Apparatus for the manufacture of fibrous webs.

Priority: 16.04.84 US 600679

Date of publication of application: 23.10.85 Bulletin 85/43

Publication of the grant of the patent: 20.12.89 Bulletin 89/51

Designated Contracting States: AT BE CH DE FR GB IT LI NL SE

References cited:
DE-A-2 620 033
US-A-3 938 782

Proprietor: James River-Norwalk, Inc.
P.O. Box 6000
Norwalk Connecticut 06856 (US)

Inventor: Cheshire, James Oscar
786 Dartmouth Lane
Neenah Wisconsin 54956 (US)

Inventor: Marinack, Robert John
3585 Allenville Rd.
Oshkosh Wisconsin 54901 (US)

Inventor: Van den Akker, Johannes Archibald
1 Brokaw Place
Appleton Wisconsin 54911 (US)

Inventor: Lindgren, Douglas Leroy
811 Windfield Place
Appleton Wisconsin 54911 (US)

Representative: Schupfner, Gerhard D. et al
Müller, Schupfner & Gauger Karlstrasse 5
Postfach 14 27
D-2110 Buchholz/Nordheide (DE)

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European patent convention).
Description

This invention relates to an apparatus for forming and directing a foam-fibre furnish onto a forming wire in the manufacture of a fibrous web, with a slice positioned and operative to deposit said foam-fibre furnish onto said forming wire; and a headbox channel in direct fluid flow communication with said slice and including an inner wall portion; a plurality of foam-forming openings in fluid flow connection with said headbox channel and positioned and adapted to receive a foamable liquid-fibre furnish and to form and force direct foam-fibre furnish having a relatively low viscosity into said channel and as it flows through said slice, whereby random orientation of the fibers in the furnish is insured throughout said channel and as it flows through said slice for deposit on said forming wire.

In the manufacture of fibrous webs, such as paper, from a foam-fibre furnish deposited on a forming wire from the slice of a conventional foam-forming headbox, it has been found difficult to maintain a desired random orientation of fibers ensuring optimum MD/CD tensile strength of the formed sheet at the preferred, relatively high wire speeds associated with papermaking. Efforts at achieving a desired fiber orientation have involved delivering the foam-fibre furnish to the slice, immediately upon creation of the furnish.

DE—A—2 620 033 discloses an apparatus for forming and directing a foam-fibre furnish onto a forming wire in the manufacture of a fibrous web, with a slice positioned and operative to deposit said foam-fibre furnish onto said forming wire. A headbox channel in direct fluid flow communication with said slice includes inner wall portions. A plurality of foam-forming openings is in fluid flow connection with said headbox channel and is positioned and adapted to receive the foamable liquid-fibre furnish and to form and directly force foam-fibre furnish having a relatively low viscosity into said channel, whereby the foam-fibre furnish impinges upon the inner wall portion and flows throughout said channel through the slice. The recited impingement creates turbulence in the low-viscosity foam-fibre furnish whereby random orientation of the fibres in the furnish is insured throughout said channel and as it flows through said slice for deposit on said forming wire.

The invention contemplates an improvement on the foregoing explained apparatus in such a manner that a better turbulent flow of the foam-fibre furnish is created to obtain a better random fiber orientation.

The improvement is characterized in that each of said foam-forming openings are nozzles, which comprises means defining a generally tubular fluid passage having regions of alternate lesser and greater cross sectional areas.

Such nozzles with alternate cross sectional areas create a turbulent flow immediately and especially prior said foam-fibre furnish passes said slice.

It is important, how the inner wall portion of the headbox channel is formed. Preferred embodiments of the invention are therefore characterized in that the inner wall portion is substantially planar, curved or cylindrical.

Furthermore the turbulent flow will advantageously be improved with a feature characterized in that said channel is provided with a second array of foam forming nozzles positioned to direct foam-fibre furnish onto an opposing wall of said channel, or with a feature characterized in that a plurality of rows of foam forming nozzles extend longitudinally of said cylindrical channel and so positioned as to direct foam-fibre furnish into said channel in a radial direction.

