METHOD AND APPARATUS FOR MAKING A LAP OF FIBRES

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References Cited
UNITED STATES PATENTS
2,244,203 6/1941 Kern .......................... 19/65 T
2,247,504 7/1941 Kern .......................... 19/65 T
3,376,609 4/1968 Kalwates ....................... 19/66 T

FOREIGN PATENTS OR APPLICATIONS
1,258,313 1/1968 Germany ...................... 19/65 T

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ABSTRACT
A method of manufacturing a lap of fibres from a sliver of continuous chemical fibres by passing the sliver through the nips of two spaced pairs of driven rollers, and subjecting the section of sliver between the roller pairs to the striking action of concave edges of elongate paddle like members disposed as a driven paddle wheel around which the section passes. This paddle wheel is arranged to rotate about an axis located outside the plane extending directly between the nips of the roller pairs.

18 Claims, 20 Drawing Figures
METHOD AND APPARATUS FOR MAKING A LAP OF FIBRES

The present invention relates to a method of forming a lap of fibres from sliver of continuous chemical fibres of the type wherein the sliver is drawn out and caused to pass continuously between two pairs of feed rollers whose axes are parallel and are preferably horizontal, above a sectional member extending perpendicularly to the direction of travel and by means of which, in the region of contact between said sectional member and the section of sliver stretched between the two pairs of feed rollers, additional tensions in the form of vibrations are applied alternately to the fibres in a direction at least approximately perpendicular to the fibres located in said region.

A known method of the above mentioned type has been proposed for removing artificial threads or fibres from sliver of fibres in the form of individual fibres. For this purpose, the sliver is constituted by several rectilinear sections such as bars integral with a drive shaft and distributed uniformly around this shaft have been used. In order to improve the removal of fibres and with a view to widening out the sliver of fibres, it has been proposed to pass the sliver over a curvilinear section which guides the fibres of the slayer as they pass towards the vibrator.

This known method makes it possible to remove fibres from a sliver to a certain extent. However, it is unsuitable for the appreciable spreading out of fibres, a spreading out process which, moreover, was not desired by the known method.

An object of the invention is to provide a spreading method of the aforementioned type which makes it possible to at least double the width of the sliver of fibres.

There is provided according to the invention a method of manufacturing a lap of fibres from a sliver of continuous chemical fibres, wherein the sliver is stretched and caused to pass continuously between two pairs of feed rollers whose axes are parallel and which are preferably horizontal, over a sectional member extending perpendicularly to the direction of travel and according to which, in the region of contact between the sectional member and the fibres of the section of sliver stretched between the two pairs of feed rollers, additional tensions in the form of vibrations are applied alternately to the fibres in a direction at least approximately perpendicular to the fibres located in said region, the vibrations being applied to the fibres of the section of stretched sliver in such a way that the majority of vibrations imparted have an inclined transverse resultant with respect to the plane passing between the rollers of each of the two pairs of rollers.

Thus at the location of the curvilinear section the fibres of the sliver are subjected to vibrations which tend to widen the sliver out into a lap of well spread fibres, this widening out taking place quickly and uniformly without the sliver or resulting lap of fibres being diverted from its initial trajectory.

The invention also relates to apparatus for forming a lap of fibres from a sliver of fibres.

A known apparatus comprises two pairs of feed rollers, between which rollers pass the fibres of the sliver, control means for controlling the pair of upstream or so-called inlet rollers at a peripheral speed equal to or different from that of the pair of downstream or so-called outlet rollers and a rotary vibrator constituted by several sectional members located and uniformly distributed on a cylindrical support which is rotatable and connected to drive means, this vibrator being interposed between the two pairs of rollers in such a way that the peripheral face of each sectional member may come into contact with the fibres and extend transversely with respect to said fibres.

This known apparatus does not make it possible to achieve an appreciable spreading out of the fibres of the sliver, in particular due to the fact that the sectional members are constituted by rectilinear bars. In this case, the fibres remain side by side in the form of a flat bunch and do not constitute a genuine lap of fibres after they have passed above the rotary vibrator.

A further object is to remedy this drawback provide an apparatus which ensures a transverse spreading out of the fibres of the slayer in such a way that as they leave the apparatus the fibres are placed side by side and are uniformly distributed in transverse direction of the lap which they form.

