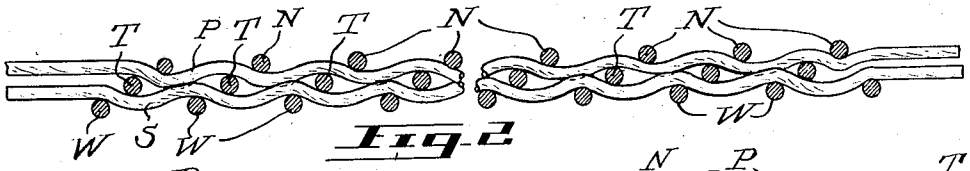


Fig. 2



Fig. 3

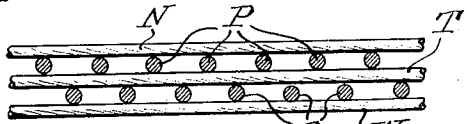


Fig. 4

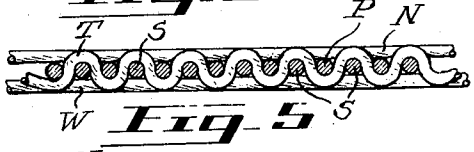
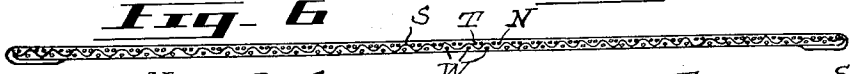


Fig. 5

Fig. 6



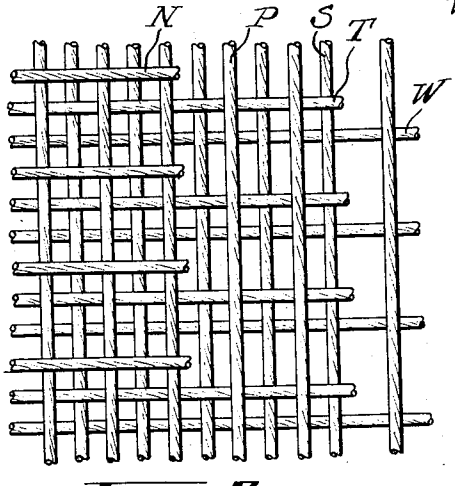


Fig. 7

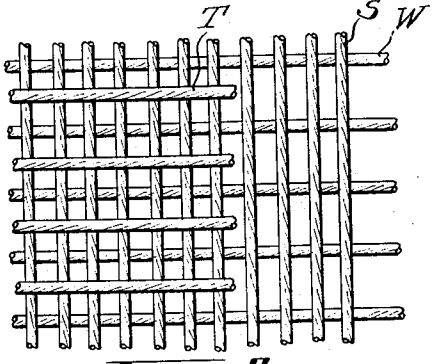


Fig. 8

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TEXTILE WEBS

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5 Claims. (Cl. 154—46)

This invention relates to fabric webs made from yarns, filaments or other strands of textile material.

More particularly, it relates to such fabric made from yarns of fibrous material assembled in the form of warp and weft layers bonded together by a heat-activated bonding agent.

The disadvantages of the normal processes of producing textile fabric by weaving are well known. Weaving is a method of fabric construction in which at least two sets of yarns are interlaced at right angles. Interlacing of yarn is thus the basic foundation to form a weave or fabric and gives the fabric its strength. So far there have been no really practical solutions to avoid the complexities of normal weaving and yet to provide fabric which has the desirable characteristics of woven textile fabrics.

Because of the disadvantages of weaving, there have been attempts to make unwoven fabric from fibers. These non-woven fabrics are very suitable for particular uses but are not applicable in many of the fields in which conventional woven fabrics are employed, particularly because they lack strength or are not sufficiently porous.

The applicant's development

The applicant now provides a fabric web which has many of the desirable characteristics, including appearance and hand, of material woven from yarns in the normal way, but which is made avoiding the bottleneck of conventional weaving, i.e. interlacing.

The method of the invention involves a series of steps which can be performed without the complicated and costly equipment necessary in the normal weaving operation.

And, the apparatus employed is simpler than the normal weaving apparatus and can be operated at a higher capacity and with less attention.

A textile weave according to the invention comprises at least one warp layer down or up, made up of a plurality of undividual yarns, at least one weft layer up or down, made up of a plurality of individual yarns. The individual yarns of the warp and weft layers are separated by interstices. The warp and weft layers are separate but in direct contact, i.e., are juxtaposed without being interlaced, the respective threads with an imparted or added thermoplastic or thermosetting agent being welded together at contact points by the action of heat, created by radiant or shortwave heating and by application of pressure so as to cause the weft and warp yarns to be crimped by crossing warp and weft yarns, by cooling action while the bonding agents are still plastic and under pressure, to cause coagulation to stabilize the form of a woven-like web without interlacing of the yarns. So, the web has much the appearance of a woven web. The web also has other characteristics, for example, hand, strength and breeze (permeability to air) of a woven web made from yarns.