Another preferred embodiment of the invention is achieved with the feature, characterized in that said foam forming nozzles are so positioned as to direct a stream of foam-fibre furnish into said channel to impinge upon at least one stream of foam-fibre furnish from another of said foam-forming nozzles.

A further preferred embodiment of the invention is characterized in that each said nozzle is about 7.6 cm (about 3 inches) long, said bore is generally cylindrical, said lesser cross sectional areas are of about 1.3 cm (about 1/2 inch) diameter, said greater cross sectional areas are of about 1.9 cm (about 3/4 inch) diameter, and said regions are spaced axially of the nozzle about 1.3 cm (about 1/2 inch), and further wherein the recited connection of said nozzles with said headbox is about 5 cm (about 2 inches) from said inner wall portion.

A further preferred embodiment of the headbox channel is characterized by an apparatus according to Claim 1, including wall portions of the headbox defining the channel in substantially direct fluid flow communication with said slice, at least one pair of said wall portions being in mutually confronting spaced relation; and an array of foam forming nozzles connected through one of the confronting wall portions to said headbox channel and positioned and operative to impinge upon the other of said confronting wall portions.

A further preferred embodiment of the invention is characterized in that said channel further is defined by an additional pair of closely spaced confronting wall portions extending transversely of said first recited pair of wall portions; and at least one wall portion of the second recited pair having connected therethrough to said channel a second array of foam forming nozzles positioned and adapted to direct foam-fibre furnish for
impingement on the opposite wall portion of said second pair and flow through said slice.

Further preferred embodiments of the invention are characterized in that said impact surface is substantially perpendicular to the polar axis of a nozzle and that said forming wire is linearly movable at a predetermined speed, and the speed at which said furnish is deposited is in excess of the speed of movement of said forming wire.

Brief description of the drawing

Figure 1 is a diagrammatic showing of a web forming apparatus embodying the invention;

Figure 2 is a detailed showing, on an enlarged scale and partly in section, of a portion of the apparatus seen in Figure 1, and illustrating important structural features of the invention.

Figure 3 is a top plan view of the portion of apparatus seen in Figure 2; and

Figures 4 to 7 are showings similar to Figure 2, and illustrating modified embodiments of the invention.