According to another aspect of the invention there is provided an apparatus for forming a lap of fibres from a sliver of continuous chemical fibres comprising two pairs of feed rollers, between the rollers of which pass the fibres of the slayer, control means for driving the pair of upstream or so-called inlet rollers at a peripheral speed equal to or different from that of the pair of downstream also called outlet rollers, and a rotary vibrator constituted by several sectional members located and uniformly distributed on a cylindrical support which is rotatable and connected to drive means, this rotary vibrator being interposed between the two pairs of rollers in such a way that the peripheral face of each sectional member may come into contact with the fibres and extend transversely with respect to said fibres, characterised in that the peripheral face of each sectional member coming into contact with the fibres comprises, perpendicular to said fibres, a section of general convex curvilinear shape, whose apex, seen in plan view is in alignment with the axis of the sliver of fibres.

Thus, the stretched fibres of the slayer are subject to vibrations which separate said fibres from each other and which, in co-operation with the convex face of the curvilinear section, ensure a lateral spreading out and uniform transverse distribution of said fibres.

The invention will now be further described with reference to several non limiting embodiments, illustrated in the accompanying drawings in which:

FIG. 1 is a central cross sectional diagrammatic view of one embodiment of the apparatus according to the invention;
FIG. 2 is a plan view of the apparatus in FIG. 1;
FIG. 3 is a perspective view of an embodiment of the spreader device used in the apparatus according to the invention;
FIG. 4 is a front view of one embodiment of a curvilinear sectional member provided on the spreading device illustrated in FIG. 3;
FIG. 5 is a front view of another embodiment of a curvilinear sectional member of the spreading device illustrated in FIG. 3;
FIG. 6 is a central cross sectional view of the spreading device according to FIG. 3;
FIG. 7 is a central cross sectional diagrammatic view of a second embodiment of the apparatus according to the invention.

FIG. 8 shows a detail of the pair of inlet rollers of the apparatus according to FIG. 7.

FIG. 9 shows an embodiment of a curvilinear sectional member of the first spreading device used in the apparatus according to FIG. 7.

FIG. 10 shows an embodiment of a curvilinear sectional member of a second spreading device also used in the apparatus according to FIG. 7.

FIGS. 11a–11c shows the shape of several curvilinear sectional members which may be used in a spreading device according to the invention.

FIG. 12 and 13 show perspective views of blades provided with deflectors.

FIG. 14 is a front elevational view of a pneumatic device located in the vicinity of the pair of outlet rollers of the apparatus.

FIG. 15 is a front elevational view of another embodiment of the pneumatic device located in the region of the pairs of outlet rollers to the apparatus.

FIG. 16 is a plan view in section on the line XVI—XVI of FIG. 15.

FIG. 17 shows an embodiment of a rotary vibrator in cross section and.

FIG. 18 is a partial axial section of the rotary vibrator according to FIG. 17.

As can be seen particularly from FIGS. 1 and 2, the apparatus comprises a cardboard drum or box in which is disposed a sliver of fibres 1 which passes through several sets of bars 3 and 4 constituted by bars, which are, for example, cylindrical, rectilinear and horizontal, located at a certain distance from the cardboard drum 2. After having left the second set of bars 4, the sliver of fibres 1 is introduced between a pair of rollers 5, so called inlet rollers, and then passes over a spreading device 6 before being picked up by another pair of rollers 7, so called outlet rollers. The pairs of inlet and outlet rollers 5 and 7 respectively, as well as the different sets of bars 3 and 4, and the spreading device constituted by a rotary vibrator 6, are received at their ends, in bearings supported by vertical members 5a, 6a, 7a, 8a, 10a, 11a, 12a and 13a. If necessary, below the pair of outlet rollers 7, there is located a pneumatic spreading device 9, an outlet aperture 8 of which is open in the feed direction of the sliver 1a. Inside the pneumatic spreading device 9 there is provided a source of gaseous fluid such as a fan, the inlet side of which is open to air and the outlet of which is connected to the aperture 8.

Downstream of the pair of rollers 7 and the aperture of the pneumatic device 9 and slightly below the level of said aperture 8 is disposed a guide plate 10 which has a downwards concave curve. A conveyor belt which is not shown may be located after this guide plate 10.