The weft yarns are preferably longer than the normal width of the warp and are inturned over the edge of the web and under heat and pressure welded in this position by the bonding agent to form a selvedge.

A fabric may be made up of several warp layers and several weft layers. This construction is preferably accomplished by a method forming a part of this invention.

The method according to the invention comprises the following steps. The warp yarns are fed from a suitable source of supply to form a first warp which is continuously conveyed through a constructional path.

While the warp is conveyed through this path a first weft layer is laid as follows.

Weft yarns are conveyed from a suitable source of supply to form a continuous weft layer. Successive sections of this weft layer are brought into contiguity with the warp layer at a first weft applying station. The section of the weft layer is then severed from the succeeding sections and conveyed through the constructional path contiguously to the warp layer. This operation is repeated at the first station so that one weft yarn section after the other is brought into contiguity with the warp side by side with the previous weft yarn section and the continuous weft so formed is conveyed through the constructional path in contiguity with the warp.

Warp threads are then brought from a second source of supply to form a second warp layer. This second warp layer is guided at a second station into contiguity with the warp and weft yarns previously laid. The second warp layer is conveyed from this second station in contiguity with the continuous weft yarns above referred to and is carried in such relationship continuously through the constructional path.

Then, at a third station a second continuous weft layer is formed in the same manner as the first weft layer and this weft layer is carried through the constructional path in contiguity with the previously laid layers. Then, at a fourth station a third warp layer is laid and carried through the constructional path in contiguity with the previously laid layers.

At a subsequent station a thermoplastic or thermosetting bonding agent is applied to the composite fabric, if necessary. Then, at a subsequent station, heat is applied to the web to activate the bonding agent.

Then the web with the bonding agent softened is subjected to pressure to press the respective layers together and cause the yarns to assume an undulating condition by virtue of indentation by adjacent yarns. Then, the bonding agent is allowed to cool to stabilize the resulting web with the respective yarns welded together at their contact points.

The weft threads extend laterally beyond the warp and are cut off or are inturned after heating and pressed to form a selvedge on the web.

In fact now that the invention has been generally summarized, preferred embodiments of it will be described in more detail by reference to the accompanying drawings, in which:

Figure 1 is a perspective view showing diagrammatically the formation of a textile "weave" according to the present invention.

Figure 2 is a cross-section along the line 2—2 of Figure 1.

Figure 3 is a cross-section along the line 3—3 of Figure 1.

Figure 4 is a cross-section along the line 4—4 of Figure 1.

Figure 5 is a cross-section along the line 5—5 of Figure 1.

Figure 6 is a cross-section along the line 6—6 of Figure 1.

Figure 7 is a top plan view of one form of weave according to the invention with the upper layers of yarn partly removed to show the construction underneath.

Figure 8 is a view similar to that of Figure 7 showing another type of weave according to the invention.

Web

Referring in more detail to the drawings, Figure 1 is a diagrammatic perspective view illustrating one form of textile web being made according to the invention.

This web is made up of a lower warp layer W, a weft layer S immediately on top of the warp layer W, a warp layer T on top of the weft layer S, a weft layer P on top of the warp layer T and a top warp layer N on top of the weft layer P. As shown, the weft yarns extend outwards from the warps at each side of the fabric. As indicated on the left hand side of the figure these protruding ends are inturned and lapped over the edge of the fabric to form a selvedge.

As perhaps better illustrated in Figures 2 and following, the warp and weft yarns are not interlaced as in normal textile fabric. They are juxtaposed and pressed into interstices between adjacent yarns. The connection between the respective warp and weft yarns is by a heat-activated bonding agent, for example, a thermoplastic or thermosetting material which has been applied either to the yarns beforehand or to the laminae during the formation of the composite fabric. The respective yarns of each warp and weft layer are spaced apart laterally enough to permit breathing of the fabric, thus avoiding the disadvantage of non-woven fabrics made from fibers. The web may be made up of three warps and two wefts as, for example, shown in Figure 7. Or, it may be a simpler fabric as shown in Figure 8 in which there are warps and a single weft. Many variations are possible in the number of laminae.

While the web is not woven it is pressed during formation so that the weft and warp threads are pressed against each other causing them to undulate and to fill interstices between adjacent juxtaposed yarns.