Detailed description of the several embodiments

With more detailed reference to the drawing, there is seen in Figure 1 a web forming apparatus 10 comprising a headbox 11 provided with a channel 11a leading to throat 12a of an adjustable slice 12 positioned and operative to discharge a foam-fiber furnish onto a forming wire 13 as it passes over a breast roll 14. Adjustment of the slice is afforded by a roof or upper wall 12b of throat 12a mounted for pivotal movement about hinge P, and positionable by a conventional jack means 12c. Suction boxes 15 and 16 are disposed beneath wire 13, and are connected to a vacuum source 17 for receiving both foam and liquid derived from collapsed foam, and drained through the wire. Drained foam and liquid are returned by a pump 18 through conduit 19 to an in-line mixer 20 for reuse, where additional fiber, either dry or as a dispersion, and air are introduced through pipe 33 to conduit 19, by means of a known metering device such as is seen at 32, to form a dispersion of air and fiber in water containing a surfactant in creation of a foamable furnish. From mixer 20, the foamable furnish is fed under pressure by a pump 21 through conduit 19 to an in-line mixer 20 for reuse, where additional fiber, either dry or as a dispersion, and air are introduced through pipe 33 to conduit 19, by means of a known metering device such as is seen at 32, to form a dispersion of air and fiber in water containing a surfactant in generation of a foamable furnish. From mixer 20, the foamable furnish is fed under pressure by a pump 21 through conduit 19 to an in-line mixer 20 for reuse, where additional fiber, either dry or as a dispersion, and air are introduced through pipe 33 to conduit 19, by means of a known metering device such as is seen at 32, to form a dispersion of air and fiber in water containing a surfactant in generation of a foamable furnish. From mixer 20, the foamable furnish is fed under pressure by a pump 21 through conduit 19 to an in-line mixer 20 for reuse, where additional fiber, either dry or as a dispersion, and air are introduced through pipe 33 to conduit 19, by means of a known metering device such as is seen at 32, to form a dispersion of air and fiber in water containing a surfactant in generation of a foamable furnish. From mixer 20, the foamable furnish is fed under pressure by a pump 21 through conduit 19 to an in-line mixer 20 for reuse, where additional fiber, either dry or as a dispersion, and air are introduced through pipe 33 to conduit 19, by means of a known metering device such as is seen at 32, to form a dispersion of air and fiber in water containing a surfactant in generation of a foamable furnish. From mixer 20, the foamable furnish is fed under pressure by a pump 21 through conduit 19 to an in-line mixer 20 for reuse, where additional fiber, either dry or as a dispersion, and air are introduced through pipe 33 to conduit 19, by means of a known metering device such as is seen at 32, to form a dispersion of air and fiber in water containing a surfactant in generation of a foamable furn...
another and fully on the confronting impact surfaces or walls of the headbox channel at relatively short distances from the slice 12. Since foam flowing from nozzles 24 is at its lowest apparent viscosity, a condition under which it is most likely to become turbulent, the abrupt changes of direction due to the hereinabove described impingements advantageously create considerable turbulence in channel 11a immediately prior to flow of the foam-fiber furnish through the relatively short throat 12a to slice 12 for uniform distribution onto forming wire 13. Throat 12a of slice 12 is about 41 cm (16 inches) long so that the foam with its dispersion of randomly oriented fibers advantageously travels a relatively short distance from the headbox channel through the slice throat, thereby minimizing unidirectional orientation as the foam tends to revert to laminar flow in the slice throat. Hence, apparatus embodying the invention achieves desirable, relatively low MD/CD ratios of fibrous webs with minimization of the number of moving parts.

In the additional, modified embodiments of the invention as seen in Figures 4 to 6, the foam forming nozzles are in fluid flow communication with the headbox channel at different locations than those hereinabove described. In the additional, modified embodiment seen in Figure 7, the headbox channel is generally cylindrical, affording curved walls as briefly described hereinabove, and the axes of the nozzles are located along the length of the channel as are the axes of the nozzles in Figures 1 to 3.

In Figure 4, the several walls 126 through 131 of headbox 111, similar to the one described in connection with Figures 1 to 3, define a channel 111a leading to throat 112a for feeding foam-fiber furnish through adjustable slice 112 onto forming wire 113 moving on breast roll 114. Nozzles 124 are similar to the hereinabove described foam forming nozzles 24, and, while arranged in staggered array, are provided only in top wall 126, whereby foam-fiber furnish introduced into the channel impinges upon lower wall 127 as an impact surface.

In Figure 5, reference numerals refer to like numerals as seen in Figures 1, 2 or 3, but with the prefix 2 applied. It is seen that foam forming nozzles 224 are so positioned that one array is connected to the headbox channel 2121a through top wall 226 and the other array is offset as respects the one array and is connected to the channel through bottom wall 227. In this construction the foam-fiber furnish introduced to the headbox channel through upper nozzles 224 impinges upon lower wall 227 and flows through throat 212a, while furnish introduced through lower nozzles 224 impinges on upper wall 226 and mingles with the furnish introduced through the upper nozzles as it flows through throat 212a.

In Figure 6, elements are designated with numerals used to designate like elements of Figures 1, 2 and 3, but with the prefix 3 applied, and it is seen that all nozzles 324 are connected to the headbox channel 311a through wall 331 for impingement of the foam fiber furnish onto opposite wall 330.

