

[54] **METHOD AND APPARATUS FOR THE  
CONTINUOUS PRODUCTION OF A WEB OR  
MAT OF STAPLE FIBRES**

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**Related U.S. Application Data**

[63] Continuation-in-part of Ser. No. 212,777, Dec. 27,  
1971, abandoned, which is a continuation of Ser. No.  
11,168, Feb. 13, 1970, abandoned.

[30] **Foreign Application Priority Data**

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[51] Int. Cl. .... C03b 37/02  
[58] Field of Search ..... 264/121; 65/1, 2, 4, 9,  
65/29

[56] **References Cited**

**UNITED STATES PATENTS**

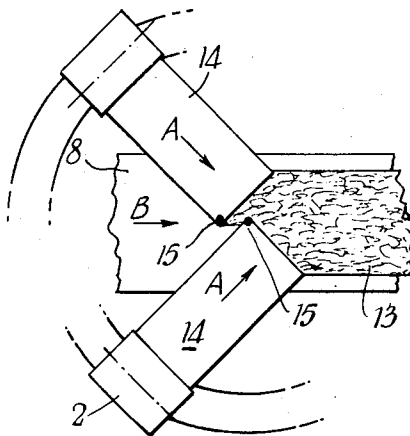
|           |         |          |        |
|-----------|---------|----------|--------|
| 2,961,698 | 11/1960 | Rea      | 65/9 X |
| 3,220,811 | 11/1965 | Schuller | 65/9 X |
| 3,445,207 | 5/1969  | Goerens  | 65/4 X |

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*Attorney, Agent, or Firm*—Stevens, Davis, Miller &  
Mosher

[57] **ABSTRACT**

A process and apparatus for producing a web, tissue or mat of short staple glass fibres involves producing continuous filaments of molten glass which are delivered from a source of molten glass on to the periphery of a horizontally mounted rotating drum, from which the filaments are removed by scraper means which acts to break them into short staple fibres. The fibres are carried in an air stream along a main axis of feed and deposited on to a moving conveyor band. The main axis of feed lies at an angle to the run of the conveyor, and the air stream is controlled by a stationary guide conduit which directs the entrained fibres on to a strip-like deposit area on the conveyor band, the width of which depends on the angle above-mentioned, but which may be greater than the length of the furnace and of the drum. To compensate for irregularities in the density of fibres, the mouth of the guide conduit is totally enclosed and is deformable so that the pattern and density of the deposition can be varied. Control of density may be achieved by density sensing means linked to a mechanism for deforming the conduit mouth.

