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(54) **Method for corrugated bonded or thermo-bonded fiberfill and structure thereof.**

(57) A method for forming a corrugated structure from a fiber web comprises opening and carding a bale of fiber, forming the fiber web (40); alternately lapping the fiber web (40); and folding the fiber web at the alternating laps to form corrugations (21); spraying resin on the corrugated fiber web or melting fiber of low melting point incorporated in the fiber web and causing the resin or fiber of low melting point to bond the fiber web. The fiber web (40) can be sandwiched between a pair of outer webs with resin sprayed thereon and cured to assure the integrity of the sandwiched fiber web.

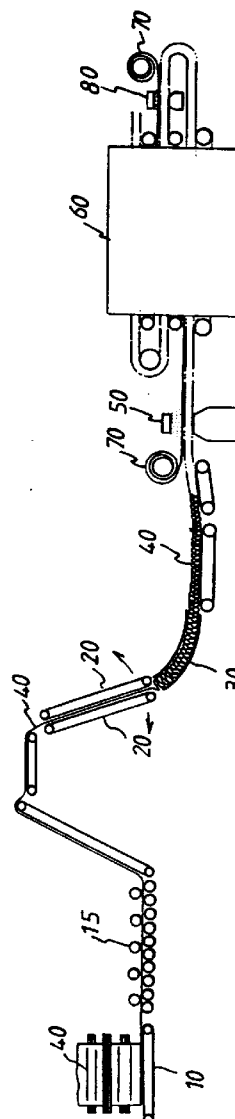


FIG. 2.

The present invention relates to a method for corrugating bonded fiberfill, especially to a resin-bonded or thermo-bonded fiberfill structure formed therefrom.

According to prior art as shown in Fig. 1, after opening bale and carding fiber to a web A, the web A is shaped into criss-cross laminations A' to create strength in both longitudinal and transverse directions. This is accomplished by sequential conveying belts B, C, and D, which transversely convey the web A. Belt E conveys longitudinally, whereas conveying belts C and D independently move to and fro transversely. After the criss-cross lamination A' is shaped by cross lapping, resin is sprayed on the criss-cross lamination A', thereby penetrating and bonding the lamination A'. However, the prior process possesses the following drawbacks:

1. The thickness of the web A' needs to be diversified for various applications. The thickness of the lamination A' depends on the number of single webs A, i.e., the manufacturing conditions must be controlled under a higher conveying speed of conveying belts B, C, and D; a higher transverse moving speed of conveying belts of C and D; and/or a lower speed of conveying belt E. Regarding a specification of 500g/cm² of the bonded fiberfill, the cross angle of lamination A' ends up being small or even nearly zero, thereby maintaining transverse strength but, at the same time, decreasing longitudinal strength, i.e., the performance of final product is inferior with regard to the longitudinal strength.

2. Taking a carding web of 20g/cm², for example, a final product to the specification of 500g/cm² necessitates 25 layers of web, thereby resulting in low productivity, poor resin-penetration, and difficulty in ensuring the criss-cross lamination A' bonds together.

3. Conventional resin-bonded fiberfill only exhibits strength in transverse and longitudinal directions but lacks three-directional strength; therefore, the final products are poor in anti-compression properties, etc.

It is the purpose of this present invention, therefore, to mitigate and/or obviate the above-mentioned drawback in the manner set forth in the detailed description of the preferred embodiment.

Accordingly, it is an object of this invention to provide a method for corrugating bonded fiberfill which enhances three-directional strength and resilience of the final product.

This invention seeks to provide a method for corrugating bonded fiberfill which allows excellent penetration of resin and hot air by means of resin bonding or thermo bonding, thereby resulting in products having increased strength.

This invention also seeks to provide an improved structure of resin-bonded or thermo-bonded fiberfill

which possesses high resistance to compression and high air permeability, for use in quilts, pillows, cushioned seats, cushions, mattresses, sleeping bags, ski jackets, etc. and as filtering material.

Likewise this invention seeks to provide an improved structure of resin-bonded or thermo-bonded fiberfill which can be made available in different thicknesses by regulating the corrugated fiber web, thereby maintaining good anti-compression and air permeability qualities.

