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PROCESS AND APPARATUS FOR THE PRODUCTION OF FIBER FLEECE

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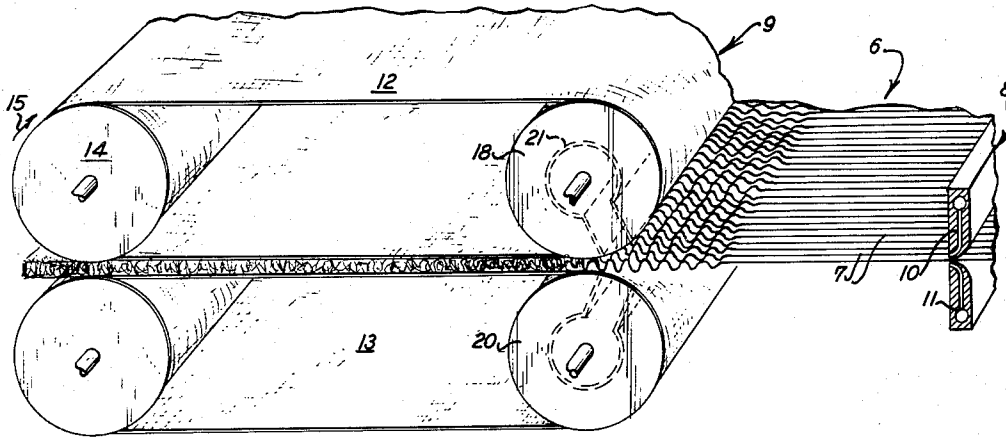


Fig. 1

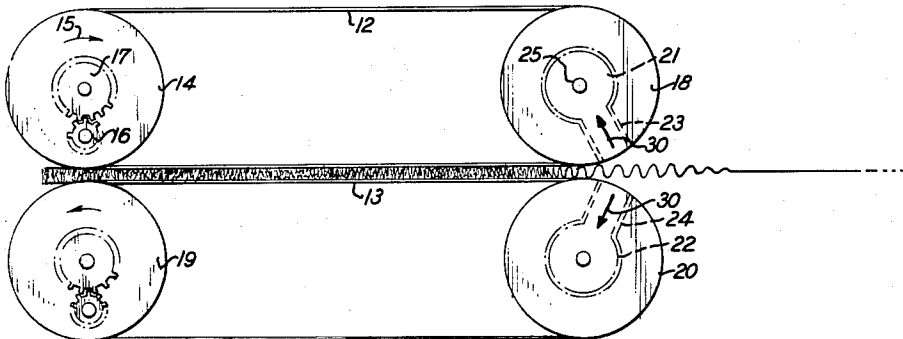
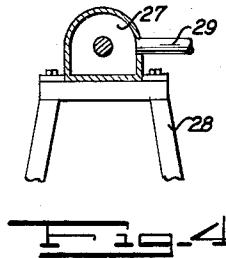
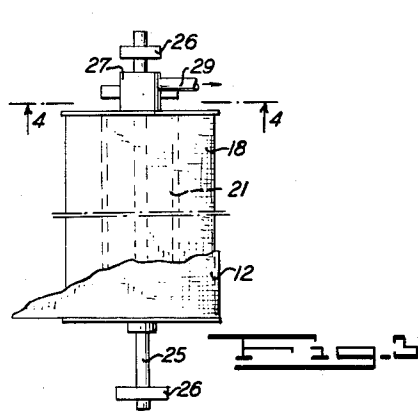


Fig. 2



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**PROCESS AND APPARATUS FOR THE PRODUCTION OF FIBER FLEECE**

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Fiber batts of fleeces, such as those used in the manufacture of matting, filter materials or materials to be used as supports for a coating of plastics, should preferably have the fibers in a random arrangement, thereby achieving equal strengths in various directions. In the prior manufacture of these batts, such random arrangement is produced, for example, by the superposition of a plurality of webs, so that on the average a random distribution of fiber orientations is achieved. One disadvantage of these materials, however, consists in the fact that the individual layers tend to come apart. This characteristic can be overcome, however, by the present invention.