**8 Claims, 11 Drawing Figures**



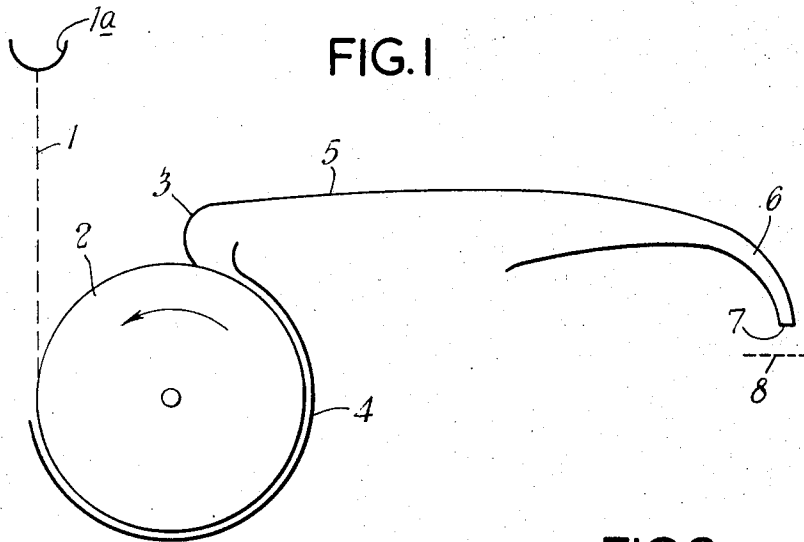


FIG. 1

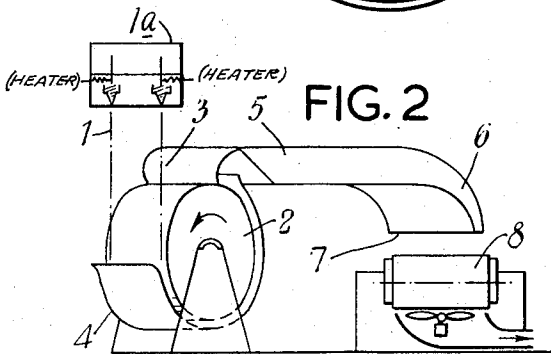


FIG. 2

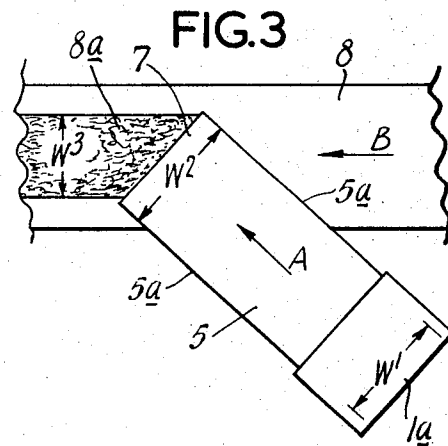


FIG. 3

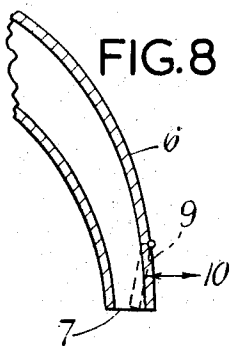


FIG. 8

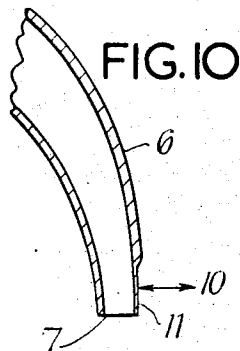


FIG. 10

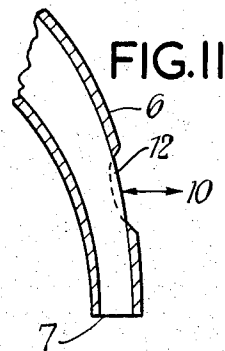


FIG. 11

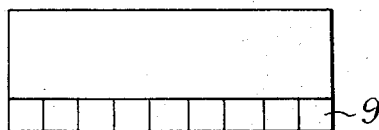


FIG. 9

FIG. 4

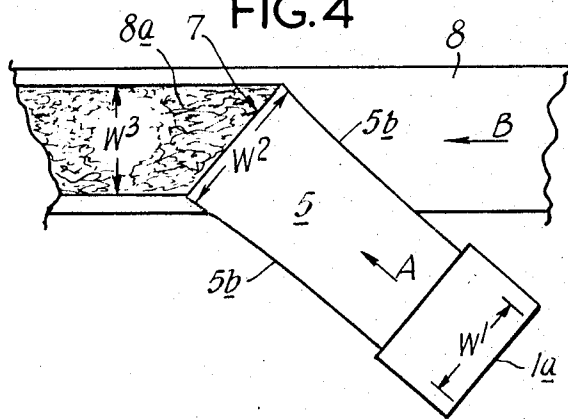


FIG. 5

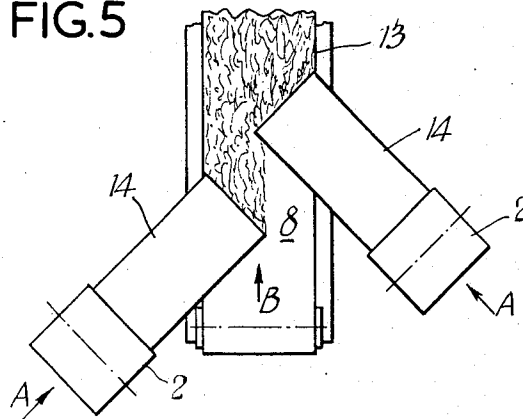


FIG. 6

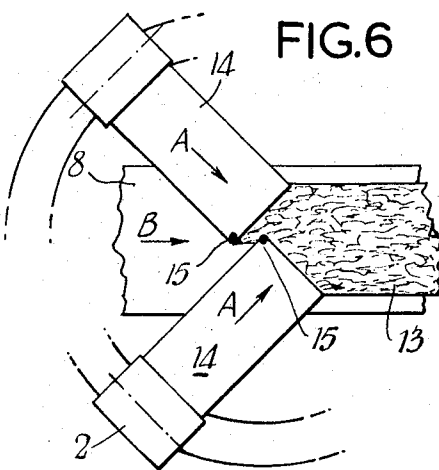
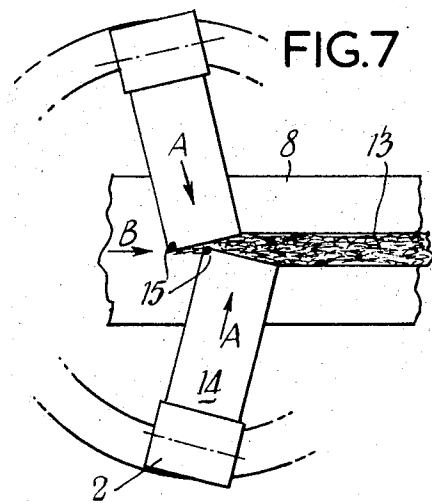


FIG. 7



# METHOD AND APPARATUS FOR THE CONTINUOUS PRODUCTION OF A WEB OR MAT OF STAPLE FIBRES

This is a continuation-in-part of application Ser. No. 212,777, filed Dec. 27, 1971, which is a continuation of application Ser. No. 11,168, filed Feb. 13, 1970 both now abandoned.

This invention relates to a method and apparatus for continuously producing a web, tissue or mat of predetermined density, composed of discontinuous lengths of glass fibre (herein termed "staple glass fibres") which are deposited in a random orientation upon a moving air-pervious conveyor belt, and are held thereon by suction from below the belt, and are then impregnated with a suitable thermoplastic or thermosetting synthetic resin in liquid phase which, when heated and cured will serve as a matrix to interbond the fibres so as to produce a continuous strip or sheet.

The broad process is well established and involves several stages. First there is a melting and fibre-producing stage in which solid glass of suitable composition is made molten and caused to emerge continuously through suitable downwardly directed nozzles as fine unbroken filaments. Next, there is a drawing stage, in which the filaments fall on to, and are picked up by, the surface of a continuously rotating drum, located below the melting furnace. Thirdly, there is the filament breaking stage in which the filaments are carried around the drum for part of a revolution, and are then removed from the surface by a scraper mechanism, which also serves to break the continuous filaments into staple fibres. Fourthly there is the delivery stage, in which the staple fibres are entrained in a current of air, created by the rotation of the drum within a shroud, with or without additional externally created air