In Figure 7, elements are designated with numerals used to designate like elements of Figures 1, 2, and 3, but with the prefix 4 applied. In Figure 7, the horizontally extending headbox channel 411a is defined by curved wall portions of a hollow cylindrical structure about 5.7 cm (2 1/4 inches) in diameter and closed at its ends by walls, one of which is seen at 428. A cylindrical channel advantageously affords a compact arrangement for three arrays of foaming nozzles 424 of the type hereinabove described, and whose centerlines are spaced about 5.7 cm (2 1/4 inches) apart along the length of the channel. The arrays are disposed in fluid flow communication with channel 411 in upper left and right quadrants and in the lower right quadrant of the cylindrical wall portions of the channel so that each nozzle is effective to direct foam-fiber furnish transversely of the polar axis of the cylindrical structure onto an opposed curved, cylindrical wall portion serving as an impact surface. The entrance of the slice throat 412a occupies the lower left quadrant. While the nozzles are shown in the same plane for the sake of convenience, it will be understood that the nozzles of each array are staggered as respects the nozzles of the other arrays, so that the spacing between centerlines of the nozzles as between arrays is about 1.9 cm (3/4 inch).

In any of the embodiments shown in Figures 1 to 6, the impact surface is relatively closely spaced from the region of introduction of the foaming nozzle to the relatively low-volume headbox channel, which impact surface also is substantially perpendicular to the axis of a nozzle. In the embodiment shown in Figure 7, essentially the same spatial relationship exists, with the tangent to the cylindrical surface at the center of the impact being substantially perpendicular to the axis of a nozzle. By such cooperative dispositions of the nozzles and impact surfaces, taken with a headbox channel of relatively small volume, turbulent foam flow is achieved throughout the channel and well into the slice throat. This turbulent flow advantageously maximizes random orientation of fibers well into the slice throat and as they exit the slice for deposition on the forming wire.

Claims

1. Apparatus for forming and directing a foam-fiber furnish onto a forming wire in the manufacture of a fibrous web, with a slice (12) positioned and operative to deposit said foam-fiber furnish onto said forming wire (13, 113, 213, 313, 413); and a headbox channel (11a, 111a, 211a, 311a, 411a) in direct fluid flow communication with said forming wire (13, 113, 213, 313, 413) and said headbox channel (11a, 111a, 211a, 311a, 411a) and positioned and adapted to
receive a foamy liquid-fiber furnish and to
form and forcible direct foam-fiber furnish having a relatively low viscosity into said channel to
impinge upon said inner wall portion (27, 30, 127, 227, 330) and flow throughout said channel, the
recited impingement being effective to create
turbulence in the low-viscosity foam-fiber furnish in
said channel immediately upon its flow through said slice (12, 112, 212, 312, 412) whereby random orientation of the fibers in the furnish is insured throughout said channel and as it flows through said slice for deposit on said forming wire (13, 113, 213, 313, 413);
characterized in that each of said foam-forming
openings (24, 124, 224, 324, 424) are nozzles, which comprises means defining a generally
tubular fluid passage having regions of alternate lesser and greater cross sectional areas.