The manufacture of the fiber fleeces is performed in the process of this invention by vertical and horizontal deposition of the fibers and matting them together in the manner of a cocoon. The fibers or filaments used in building up the fiber fleeces are blown in an airstream to between a pair of suction rolls. The suction rolls can be disposed one over the other, for example, the distance between the rolls corresponding approximately to the desired thickness of the fiber fleece. The fibers or filaments, as the case may be, are carried in a current of gas or vapor of the width of the desired fleece against the pair of suction rolls in such a manner that, in the course of time, the fibers pour into the roller gap over its entire width. Due to the turbulence of the airstream, the fibers or filaments begin, at a predetermined distance in front of the rolls, to swing and oscillate back and forth. They are therefore seized in irregular order, sometimes by the upper suction roll and sometimes by the lower one, as they advance to between the pair of rolls. Since the rate of delivery of the fibers or filaments is a multiple of the rate at which the fiber batt is withdrawn, a short length of an individual fiber is drawn up, for example, by the upper suction roll, and due to the up and down oscillation of the airstream carrying the fibers, an adjacent part of the fiber is seized in the next moment by a lower suction roll and thus the fiber is disposed in a vertical orientation. Since the airstream oscillates not only up and down but also back and forth, in the next moment another fiber is laid crosswise at a certain angle to the previously deposited fiber. This process is repeated in rapid succession over the entire fiber catching width and height, so that a random, homogeneous fiber structure is produced. Especially when endless fibers are used for the production of the fleece, the orientation of the deposit is constantly changing direction and fiber fleeces of any desired thickness can be produced.

Thus, the process of the invention comprises advancing a plurality of filaments along a path leading to between spaced fleece forming members so that the filaments move to adjacent and on to between said members. Gas streams are passed in a direction extending transverse to the path and the gas streams have a component perpendicular to the path so that movement of the filaments as they pass to between the fleece forming members is disrupted and individual filaments are caused to be dispersed in back and forth random array with respect to the fleece forming members. There are at least two such gas streams and the perpendicular com-

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ponents of said streams are disposed in opposite direction. The filaments are collected as a fleece between the fleece forming members and the fleece so formed is moved away from between the fleece forming members. Desirably, the direction of movement of the gas streams is such that the said perpendicular components thereof are in a direction away from the path of the filaments toward the fleece forming members and of the fleece being formed.

The filaments advanced to the fleece forming members can be produced by spinnerets, and the filaments can move directly from the spinnerets to the fleece forming members so that continuous production of fleece from filament forming material, such as multiple polymers, can be achieved.

The procedure and apparatus of co-pending application Serial No. 341,489, filed January 27, 1964, can be utilized for the production of the filaments. In this procedure a plurality of filaments issue from a like number of spinnerets and the filaments are distended by a gas stream which impinges upon the filament forming material as it leaves the spinneret. The gas stream which so impinges can be utilized, supplemented if desired by further gas streams, to carry the filaments to the fleece forming device of the invention. Thus the filaments are moved from the spinneret head to a fleece forming device as a rank of filaments. Entanglement is prevented by closely controlling the gas stream which entrains the filaments and carries them to the fleece forming device. Operation in this manner provides monofilaments and it is desirable to practice the present invention with monofilaments.

The fleece forming device of the invention can comprise perforated members disposed one on other side of the filament path and spaced apart a distance in excess of the filament thickness and equal to the thickness for the fleece to be produced. The gas streams utilized to disrupt the movement of the filaments can be drawn through the perforated members, or forced outwardly through these members so that as the filaments advance toward and between the perforated members, their movement is modified in a manner to provide a random array.

The invention is fully described in reference to the accompanying drawing, wherein:

FIG. 1 is a perspective view schematically indicating the combination of a spinneret and a fleece forming device;

FIG. 2 is a schematic side elevation of a fleece forming device;

FIG. 3 is a plan view of a portion of the device shown in FIG. 2;

FIG. 4 is an elevation view taken along line 4—4 in FIG. 3.