currents, and carried away from the drum to be deposited loosely in random orientation as a web, tissue or mat, on a moving belt conveyor. Fifthly, there is the impregnation stage, in which the loose fibres are impregnated with synthetic resin and heat-cured to form a continuous strip or sheet. Sixthly, there is the finishing stage, in which the strip or sheet is trimmed to size, with or without the addition of further reinforcement, e.g. in the form of continuous lengthwise filaments. Lastly, in most cases, the strip or sheet is coiled upon a winding drum for subsequent storage until it is required to be used for further manufacturing processes.

The invention is applicable to such a process (herein called "a process of the type described") and is directed in particular to improving the delivery stage, to provide a more economical method and apparatus than those hitherto employed.

An early example of processes of the type described is exemplified by British Pat. Nos. 628,145 and 686,564 (Schuller). In those Specifications the axis of rotation of the drum is normal to the run of the conveyor, and the fibres are carried away from the drum in a direction (herein termed "the main axis of feed") parallel to the run of the conveyor. Such an arrangement makes it difficult to use more than one drum, since it postulates either placing a single furnace and drum at the end of the conveyor (as shown in said British Patents) or mounting more than one such apparatus each of which is of considerable size and weight in tandem above the conveyor.

To overcome these difficulties in later U.S. Pat. Nos., 2,996,102 and 3,220,811 (Schuller) it is proposed to mount the equipment at the side of the conveyor, so that several sets of equipment each comprising a furnace, a drum and a fibre-distributing head, can be used to deliver fibres on to a single conveyor, thus greatly increasing the rate of production. In the arrangement of said U.S. Patents, the fibres are guided through two or more distributing heads which reciprocate in directions transverse to the run of the conveyor. Such an arrangement has proved practicable and has resulted in greatly increased production. Moreover, by varying the relative speed of the conveyor belt, and/or the number of sets of equipment in use, the density of the deposited mat of loose fibres can be controlled.