The pairs of feed rollers 5 and 7 are coated with a resilient layer, for example rubber, the inlet rollers 5 are preferably formed with grooves 5b parallel to their axes. Moreover, the pairs of inlet and outlet rollers 5 and 7 respectively are connected to drive means 5c and 7c such as electric motors each provided with a reduction gear and a gear box such that the peripheral speed of the outlet rollers 7 may be greater than the peripheral speed of the inlet rollers 5. In this case, the sliver fibres 1a are previously stretched before being subjected to additional alternating tensions. In certain cases it is advantageous to drive the outlet rollers 7 at a peripheral speed equal or less than that of the inlet rollers 5 such that the section of sliver between the two pairs of rollers 5 and 7 is not stretched. Naturally, in place of the gear boxes there may also be used appropriate transmission devices which make it possible to impart a speed less than that of the outlet rollers 7 to the inlet rollers 5.

The spreading device comprises at least one curvilinear sectional member 21, the shape of which is illustrated, for example, in FIGS. 3 to 5. The spreading device is located in the path of the sliver 1a, at the section of sliver between the pair of inlet rollers 5 and the pair of outlet rollers 7 and is located at a level different from that defined by the sliver if it extended directly between the nips of the roller pairs 5 and 7.

In a preferred embodiment, the spreader device 6 is mounted to rotate and constitutes a rotary vibrator such that the curvilinear sectional member rotating about a horizontal axis only strikes the fibres 1a obliquely, then moves with them raising or lowering them slightly and finally leaves them tangentially.

Advantageously the spreader device is constituted by a series of curvilinear sectional member 21 located on a support 23, which is for example cylindrical mounted on a horizontal rotating shaft 20. In the case of the embodiment illustrated in FIGS. 3 to 6 the curvilinear section members are constituted by plane or straight blades 21, whose faces 21a, which come into contact with the sliver 1a, each has a convex shape, such that the apex of this contact face 21a is located at the centre of the blade 21. The convex or curvilinear shape of this contact face 21a is, for example, in the form of an arc of a circle which is terminated laterally and progressively by horizontal straight portions. The blades 21 are mounted at their lateral ends on the supports 23 constituted for example by discs which, themselves, are keyed on the rotating shaft 20 connected for example by the intermediary of a pulley 6b and a belt 6c to a drive motor 6d. The contact face 21a of the curvilinear section members 21 may have undulations 21b (see FIG. 5), the apices of which appear in the general outline of the curvilinear section, an outline which constitutes the envelope of a body of revolution, the axis of which coincides with the drive shaft 20.

Advantageously, the convex sectional members are constituted by full blades 21 which are located on the support discs 23, in such a manner that the planes defined by them are tangential to one circle concentric with the rotating shaft 20, the lateral end of the blades, which end is integral with the support disc, being located in front of the contact face 21a in the direction of rotation F of the spreading device. In the case of the example illustrated in FIG. 1, the direction of rotation F is clockwise and, in the region of contact between the fibres 1a and the blades 21 or curvilinear sectional members, is in the same direction as the direction of movement of said fibres 1a.

During operation, the sliver 1 arrives with its fibres practically parallel to each other at the pair of inlet rollers 5 and passes for example under tension over the spreading device 6, before being picked up again by the pair of inlet rollers 7. Due to the fact that its shape is similar to that of a paddle wheel, the spreader device 6 applies additional alternating tensions to the various sliver fibres 1a, in such a manner that these fibres 1a are subjected to vibrations, the majority of which have
an inclined transverse resultant with respect to the plane passing between the rollers of each of the two pairs of rollers. The contact faces 21a of the curvilinear sections serve not only to impart to the fibres vibrations having an inclined resultant but also constitute a transverse guide face and ensure a spreading out of the sliver fibres 1a from the pair of inlet rollers 5 (see FIG. 2).

The frequency of vibrations produced by the spreader device or rotary vibrator 6 on the fibres 1a is relatively great for example at least of the order of 1,000 strokes per minute and also depends on the speed of travel of the fibres 1a. Generally, good results have been obtained when the frequency of application of the alternating tension, i.e. vibration strokes, is at least equal to one alternation of tension per centimetre of travel of the fibres.