The invention will now be explained in more detail, by way of example only, in the following description taken in conjunction with the accompanying drawings in which:

Fig. 1 is a perspective view of a cross-lapping machine according to prior art;

Fig. 2 is a schematic view of an apparatus for corrugating resin-bonded fiberfill according to the present invention;

Fig. 3 is a schematic view of an apparatus for corrugating thermo-bonded fiberfill according to the present invention, optionally with another two outer webs adhering onto the corrugated fiber web;

Fig. 4 is a perspective view of an improved structure of resin-bonded or thermo-bonded fiberfill according to the present invention;

Fig. 5 is a perspective view of an embodiment in accordance with the Fig. 3;

Fig. 6 is a side view of another embodiment in accordance with the present invention, where a fiber web is saw tooth-like; and

Fig. 7 is a side view of yet another embodiment in accordance with present invention, where the fiber web is triangularly corrugated.

Now referring to the drawings, initially to Fig. 2, a preferred embodiment of an apparatus for implementing a method for corrugating resin-bonded or thermo-bonded fiberfill in accordance with the present invention is shown. The method proceeds as follows.

A bale of fiber is initially opened, carded, and formed into a fiber web, which is indicated by reference numeral 40. The fiber web 40 is fed into a cross-lapping machine 10 which laps the fiber web 40 in alternating directions.

After leaving the cross-lapping machine 10, the fiber web 40 is drafted by a drafting machine 15, thereby increasing the longitudinal strength thereof. The fiber web 40 is conveyed between a pair of parallel-spaced conveyor belts or rollers 20. The conveyor belts or rollers 20 pivot about an axis at the entrance thereto, as shown by the arrows in Fig. 2, so that as the fiber web 40 exits therefrom, the pivoting motion folds the fiber web 40 at the laps formed by the cross-lapping machine 10, forming a corrugated structure as the fiber web 40 enters a conveying passage 30. The conveying passage 30 has a height set

at a predetermined height desired of the corrugations of the fiber web 40.

At this point, the fiber web 40 is applied with a first outer web 1 which is conveyed from a first roller 70, and then passes into a spraying machine 50, where resin is sprayed onto one side of the first outer web 1. Then, the fiber web 40 having the first outer web 1 thereon is heated and dried by oven 60. After leaving the oven 60, the fiber web 40 is applied with a second outer web 1 which is conveyed from a second roller 70, and then passes into a spraying machine 80, where resin is sprayed onto the second outer web 1. Again, the fiber web 40 having two outer webs 1 thereon is heated and dried by the oven 60. The resin will adhere the corrugations 21, as shown in Fig. 5. The first and second outer webs 1 can be optionally applied to the fiber web 40 after passing into the spraying machines 50 and 80 respectively. Alternatively, products possessing no sandwich structure, as shown in Fig. 4, can be manufactured by canceling the step of applying the two outer webs 1 on the fiber web 40.

Fig. 4 provides a perspective view of the product having no sandwich structure. The fiber web 40 possess strength along the three directional axes thereof, significantly increasing the strength and resilience of the overall structure. Furthermore, the spaces between the contact sites 41 and 42 of the corrugations allow resin to be uniformly dispersed and penetrated throughout the structure, which subsequently facilitates the drying and curing process.

Instead of adding resin, fiber of low melting point can be blended into regular fiber, and when melted will bond the corrugations and the regular fiber together. Before passing into the oven 60, the fiber web 40 is optionally sandwiched with a pair of transversely-positioned outer webs 1 respectively conveyed from two rollers 70. The sandwich structure passes into the oven 60, thereby bonding the outer webs 1 on the fiber web 40.

Preferably as shown in Fig. 5, corrugations 21 of the fiber web 40 are accordion-like, where top and bottom ends thereof are generally rounded, with respective inner and outer spaces 22 formed between respective corrugations 21 and the outer webs 1. Also, in accordance with the present invention, the corrugations 21 of the fiber web 40 can be saw tooth-shape or triangularly-shaped, as respectively shown in Figs. 6 and 7.

Overall, the structure of the present invention has a high degree of air permeability, resistance to compression, and loftiness, and is useful in quilts, pillows, cushioned seats, cushions, mattresses, sleeping bags, snow clothing, etc. and as filtering material.

While the present invention has been explained in relation to its preferred embodiment, it is to be understood that various modifications thereof will be apparent to those skilled in the art upon reading this

specification. Therefore, it is to be understood that the invention disclosed herein is intended to cover all such modifications as shall fall within the scope of the appended claims.