It is inevitable that the arrangement of said U.S. Patents involves relatively complex and expensive machinery, since the distributing heads and ancillary trunking have to be capable of continuous reciprocation across the belt.

There are further disadvantages with the apparatus of U.S. Pat. Nos. 2,996,102 and 3,220,811. These relate respectively to the width of web which can be produced and to the speed of production and density of the deposit which can be achieved.

Considering the apparatus in FIG. 1 of each of said U.S. Pat. Nos. 2,996,102 and 3,220,811, in which the reciprocating heads move at right angles to the run of the belt, it will be appreciated that there is a limit to the stroke of reciprocation and that if the heads extend too far in their forward movement the fibres will not be carried by the entrained air to the extreme end of the fully extended head. Any attempt to overcome this by staggering and overlapping the strokes of machines on opposite sides of the belt, brings in difficulties due to the unevenness of the central area of deposit where the individual heads overlap. Thus web width is effectively limited.

Where the heads are inclined at an angle to the run of the belt, as in FIG. 4 of U.S. Pat. No. 2,996,102 and FIG. 3 of U.S. Pat. No. 3,220,811, it will be apparent that assuming these heads to be stationary (which is not apparent from the text of these Specifications but may be deduced from the figures) then the available web width inevitably must be less than the width of the fibre-producing source.

Moreover, where the fibres are glass fibres and are produced on a rod melting furnace by the process of British Pat. No. 628,145 referred to in the said U.S. Schuller Patents, there is a practical upper limit to the length of that furnace and hence to the width of the stream of fibres carried forward into the hood. This in turn further limits web width when taken in conjunction with the limitations previously mentioned.

Moreover, with the reciprocating heads of U.S. Pat. Nos. 2,996,102 and 3,220,811 there is also a limit to the quantity of fibres which can be fed from any one head. In order to ensure even deposit, if the fibre output is increased, the linear speed of the belt must be increased proportionally and, at the same time, the speed of reciprocation of the heads must be increased. There is however, a practical upper limit to the speed of reciprocation of the heads due to the relatively cumbersome mechanism involved. Moreover, even if such a difficulty could be overcome there is another limiting factor on reciprocation speed, namely that if the heads are reciprocated too fast, the fibres will not be showered

back and forth across the belt in an even manner but the very movement of the hoods will create areas of turbulence and produce unpredictable bunching and swirling of the fibres and may even interfere, as between one hood and another, with steady delivery.

It is an object of the present invention to provide improved apparatus for carrying out a process, of the type described utilizing one or several fibre producing machines, feeding the same belt, which will avoid the necessity for reciprocating heads, and yet permit a web width at least comparable with that achieved by reciprocating head machines.

It is a further object of the invention to provide such apparatus which may employ a rod-melting furnace and yet provide a deposit area which is greater in width than the length of said rod melting furnace, and a web width which is greater than such length.

It is yet another object of the invention to provide such apparatus which can accommodate a greater fibre production rate than was hitherto found to be possible with reciprocating head equipment.

The invention provides improved apparatus for producing a web, tissue or mat of discontinuous glass fibres, including:

- a. a moving, air pervious conveyor belt;
- b. at least one source of continuous glass filaments which is located beside said conveyor belt and which comprises a laterally extending row of molten glass filament forming elements;
- c. means for continuously drawing out and solidifying said glass filaments and for breaking them into discontinuous fibres of varying staple lengths;
- d. means for providing a continuous air current from said filament breaking means to a region above said conveyor belt and for entraining said fibres in said air current in a flow path along a main axis of feed;

the improvement comprising the provision of stationary hood means defining at least the top and sides of said flow path and serving to guide said air current and entrained fibres over and down on to said conveyor belt, in a stationary strip-like deposit area extending over said belt at an oblique angle to its line of movement and wherein the longer dimension of said deposit area exceeds the length of a row of said filament forming elements.

In one preferred form of the invention said source of continuous glass filaments includes a row of substantially vertically disposed glass rods, and electric heating means is provided to melt the lower ends of said rods thereby generating continuously falling molten filaments.

In another preferred form said source of continuous glass filaments includes a row of nozzles extending beneath crucible means containing molten glass.