2. Apparatus of Claim 1, characterized in that
said inner wall portion (27, 30, 127, 227, 330) is substantially planar.
3. Apparatus of Claim 1, characterized in that
said inner wall portion is curved.
4. Apparatus of Claim 3, characterized in that
said curved inner wall portion is a cylindrical section.
5. Apparatus according to any of Claims 1 to 4
characterized in that said channel (11a, 211a, 311a, 411a) is provided with a second array of foam forming nozzles (124, 224, 324, 424) positioned to direct foam-fiber furnish onto an opposing wall (127, 227, 330) of said channel (11a, 211a, 311a, 411a).
6. Apparatus according to Claim 4 characterized in that a plurality of rows of foam forming nozzles (424) extend longitudinally of said cylindrical channel (411a) so positioned as to direct foam-fiber furnish into said channel (411a) in a radial direction.
7. Apparatus according to any of Claims 1—5
characterized in that said foam forming nozzles (24, 424) are so positioned as to direct a stream of foam fiber furnish into said channel (11a, 411a) to impinge upon at least one stream of foam-fiber furnish from another of said foam-forming nozzles.
8. Apparatus according to any of Claims 1—5
characterized in that said second array of nozzles (124, 224, 324) is arranged to forcibly discharge foam-fiber furnish in a non-intersecting path relative to paths of flow of foam-fiber furnish from said first array of nozzles.
9. Apparatus according to Claim 1, wherein
each said nozzle (24, 124, 224, 324) is about 7.6 cm
(about 3 inches) long, said bore (25, 125, 225, 325) is generally cylindrical, said lesser cross sectional areas are of about 1.3 cm (about 1/2 inch) diameter, said greater cross sectional areas are of about 1.9 cm (about 3/4 inch) diameter, and said regions are spaced axially of the nozzle about 1.3 cm (about 1/2 inch), and further wherein the recited connection of said nozzles with said headbox (11, 111, 211, 311) is about 5 cm (about 2 inches) from said inner wall portion.
10. Apparatus according to Claim 1 charac-
terized by including wall portions (28, 27, 30; 127, 227, 330, 331) of the headbox defining the channel (11a, 111a, 211a, 311a) in substantially direct fluid flow communication with said slice, at least one pair of said wall portions being in mutually confronting spaced relation; and an array of foam forming nozzles (24, 124, 224, 324, 424) connected through one of the confronting wall portions (26, 127, 227, 331) to said headbox channel and positioned and operative to impinge upon the other of said confronting wall portions (27, 30, 127, 330).
11. Apparatus according to Claim 10, charac-
terized in that said channel (311a) further is
defined by an additional pair of closely spaced confronting wall portions (330, 331) extending transversely of said first recited pair of wall portions (326, 327); and at least one wall portion (331) of the second recited pair having connected therethrough to said channel a second array of foam forming nozzles positioned and adapted to direct foam-fiber furnish for impingement on the opposite wall portion (330) of said second pair and flow through said slice (312).
12. Apparatus of Claim 10 characterized in that said impact surface is substantially perpendicular to the polar axis of a nozzle.
13. Apparatus of Claim 1 or 10 characterized in that said forming wire (15, 113, 213, 313, 413) is linearly movable at a predetermined speed, and the speed at which said furnish is deposited is in excess of the speed of movement of said forming wire.