Claims

1. A method for forming a corrugated, thermo-bonded fiberfill structure comprising the steps of:
 - (a) adding fiber of low melting point into fiber web;
 - (b) opening and carding a bale of fiber to form a fiber web (40);
 - (c) lapping said fiber web in alternating directions to form alternating laps;
 - (d) folding said fiber web at said alternating laps to form corrugations (21); and
 - (e) subjecting the web to conditions such that said fiber of low melting point bonds and maintains said corrugations (21).
2. A method as claimed in claim 1, further comprising a step after said step (c) of drafting said fiber web, such that the longitudinal strength of said fiber web is increased.
3. A method as claimed in claim 1, further comprising a step after said step (d) of applying to said fiber web (40) a transversely-positioned outer web (1), or a pair of outer webs (1) sandwiching said fiber web (40).
4. A method according to claim 1, 2 or 3, wherein step (a) is omitted and in step (e), instead of employing low melting point fiber for bonding the fiber web, step (e) involves spraying it with a bonding resin.
5. A corrugated, thermo-bonded fiberfill structure as formed by the method set forth in claims 1, 2, 3 or 4.
6. A structure according to claim 5, wherein the corrugations (21) are accordion-shaped, saw-tooth shaped or of triangular zig-zag form.

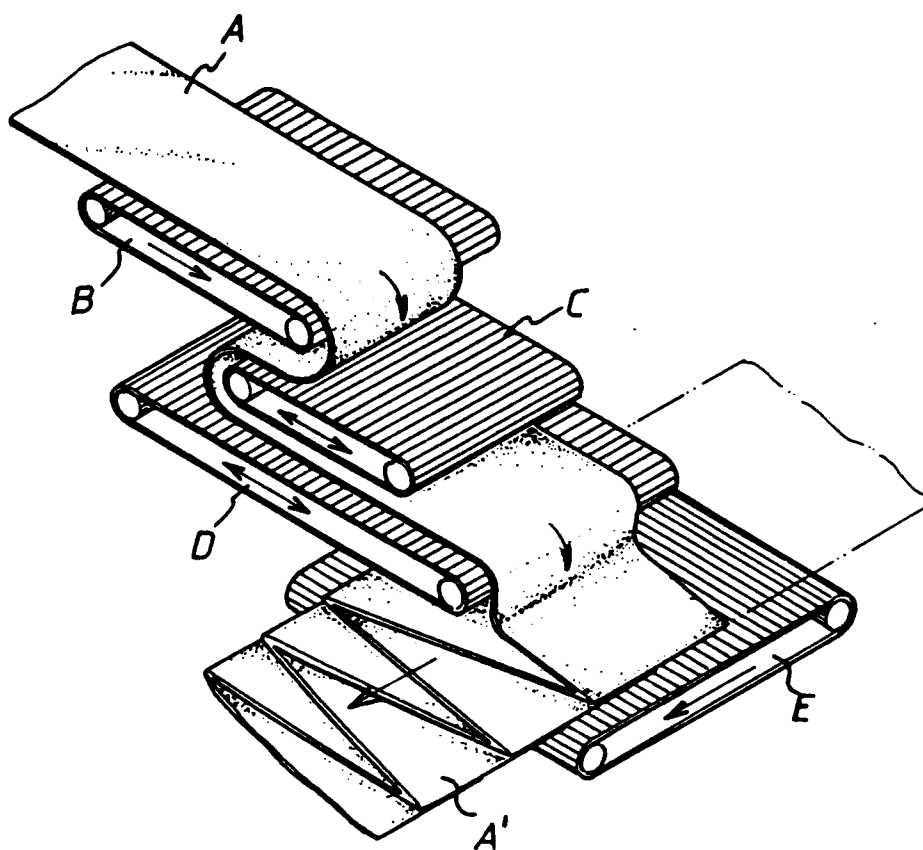


FIG. 1.
PRIOR ART

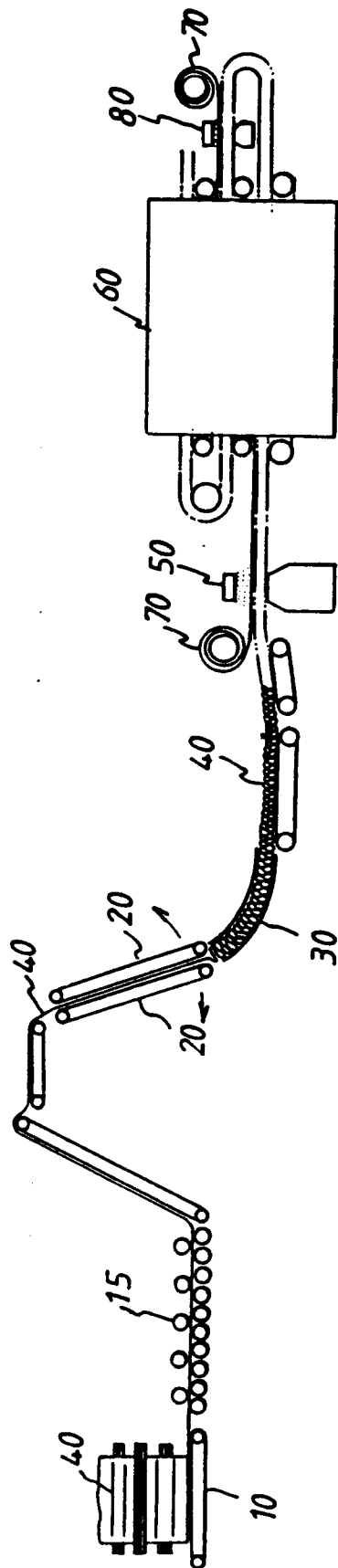


FIG. 2.

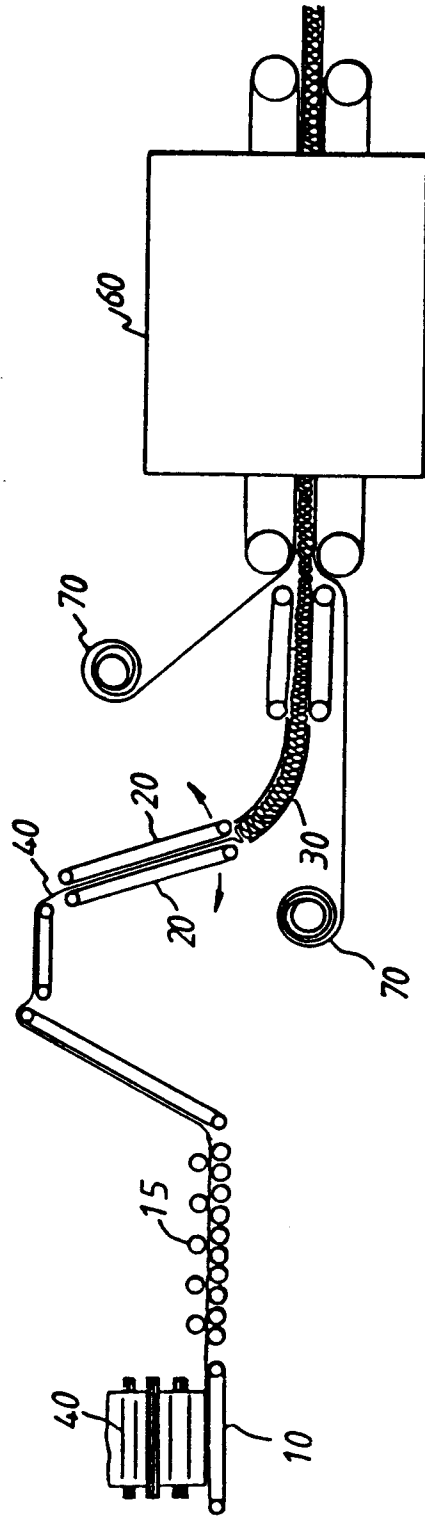


FIG. 3.

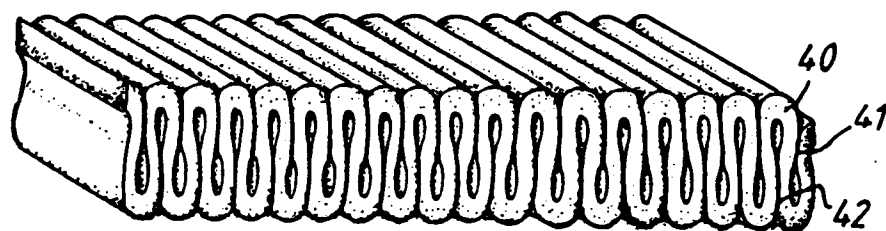


FIG. 4.