Conveniently said stationary hood means may extend substantially horizontally and terminate in a downwardly extending end surface in a plane which (in plan) lies at right angles to said main axis of feed, the end lip of said end surface being substantially equal to said longer dimension of said deposit area. The width of said stationary hood means, where said air current first impinges upon it, may only be very slightly greater than the length of a row of said filament forming elements, whereas the length of said end surface preferably exceeds the length of such row by at least 10 percent. It is also desirable that the sides of the upper surface of

said stationary hood means shall flare smoothly outwardly in plan towards said end surface.

As an alternative to the use of a flared hood, there is a further arrangement, in accordance with the invention for providing that the width of the web formed by depositing said fibres on said conveyor belt shall exceed the length of a row of said filament forming elements.

In this alternative there is provided apparatus including at least one pair of glass fibre producing machines disposed on opposite sides of said conveyor belt, and delivering said fibres over their respective deposit areas which at least partially overlap each other towards the center of said conveyor belt. In such apparatus the density of deposited glass fibres will normally diminish at the two ends of said longest dimension of said deposit area, but the aggregate density of said deposited fibres in the middle region of said belt is not significantly diminished, by virtue of said overlap.

In another form of this apparatus each of a pair of such glass fibre producing machines is staggered in relation to the other of such pair on the opposite side of said conveyor belts, and both such machines are adjustably mounted to enable the angular relationship of their main axis of feed to be changed in relation to the line of movement of said conveyor belt when the machine is not running; each such machine being adjustably mounted so that its main axis of feed can be slewed in a horizontal plane about a vertical axis which passes (in plan view) through a region within and close to the inner corner of said hood in each machine and a region at or close to the center line of said conveyor belt, whereby the width of the web deposited may be varied without destroying said overlap between opposing staggered deposit areas.

The present invention also aims to provide a simplified method and apparatus, for delivering the staple fibres to the belt, which enables one or several machines to be used; which dispenses with the need to reciprocate the distributing heads, but nevertheless provides means to compensate for unevenness in the air flow from the drum, and the consequent uneven deposition of fibres.

According to the present invention there is provided a process of the type described, having an improved delivery stage which involves the steps of entraining staple glass fibres, as they leave the drum, in a continuous current of air generated by the rotation of the drum within a partially surrounding close fitting shroud; guiding the current in a path away from the region of the drum and along a main axis of feed which extends across and above the conveyor belt at an angle other than a right angle to the run of the conveyor, and thence downwardly on to the conveyor to deliver fibres on to a strip-like delivery area the position of which does not move to and fro along the main axis of feed. The airborne fibres are confined at least for the latter part of their path in an enclosing passage of which the outlet orifice has a variable but substantially rectangular cross-section, being shaped to deposit fibres over the aforesaid strip-like area; the opposed long sides of at least the mouth portion of the outlet orifice being deformable with respect to one another so that, by changing the shape of the enclosing passage, the velocity of the air flow through it can be varied at selected parts across its width and hence the pattern and local density of fibre deposition along the length of the strip-like

area can be correspondingly varied, to compensate for irregularities in deposition which may occur due to irregularities in the air flow between the drum and to outlet region.

The invention includes improved apparatus for carrying out the above-mentioned process, including equipment for continuously forming glass filaments and feeding them to the surface of a continuously rotating drum partially surrounded by an enclosing shroud; scraper means for picking up the filaments, breaking them into staple glass fibres and removing the fibres from the drum before they have been carried for a complete revolution of the drum; means for entraining the fibres in an air current induced at least in part by the rotation of the drum within the shroud, and a stationary guide conduit for carrying the fibres along a main axis of feed which extends across the conveyor belt at an angle other than a right angle to the run of the conveyor, to deposit the fibres on to a moving air pervious conveyor belt. At least the delivery end of the guide conduit is totally enclosed, and terminates in a downwardly directed substantially rectangular outlet orifice having at least its two long walls deformable relative to each other, and positioned to deliver fibres over a strip-like delivery area extending at least partially across the conveyor belt.

If desired, the angle between the main axis of feed and the axis of the run of the conveyor can be varied, by swivelling the main axis of feed about a vertical axis which passes (in plan view) through the end of said delivery area furthest from the edge of said belt on the side where said apparatus is mounted. To achieve this, the complete staple glass fibre producing machine may be so mounted on rails or the like that its main axis of feed can be slewed in a horizontal plane.

It is a further feature of the invention that adjustment means may be provided for changing the width of the opening of the outlet orifice selectively along its length, and such adjustment means may comprise a plurality of hinged flaps, along one of the long sides of said orifice, each flap being provided with adjustment means for rotating it about its hinge pivot.