Referring to the drawings, a rank 6 made up of a plurality of monofilaments 7 disposed generally in a plane and issuing from spinneret head 8, advance over a path extending from the spinneret head 8 toward the fleece forming device 9. The spinneret head 8 includes gas delivering means 10 and 11, which means discharge a gas stream to impinge and entrain the filament forming material as it issues from the spinneret head 8. This gas stream, supplemented if desired by other gas streams (not shown) serves to entrain and advance the filaments to adjacent the fleece forming device 9.

The fleece forming device 9 is made up of an upper endless screen 12 and a lower endless screen 13. The upper endless screen 12 passes over the end wheel 14, which is driven in the direction indicated by the arrow 15 by drive gear 16, which intermeshes in driving relation with the gear 17 mounted on the end of the axle of the wheel 14. At the other end, the perforated screen 12

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passes over idler wheel 18. In a similar manner, the lower endless screen 13 passes over the drive wheel 19 and idler wheel 20.

As can be best seen in FIG. 3, within the idler wheels 18 and 20 are, respectively, suction chambers 21 and 22, and each of these suction chambers has an intake opening, respectively, 23 and 24. As is indicated in FIG. 3 and FIG. 4, the suction chambers are fixedly mounted on the axles of the wheels in which they are, respectively, disposed. Thus, as is indicated in FIG. 3, the suction chamber 21 is a hollow chamber disposed about the axle 25 of the idler wheel 18. This axle is mounted in journal blocks 26. The suction chamber includes intake 27 which communicates with one end of the suction chamber, and this intake is fixedly mounted on the support 28 (FIG. 4). A conduit 29 communicates the intake chamber with a vacuum source.

As is indicated in the drawing, particularly in FIG. 1 and FIG. 2, the filaments 7 in the rank 6 advance toward the fleece forming device 9 and during this advance are, individually, disposed in relatively straight lines. Suction is applied to the vicinity of the inlet to between the upper endless belt 12 and the lower endless belt 13, so that a gas stream is drawn along paths indicated by the arrows 30. Thus, gas streams are provided in the vicinity of the inlet to the fleece forming device which have a component perpendicular to the path of the filaments toward the fleece forming device. Such gas streams occasion disruption of the movement of the filaments since substantial turbulence is created in the vicinity of the inlet. This causes successive portions of each filament to be shifted in direction so that the filaments extend up and down and across to provide a random array which builds up into a fleece of a thickness corresponding to the space of the runs of the endless screens disposed adjacent to each other.

While the invention has been described with respect to particular embodiments thereof, these embodiments are merely representative and do not serve to set forth the limits of the invention.

What is claimed is:

1. Process for the production of fiber fleeces which comprises:

- (a) advancing a plurality of generally straight filaments along a path leading to between spaced fleece forming members to adjacent said members,
- (b) passing gas streams in a direction extending transverse to the path and having components perpendicular to the path to disrupt the movements of the filaments to cause individual filaments to be disposed back and forth with respect to the fleece forming members, there being at least two such gas streams, the said perpendicular components of which are opposite in direction,
- (c) collecting the filaments disposed back and forth as aforesaid as a fleece between the fleece forming members, and
- (d) moving the fleece so formed away from the fleece forming members.

2. Process according to claim 1, the perpendicular components of each of said two gas streams being away from said path.

3. Process according to claim 1, wherein the filaments are advanced to adjacent said fleece forming members by a gas stream moving along said path toward said fleece forming members.

4. Process according to claim 1, wherein said filaments are monofilaments.

5. Process for the production of fleeces which comprises:

- (a) advancing a plurality of generally straight filaments along a path leading to between spaced, perforated fleece forming members to adjacent said members,

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(b) moving said fleece forming members in the direction of said advance of the filaments,

(c) passing gas streams in a direction extending transverse to the path and having components perpendicular to the path to disrupt the movement of the filaments and cause individual filaments to be dispersed back and forth with respect to the fleece forming members, there being at least two such streams the said perpendicular components of said two streams being in opposite direction, said gas streams being passed through the perforated fleece forming members,

(d) collecting the filaments disposed back and forth as aforesaid as a fleece between the fleece forming members, and

(e) moving a fleece so formed away from between the fleece forming members.

6. Process according to claim 5, wherein the perpendicular component of each of said two gas streams is away from said path.