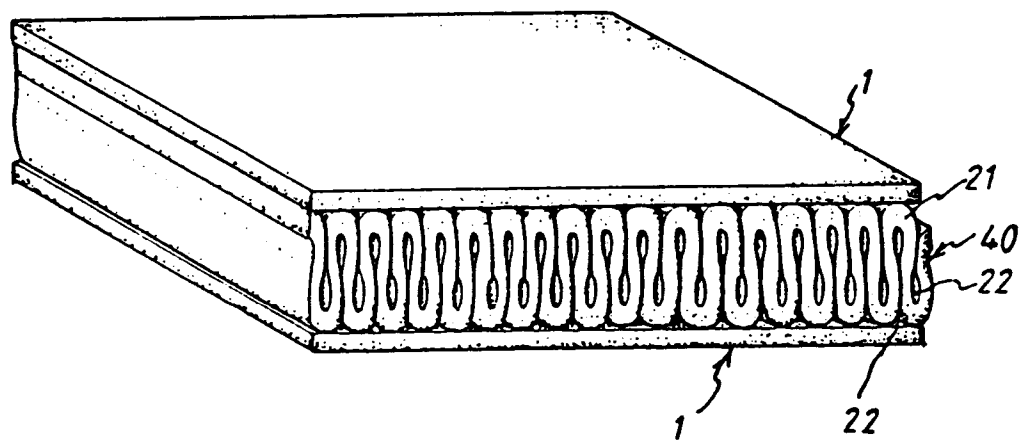
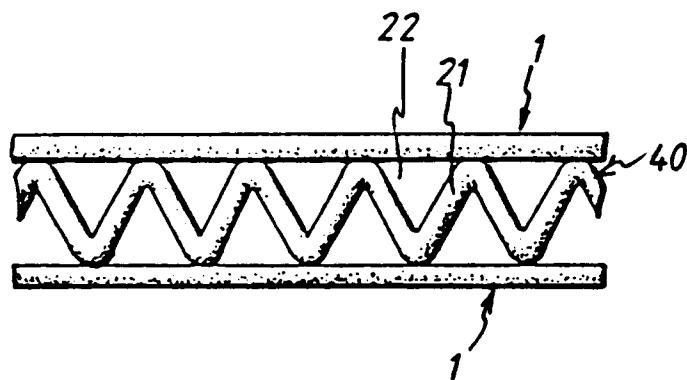
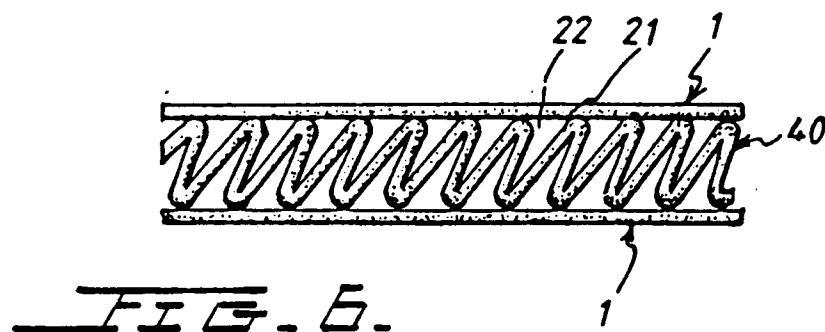


FIG. 5.





European Patent
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EUROPEAN SEARCH REPORT

Application Number

EP 93 30 0982

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	US-A-4 129 675 (PAUL T. SCOTT) * abstract * * claims 1-3; examples * ---	1	D04H1/74
Y	EP-A-0 350 627 (VYSOKA SKOLA STROJNI) * abstract * * claims 1,7,8; figures 1-4 * ---	1	
A	US-A-4 576 853 (EDWARD A. VAUGHN) * the whole document * ---	1-6	
A	US-A-2 454 175 (RUDOLPH F. HLAVATY) * claims; figures 3-5 * ---	1-6	
A	FR-A-2 117 703 (KONSTRUKTORSKOE BJURO MINISTERSTVA LEGKOI PROMYSHLENNOSTI ESTONSKOI) * claims 1-4; figure 1 * -----	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			D04H
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 09 JUNE 1993	Examiner DURAND F.C.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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