Alternatively, one long side of said orifice may be made from flexible material and adjustment means provided for distorting this flexible side towards or away from the opposite side of said orifice at selectable positions along its length.

Alternatively one long side of the enclosed part of the conduit near to, but not at, said orifice may be made from flexible material, adjustment means being provided for moving the flexible part locally towards or away from the opposite side of the conduit.

The invention also provides a process and apparatus in which the density of the deposited loose staple fibres making up the mat, web or tissue is automatically sensed and quantified and resulting information concerning irregularities in density is employed to provide a signal to a control mechanism which governs the shape of the enclosed part of the conduit at or near to the outlet orifice, such signal acting to cause the control mechanism to deform the conduit at or near to the outlet orifice automatically to a shape which alters the flow of airborne fibres through it, and hence the density of fibres at selected regions across the strip-like area in a way that tends to compensate for the irregularities in density originally observed.

To explain the invention further and to illustrate various embodiments incorporated in the invention reference is now made to the accompanying diagrammatic drawings in which:

FIGS. 1, 2 and 3 show schematically the layout of a staple fibre producing machine having stationary hood means to explain its general operation;

FIG. 1 being a diagrammatic side view;

FIG. 2, a diagrammatic perspective view looking along the belt, and

FIG. 3, a diagrammatic plan view;

FIG. 4, illustrates a construction of a machine having a flared hood in accordance with the invention;

FIG. 5, shows apparatus including two machines, arranged to provide an increased web width, while,

FIGS. 6 and 7, illustrate the manner in which the machines of FIG. 5 may be slewed to provide webs of varying width;

FIGS. 8 to 11, illustrate methods for adjusting the outlet.

In FIG. 1, a thread of molten glass 1 emanating from a source of molten glass 1a, and falling on to the anti-clockwise rotating drum 2 is carried by the drum until broken into short staple lengths and detached by the scraper 3 and swept forward in the current of air produced by the rotation of the drum within the shroud 4 along the conduit 5, the latter part of which, 6, is enclosed and curved downwards so as to discharge the fibres through the orifice 7 on to the pervious moving belt 8.

FIG. 2 shows diagrammatically in side perspective view the staple fibre making machine of FIG. 1 disposed at one side of the moving belt, the orifice 7 of said machine extending across the full width of the belt, while FIG. 3 shows the plan view of FIG. 2, in which  $W^1$  is the width of the source of molten fibres 1a,  $W^2$  is the width of the outlet 7 of the hood 5 and  $W^3$  the width of the web 8a on the belt 8.

The machine illustrated in FIGS. 1, 2 and 3 may not necessarily incorporate features of the present invention but is described in order to show the general operation of a stationary hood machine, such for example as is disclosed in my prior U.S. application Ser. No. 212,777.

Referring specifically to FIG. 3, the arrow A indicates the main axis and direction of feed of the fibres and the arrow B indicates the axis and direction of run of the belt 8. It should be noted that the sides 5a of the hood 5 are parallel and have no divergent outward flare. Taking the length  $W^1$  of the source of molten glass 1a as 100 percent, the length  $W^2$  of the orifice 7 is within the range 95 - 105 percent and the effective width of the deposit area is likewise  $W^2$ , i.e., 95 to 105 percent. The width  $W^3$  of the web 8a formed on the belt 8 is in the order of 70 percent, when the angle of feed of the stream of entrained fibres is at  $45^\circ$  to the run of the belt. Indeed, since the extreme margins of the web tend to be somewhat less dense than the central portion, and are always trimmed off after impregnation with plastics, the effective width of the web in FIG. 3 may well be in the order of 65 percent.

FIG. 4 shows a construction of a machine in accordance with the invention. Again the arrows A and B indicate fibre feed and belt run respectively. In this machine, the sides 5b of the hood are flared outwardly so that the length  $W^2$  of the orifice 7 is greater than the length  $W^1$  of the source of molten glass 1a. It has been

found that by flaring the hood divergently in this manner, the length  $W^2$  of the end 7 of the flared hood may effectively be made at least 10 percent greater than the length  $W^1$  of the source of molten glass 1a. Therefore, assuming  $W^1$  to be 100 percent and  $W^2$  to be 110 percent or even greater, the width  $W^3$  of the web 8a formed on the belt 8 will be in the order of 85 to 90 percent and even after trimming, the effective width of the web may be in the order of 80 to 85 percent. This represents an increase in the order of  $\frac{1}{4}$  to  $\frac{1}{3}$  over the web width of FIG. 3.