7. Process according to claim 5, wherein the filaments are advanced to adjacent the fleece forming members by a gas stream moving in the direction of movement of the filaments toward the fleece forming members.

8. Process according to claim 5, wherein said filaments are monofilaments.

9. In combination with means for spinning filaments and advancing the filaments along a defined path, a fleece forming device comprising:

(a) perforated members disposed one on either side of the said path, and spaced from each other a distance in excess of the thickness of the filaments and equal to the thickness of the fleece to be formed and means for moving said members in the direction of the advance of the filaments along said path,

(b) means for passing gas streams in a direction extending transverse to the path and having components perpendicular to the path to disrupt the movement of the filaments and as they pass to between the fleece forming members to cause individual filaments to be dispersed back and forth with respect to the fleece forming members, said means for passing the gas streams providing at least two gas streams the said perpendicular components of which are opposite in direction, and

(c) means for directing the filaments in generally straight condition along a portion of said path to said gas streams.

10. Apparatus according to claim 9, the means for passing gas streams as aforesaid providing at least two of said gas streams to move away from the direction of advance of the filaments toward the fleece forming device.

11. Apparatus according to claim 9, wherein said perforated members comprise two endless belts.

12. In combination with means for spinning filaments and advancing the filaments along a defined path, a fleece forming device, comprising:

(a) a perforated endless belt disposed on each side of said path with a run of each belt disposed alongside a portion of said path, the belts in their endless paths turning into their respective runs at the same position along the path, said belts being spaced apart a distance in excess of the thickness of the filaments and equal to the thickness of the fleece to be formed, and means for moving said belts so that said runs thereof move along said path in a direction of advance of filaments along said path,

(b) means for passing gas streams in a direction extending transverse to the path and having components perpendicular to the path to disrupt the movement of the filaments and as they pass to between the fleece forming members to cause individual filaments to be dispersed back and forth with respect to the fleece forming members, said means for passing the gas streams as aforesaid providing at least

two such gas streams, the said perpendicular components of which are opposite in direction, and

(c) means for directing the filaments in generally straight condition along a portion of said path to said gas streams.

13. Apparatus according to claim 12, wherein said means for passing gas streams is for providing gas streams moving away from the direction of advance of filaments toward the fleece forming device.

14. A device for forming a fleece from filaments moving along a defined path, comprising:

(a) perforated members disposed one on either side of the said path, and spaced from each other a distance in excess of the thickness of the filaments and equal to the thickness of the fleece to be formed and means for moving said members in the direction of the advance of the filaments along said path,

(b) means for passing gas streams in a direction extending transverse to the path and having components perpendicular to the path to disrupt the movement of the filaments and as they pass to between the fleece forming members to cause individual filaments to be dispersed back and forth with respect to the fleece forming members, said gas supply means providing at least two gas streams the said perpendicular components of which are opposite in direction, and

(c) means for directing the filaments in generally straight condition along a portion of said path to said gas streams.

15. Apparatus according to claim 14, said two gas supply means providing gas streams moving away from the direction of advance of the filaments toward the fleece forming device.

16. Apparatus according to claim 14, wherein said perforated members comprise two endless belts.

17. Apparatus for the production of fleeces from filaments moving along a defined path, comprising:

(a) a perforated endless belt disposed on each side of

said path with a run of each belt disposed alongside a portion of said path, the belts in their endless paths turning into their respective runs at the same position along the path, said belts being spaced apart a distance in excess of the thickness of the filaments and equal to the thickness of the fleece to be formed, and means for moving said belts so that said runs thereof move along said path in a direction of advance of filaments along said path,

(b) means for passing gas streams in a direction extending transverse to the path and having components perpendicular to the path to disrupt the movement of the filaments and as they pass to between the fleece forming members to cause individual filaments to be dispersed back and forth with respect to the fleece forming members, said means for passing the gas streams as aforesaid providing at least two such gas streams, the said perpendicular components of which are opposite in direction, and

(c) means for directing the filaments in generally straight condition along a portion of said path to said gas streams.

18. Apparatus according to claim 17, wherein said means for passing gas streams is for providing gas streams moving away from the direction of advance of filaments toward the fleece forming device.

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