Patentansprüche
1. Vorrichtung zum Formen und Leiten eines Schaumfasersstoffs auf ein Formsieb bei der Herstellung einer Faserstoffbahn, wobei eine Stauvorrichtung (12) so angeordnet ist, daß sie den Schaumfasersstoff aus das Formsieb (15, 113, 213, 313, 413) aufgibt, und ein Stoffauflaufkanal (11a, 111a, 211a, 311a, 411a) in direkter Fluidströmungsverbindung mit der Stauvorrichtung (12) steht und einen Innenwandabschnitt (27, 30, 127, 227, 330) aufweist; mit mehreren schaumbildenden Öffnungen (24, 124, 224, 324, 424), die mit dem Stoffauflaufkanal (11a, 111a, 211a, 311a, 411a) in Fluidströmungsverbindung stehen und so angeordnet und ausgelegt sind, daß sie einen schaumbaren Flüssigfasereintrag erhalten und einen Schaumfasersstoff relativ niedriger Viskosität unter Druck in den Kanal richten, so daß er auf den Innenwandabschnitt (27, 30, 127, 227, 330) aufprallt und den gesamten Kanal durchfließt, wobei der genannte Aufprall eine Turbulenz in dem niedrigviskosen Schaumfasersstoff im Kanal unmittelbar beim Durchfließen der Stauvorrichtung (12, 112, 212, 312, 412) erzeugt, so daß eine Wirrung der Fasern im Stoff durch den gesamten Kanal und während des Durchfließens der Stauvorrichtung zur Aufgabe auf das Formsieb (13, 113, 213, 313, 413) gewährleistet ist
dadurch gekennzeichnet, daß sämtliche schaumbildenden Öffnungen (24, 124, 224, 324,
424) Düsen sind, die einen im wesentlichen rohrförmigen Fluidkanal definierende Mittel aufweisen, die Bereiche mit alternierend kleineren und größeren Querschnittsflächen hat
durch eine Verweildauer von 30, 127, 227, 330) im wesentlichen eben ist.
2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß der Innenwandschnitt (27, 30, 127, 227, 330) im wesentlichen eben ist.
3. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß der Innenwandschnitt gekrümmt ist.
4. Vorrichtung nach Anspruch 3, dadurch gekennzeichnet, daß der gekrümmte Innenwandschnitt ein Zylinderabschnitt ist.
5. Vorrichtung nach einem der Ansprüche 1—4, dadurch gekennzeichnet, daß der Kanal (11a, 211a, 311a, 411a) eine zweite Reihe schaumbildenden Düsen (124, 224, 324, 424) aufweist, die so angeordnet sind, daß sie Schaumfaserstoff auf eine gegenüberstehende Wand (127, 227, 330) des Kanals (111a, 211a, 311a, 411a) richten.
6. Vorrichtung nach Anspruch 4, dadurch gekennzeichnet, daß mehrere Reihen von schaumbildenden Düsen (24, 424) so angeordnet sind, daß sie einen Schaumfaserstoffstrom so in den Kanal (124, 411a) richten, daB er auf den gegenüberstehenden Wandabschnitt (331) des zweitgenannten Paares einen Schaumfaserstoffstrom so in den Kanal (127, 227, 330) des Kanals (111a, 211a, 311a, 411a) richten.
7. Vorrichtung nach einem der Ansprüche 1—5, dadurch gekennzeichnet, daß die schaumbildenden Düsen (24, 424) so angeordnet sind, daß sie einen Schaumfaserstoffstrom so in den Kanal (111a, 211a) richten, daB sich auf wenigstens einen Schaumfaserstoffstrom aus einer anderen der schaumbildenden Düsen auftreffen.
8. Vorrichtung nach einem der Ansprüche 1—5, dadurch gekennzeichnet, daß die zweite Reihe Düsen (124, 224, 324) so angeordnet ist, daB sie Schaumfaserstoff in eine Bahn auspressen, die keine der Strömungsbahnen von Schaumfaserstoff aus der ersten Reihe Düsen schneidet.
9. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß jede Düse (24, 124, 224, 324) eine Länge von ca. 7,6 cm (ca. 3") hat, die Einrichtung (26, 126, 226, 326) im wesentlichen zylindrisch ist, die kleineren Querschnittsflächen einen Durchmesser von ca. 1,3 cm (ca. 1/2") und die größeren Querschnittsflächen einen Durchmesser von ca. 1,9 cm (ca. 3/4") haben und die genannten Bereiche in Axialrichtung der Düse um ca. 1,3 cm (ca. 1/2") beobachtet sind, und daß der Anschluß der Düsen an den Stoffauflauf (11, 111, 211, 311) ca. 5 cm (ca. 2") von dem Innenwandschnitt entfernt ist.
10. Vorrichtung nach Anspruch 1, gekennzeichnet durch den Kanal (11a, 211a, 311a, 411a) definierende Wandabschnitte (26, 27, 30; 126, 127, 227, 330, 331) in einem wesentlichen direkten Fluidströmungsverbindung mit der Stauvorrichtung, wobei wenigstens ein Paar der Wandabschnitte einander mit Abstand gegenübersteht; und eine Reihe von schaumbildenden Düsen (24, 124, 224, 324, 424), die durch einen der gegenüberstehenden Wandabschnitte (26, 126, 227, 331) an den Stoffauflaufkanal angeschlos-
définissant une passage de fluide globalement tubulaire ayant des zones de sections transversales alternativement plus petites et plus grandes.