FIG. 5 shows, diagrammatically, a plan view of two machines located at opposite sides of the belt and together arranged in accordance with the invention so that their deposit zones, which slightly overlap, together cover the full effective width of the mat to be formed on that belt.

In FIG. 5, the fibre-producing machines with their conduits and orifices are indicated generally by the reference 14, the belt by the reference 8 and the web which is being formed, by the reference 13. The arrows A again indicate the direction of the main axis of feed of each machine and the arrow B indicates the direction of run of the belt. The deposit zones from the two machines 14 together extend effectively across substantially the whole width of the belt 8, to produce a web 13 formed by the combined deposit zones which merge and overlap in the center. Because the inner margins of the two deposit zones tend to be less dense in fibres, the aggregate density of fibres at the point where the two deposit zones merge and overlap is approximately the same as the remainder of the deposited web.

FIGS. 6 and 7 illustrate the effect of mounting a pair of side located machines 14, on rails, to enable them to be adjusted about a vertical axis 15 which passes through the inner corner of the hood 14. This enables the angle between the main feed axis A and the axis of the run of the belt B, to be adjusted and pre-set to give the required width of web. Where this angle more nearly approaches a right angle as in FIG. 7, the web 13 becomes narrower but proportionately denser, the same quantity of fibre being deposited over a narrower area of the belt at the same rate.

It will be appreciated that the embodiments described and illustrated in FIGS. 4 to 7, are only examples of various ways in which stationary guide elements (that is to say stationary with respect to the belt when in use) can be adapted to provide webs of any predetermined width within a wide range and of any predetermined density or graduation of density, within a wide range. This can be achieved without involving the additional expense and complication of machinery to reciprocate the heads as in prior U.S. Pat. Nos. 2,996,102 and 3,220,811, or to swing the heads as in prior British Pat. No. 1,134,685.

FIGS. 8 and 9 show one method according to the invention of adjusting the narrow width of the conduit so as to ensure a uniform concentration of fibres in the air stream across the full width of the orifice 7. It will be seen that one side of the orifice is divided into a series of hinged flaps 9 which are individually adjustable towards or away from the opposite side by a screw or like means, as shown schematically at 10.

FIG. 10 shows an alternative method of adjustment, one long side of the orifice 11 being made of flexible material which can be distorted towards or away from

the opposite side at selected points along the width of the conduit by screw or like means.

FIG. 11 shows a further alternative method of adjustment, a section of one side of the enclosed part of the conduit 6 being made at 12 of flexible material and being distorted as needed towards or away from the opposite side by screw or like means, as in the example of FIG. 10.

I claim:

1. Improved apparatus for producing a web, tissue or mat of discontinuous glass fibres, including:
  - a. a moving, air pervious conveyor belt;
  - b. means for supplying continuous glass filaments which is located beside said conveyor belt and which comprises a laterally extending row of molten glass filament forming elements;
  - c. means for continuously drawing out and solidifying said glass filaments and for breaking them into discontinuous fibres of varying staple lengths;
  - d. means for providing a continuous air current from said filament breaking means to a region above said conveyor belt and for entraining said fibres in said air current in a flow path along a main axis of feed;

the improvement comprising the provision of a pair of stationary hood means, each hood means defining at least the top and sides of said flow path and serving to guide said air current and entrained fibres over and down on to said conveyor belt, in a stationary strip-like deposit area extending over said belt at an oblique angle to its line of movement and wherein the width of the web formed by depositing said fibres on said conveyor belt exceeds the length of a row of said filament forming elements, said pair of hood means being disposed on opposite sides of said conveyor belt, and delivering said fibres over their respective deposit areas which at least partially overlap each other towards the center of said conveyor belt, the density of deposited glass fibres diminishing at the two ends of the longest dimension of said deposit area, but the aggregate density of said deposited fibres in the middle region of said belt being not significantly diminished, by virtue of said overlap, and in which one hood means of the pair of said hood means is staggered in relation to the other of such pair on the opposite side of said conveyor belt, and in which both such hood means are adjustably mounted to enable the angular relationship of their main axis of feed to be changed in relation to the line of movement of said conveyor belt when said hood means are not being used, each such hood means being adjustably mounted so that its main axis of feed can be slewed in a horizontal plane about a vertical axis which passes, in plan view, through a region within and close to the inner corner of said hood means and a region at or close to the center line of said conveyor belt, whereby the width of the web deposited may be varied without destroying said overlap between opposing staggered deposit areas.