The welded contact surface between the yarns is not only considerably increased, but the yarns of the middle layers are surrounded by the adjoining yarns forming simulated interlacing. The large welded surface and the interlacing-like composition and welded salvage gives a considerable strength to the weave and enables the application simultaneously of several times more weft yarns per second than the fastest automatic loom.

Figure 4 illustrates the relationship between three warps and two wefts before pressure has been exerted to force the warp threads inwards to cause undulation of the weft and warp yarns.

The yarns used in the process may be prepared in accordance with the applicant's co-pending application S.N. 284,284, filed April 25, 1952. In this case they will contain bonding agent ready for softening and further bonding agent may or may not be applied at the application station.

Fibers employed

Fibers which may be employed in the yarn or twine used for making webs according to the invention include any kind of natural or man-made staple fibers or continuous filaments. As suitable examples of natural fibers may be mentioned cotton, jute, kenaf, ramie, sisal, hemp, flax, wool. Two or more types of fibers may be combined.

Bonding agents

The bonding agents which may be employed for welding together the yarns include heat activated materials, i.e. thermoplastic or thermosetting plastic materials, as contrasted with mere adhesives, for example, glue. The bonding action is performed by the reaction of the bonding agents under heat and subsequent coagulation by cooling which, in effect, welds the fibers together. The selection of the suitable bonding agent for the particular purpose will be within the ability of one skilled in the art.

Among suitable bonding agents may be mentioned thermoplastic or thermosetting materials, for example, cellulose esters and cellulose ethers or mixtures thereof, vinyl resins, polystrene, acrylics, polyethylene, nylon and related plastic materials, polyolefins and related plastic materials, thermosetting resins, for example, phenol-formaldehyde and ureaformaldehyde resins.

The amount of bonding agent employed may vary widely and this again is within the scope of one skilled in the art. In certain cases the amount of bonding agent may vary from about 15% by weight on the fiber up to say about 50%. The bonding agent may contain up to about 30% plasticizer. These figures are given merely by way of example since the amounts may vary widely.

The yarns may vary widely in denier as will be clear to one skilled in the art.

I claim:

1. A textile web, comprising at least one warp layer made up of a plurality of substantially parallel closely spaced individual yarns and at least one weft layer made up of a plurality of individual yarns, all said yarns being made up of textile fibers held together with a heat-activated bonding agent the warp and weft layers being separate but the yarns thereof being in direct contact at points throughout their area, the respective yarns being welded together at contact points by said bonding agent, the warp and weft layers being pressed together so that the respective yarns are crimped by crossing yarns to give the web substantially the appearance, strength, permeability to air and hand of a normal textile weave of substantially regular construction, the web being stabilized in this condition by the bonding agent distributed substantially throughout the web.

2. A web according to claim 1, in which the weft yarns extend outward beyond the warp yarns and are inturned to overlap the edge of the web and bonded by said bonding agent under heat and pressure in said position to form a selvedge.

3. A textile fabric, according to claim 1, in which there are a plurality of warp layers.

4. A fabric according to claim 1, in which there are a plurality of warp layers and a plurality of weft layers.

5. A textile web comprising at least three warp layers and a weft layer intervening the respective warp layers, each layer being made up of a number of substantially parallel closely spaced individual yarns and impregnated with a heat-activated bonding agent, the warp and weft layers being separate but in direct contact at points throughout their area, the yarns of one warp layer being spaced and placed so as to be in staggered relation to those of the next warp layer, the yarns of the weft layer being spaced and placed so as to be in staggered relation to those of the next weft layer, the yarns of respective layers being welded together in a pressed condition at said contact points by the heat activation and coagulation of the bonding agent, the warp and weft layers being pressed together so that the respective yarns are crimped by crossing yarns and being stabilized in this condition by the set bonding agent to give the web substantially the appearance, strength, air permeability and hand of a normal textile weave.

References Cited in the file of this patent

UNITED STATES PATENTS

753,752	Stewart	Mar. 1, 1904
1,188,571	Subers	June 27, 1916
1,314,519	Howard	Sept. 2, 1919
1,593,956	Sill	July 27, 1926
1,890,869	St. Clair	Dec. 13, 1932
1,942,086	Cheatham	Jan. 2, 1934
2,266,761	Jackson et al.	Dec. 23, 1941
2,485,827	Hartzell	Oct. 25, 1949
2,522,527	Manning	Sept. 19, 1950
2,574,221	Modigliani	Nov. 6, 1951
2,599,359	Banks et al.	June 3, 1952