2. Appareil selon la revendication 1, caractérisé en ce que ladite partie de paroi intérieure (27, 30, 127, 227, 330) est sensiblement plane.

3. Appareil selon la revendication 1, caractérisé en ce que ladite partie de paroi intérieure est incurvée.

4. Appareil selon la revendication 3, caractérisé en ce que ladite partie de paroi intérieure est un tronçon cylindrique.

5. Appareil selon l’une quelconque des revendications 1 à 4, caractérisé en ce que ladit canal (11a, 121a, 311a, 411a) comporte une seconde rangée de buses (124, 224, 324, 424) de formation de mousse disposées de façon à diriger une composition de mousse-fibre sur une paroi opposée (127, 227, 330) dudit canal (111a, 211a, 311a, 411a).

6. Appareil selon la revendication 4, caractérisé en ce que plusieurs rangées de buses (424) de formation de mousse s’étendent longitudinalement audit canal cylindrique (411a) afin d’être placées de manière à diriger la composition de mousse-fibre dans ledit canal (411a) dans une direction radiale.

7. Appareil selon l’une quelconque des revendications 1—5, caractérisé en ce que lesdites buses (24, 424) de formation de mousse sont disposées de façon à diriger un courant de composition de mousse-fibre dans ledit canal (11a, 411a) afin qu’il heurte au moins un courant de composition de mousse-fibre provenant d’une autre desdites buses de formation de mousse.

8. Appareil selon l’une quelconque des revendications 1—5, caractérisé en ce que ladite seconde rangée de buses (124, 224, 324) est agencée de façon à décharger à force la composition de mousse-fibre en un trajet ne coupant pas les trajets d’écoulement de la composition de mousse-fibre provenant de ladite première rangée de buses.

9. Appareil selon la revendication 1, dans lequel chacune des buses (24, 124, 224, 324) a une longueur d’environ 7,8 cm (environ 3 inches), ladite lumière (25, 125, 225, 325) est globalement cylindrique, lesdites sections transversales plus petites ont un diamètre d’environ 1,3 cm (environ 1/2 inch), lesdites sections transversales plus grandes ont un diamètre d’environ 1,9 cm (environ 3/4 inch), et lesdites zones sont espacées axialement à la buse d’environ 1,3 cm (environ 1/2 inch), et dans lequel, en outre, la liaison citée desdites buses avec ladite caisse d’arrivée (111a, 1211, 3311) est à environ 5 cm (environ 2 inches) de ladite partie de la paroi intérieure.

10. Appareil selon la revendication 1, caractérisé en ce qu’il comporte des parties de parois (26, 27, 30; 126, 127, 330, 331) de la caisse d’arrivée définissant le canal (11a, 111a, 211a, 311a) en communication d’écoulement de fluide sensiblement directe avec ladite règle, au moins une paire desdites parties de parois étant dans une disposition mutuellement en vis-à-vis; et une rangée de buses (24, 124, 224, 324, 424) de formation de mousse étant reliée à travers l’une des parties de parois en vis-à-vis (26, 126, 227, 331) audit canal de la caisse d’arrivée et étant placée et intervenant de façon à amener la composition à heurter l’autre desdites parties de parois en vis-à-vis (27, 30, 127, 330).

11. Appareil selon la revendication 10, caractérisé en ce que ladit canal (311a) est en outre défini par une paire supplémentaire de parties de parois (330, 331) en vis-à-vis, rapprochées, s’étendant transversalement à ladite première paire citée de parties de parois (326, 327); et au moins une partie de paroi (331) de la seconde paire citée comportant, reliée à travers elle audit canal, une seconde rangée de buses de formation de mousse placées et conçues pour diriger une composition de mousse-fibre afin qu’elle heurte la partie de paroi opposée (330) de ladite seconde paire et s’écoule à travers ladite règle (312).

12. Appareil selon la revendication 10, caractérisé en ce que ladite surface d’impact est sensiblement perpendiculaire à l’axe polaire d’une buse.

13. Appareil selon la revendication 1 ou 10, caractérisé en ce que ladite toile (13, 113, 213, 313, 413) de formation est mobile ligneaire à une vitesse prééDéterminé, et la vitesse à laquelle ladite composition est déposée est supérieure à la vitesse du mouvement de ladite toile de formation.