2. In a process for the production of a web, tissue or mat of staple glass fibres in which molten glass filaments emerge continuously from a furnace and are picked up on a continuously rotating drum, said filaments being removed from said drum by scraper means and then delivered in broken condition as staple glass fibres on to a conveyor belt, an improved delivery stage which involves the steps of:

- i. entraining said fibres, as they leave said drum, in a continuous current of air generated by the rotation of said drum within a partially surrounding, close fitting shroud;
- ii. guiding said current in a stationary path away from the region of said drum and along a main axis of feed which extends across and above said conveyor belt diagonally to the run of said conveyor belt, and thence downwardly on to said conveyor belt, to deliver said fibres on to a stationary strip-like delivery area; and
- iii. confining said airborne fibres at least for the latter part of their path in an enclosing passage terminating in an outlet having a substantially rectangular cross-section, and acting to deposit fibres over a striplike area extending across said conveyor belt; deforming the opposed long sides of at least the mouth portion of said outlet with respect to one another to vary, by changing the shape of said mouth portion, the velocity of said airflow through it at selected parts across its width and hence the pattern and local density of fibre deposition along the length of said strip-like area to compensate for irregularities in deposition which may occur due to irregularities in said air flow from said drum to the region of said outlet.

3. A process as claimed in claim 2, in which the density of the deposited loose fibres constituting said mat, web or tissue is automatically sensed and quantified, and resulting information concerning irregularities in said density is employed to provide a signal to a control mechanism which governs the shape of said outlet, such signal acting to cause said control mechanism to deform said outlet automatically to a shape which alters said flow of airborne fibres through it, and hence alters the density of said fibres at selected regions across said strip-like area in a way that tends to compensate for the irregularities in said density originally observed.

4. Apparatus for producing a web, tissue or mat of staple glass fibres, including equipment for continuously forming glass filaments and feeding said filaments to the surface of a continuously rotating drum partially surrounded by an enclosing shroud; scraper means for picking up said filaments and removing said filaments from said drum before said filaments have been carried for a complete revolution of said drum; means for entraining said filaments in an air current induced at least in part by the rotation of said drum within said shroud,

at least one of said means breaking said filaments into staple length fibres, the improvement comprising the provision of a stationary guide conduit for carrying said fibres along a main axis of feed on to a moving air previous, conveyor belt, said main axis of feed extending diagonally across said conveyor belt to deposit said fibres on to said conveyor belt over a stationary strip-like delivery area and means for slewing said apparatus to adjust the angle of said main axis of feed relative to the run of said conveyor belt about a vertical axis which passes, in plan view, through the end of said delivery area furthest from the edge of said belt on the side where said apparatus is mounted.

5. Apparatus as claimed in claim 4, in which at least the delivery end of said guide conduit is totally enclosed, and terminates in a downwardly directed, substantially rectangular, outlet opening, having at least its two long walls deformably adjustable relative to each other, and positioned to deposit said fibres over a strip-like delivery area extending at least partially across said conveyor belt, and in which adjustment means are provided for changing the width of said outlet opening selectively along its length.

6. Apparatus as claimed in claim 5, in which said adjustment means comprises a plurality of pivotally hinged flaps along one of the long sides of said outlet opening, each said flap being provided with means for rotating it about its hinge pivot.

7. Apparatus as claimed in claim 5, in which one long side of said outlet opening is made from flexible material and in which said adjustment means acts to distort said flexible side towards or away from the opposite side of said outlet opening at selectable positions along its length.

8. Apparatus as claimed in claim 1, including means for sensing automatically the density of said deposited loose fibres making up said mat, web or tissue; means for converting the resulting information concerning irregularities in density into a signal; means for deforming said outlet opening; and means for causing such signal to actuate such deforming means to deform said outlet opening automatically to a shape which alters the flow of said airborne fibres through it and hence to alter the density of said deposited fibres at selected regions across said strip-like area, in a way that tends to compensate for the irregularities in density originally observed.

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