In the case where the curvilinear sections 21 are constituted by full blades, the spreader device or rotary vibrator 6 simultaneously acts as a fan which forces an additional amount of air between the lap of fibres 1a and the corresponding blade 21, in such a way that the fibres 1a are also vibrated by a stirring air current. Due to the fact that the spreader device 6 effects a rotary movement which, in the vicinity of the sliver 1a is translated by a reciprocating motion in a vertical plane, a very uniform vibration is achieved without the direction of the moving masses having to be inverted. For the same reason the fibres are exposed to currents of air intermittently and periodically in synchronism with the vibrations imparted mechanically to said fibres. It has also been ascertained that when the spreader device 6, is rotated at a peripheral speed greater than the speed of travel of the sliver fibres 1a, due to friction of the contact face 21a on the fibres 1a, a filling out of the chemical fibres is produced which, at the end of the treatment, makes the fibres soft and pleasant to touch. Moreover, the rotation of the blades 21 about an axis parallel to the transverse extent of the lap of fibres 1a results in a sort of oblique beating of the various fibres 1a, a beating which also contributes to the spreading out and to improving the quality of said fibres.

As can be seen particularly in FIG. 2, the spreading out of the fibres 1a of the sliver 1 is appreciable downstream of the spreading device 6 and is for example equal to five times the original width of the sliver. However, in order to perfect this spreading out of the fibres 1a, it is an advantage to provide, downstream and in the immediate vicinity of the outlet rollers 7, a pneumatic device 9 which emits, through the outlet aperture 8, a sheet or curtain of gaseous fluid such as air propelled by a fan between, on the one hand, the lower surface of the fibre 1a which are spread out and leaving the rollers 7 and, on the other hand, a guide plate 10 located below and close to the slot 8. Due to the so-called "wail effect" or "Coanda effect," the gaseous fluid emitted from the aperture 8 sticks to the surface of the plate 10 and, in the manner of an air cushion, supports the lap of fibres 1a leaving the outlet rollers 7 above the aperture 8. It is advantageous to give the various jets of gaseous fluid leaving the aperture a direction diverging from said aperture 8, in such a way that the fibres 1a carried along by the curtain or sheet of gaseous fluid are spread out even more. For this purpose, the aperture 8 may be constituted by the mouth of a space of annular section and in the shape of a truncated cone, the small base of which is located inside the pneumatic device 9. The aperture 8 is thus curved in such a way that its apex is located in the median plane of the apparatus and nearer the outlet rollers 7 than the ends of the aperture 8 (see FIG. 14).

It is also possible to provide a horizontal rectilinear aperture 8 which constitutes the mouth of a parallelepipedal space 8a of trapezoidal horizontal cross-section the small base of which is located inside the pneumatic device and is connected to the downstream side of a fan, and the large base of which is located near the aperture 8 (see FIGS. 15 and 16).

At the downstream end of the guide plate 10, the lap of fibres 1a may be picked up by a conveyor belt which is not shown.

FIG. 7 shows diagrammatically an apparatus facilitating the simultaneous spreading of two slivers of fibres 1 and 1'. These slivers are withdrawn from two different cardboard drums 2 and 2' and are for example constituted by two different chemical materials.

These slivers 1 and 1' also first pass through sets of bars 3, 4 or 3', 4' before being introduced into the gap existing between the rollers of the pair of inlet rollers 5.

As can be seen more clearly in FIG. 8, the two slivers 1 and 1' are flattened and superimposed at the location of the inlet rollers 5. Between the pair of inlet rollers 5 and the first pair of outlet rollers 7, there is provided a spreader device 6 of the rotary vibrator type which is located at a level higher than the plane extending directly between the nips of the roller pairs 5 and 7. The sliver fibres 1a pass over this spreader device 6 and are subjected to a certain tension due to different peripheral speeds of the outlet rollers 7 and inlet rollers 5. The spreader 6 illustrated in FIG. 7 may have the same construction as that previously described and may also act on the lower face of fibres 1a.

In order to increase the lateral spreading effect of the fibres 1a, there may advantageously be provided at least one additional spreader device or rotary vibrator 16 which, as may be seen from FIG. 7, is interposed between the pair of outlet rollers 7 and a pair of additional outlet rollers 17 provided downstream of the pair of rollers 7. This additional spreader device 16 is located for example at a level below the plane extending directly between the nips of the roller pairs 7 and 17, the fibres 1a passing below said spreader device 16.

Thus, by means of the spreader device 6 and 16, one acts not only on one of the faces of the lap fibres 1a, but also on the other face. Naturally in certain cases the second spreader device 16 may be located at the same side as the first spreader device 6 (for example the device 16 illustrated in broken lines in FIG. 7). The fact of placing at least two spreader devices 6 and 16 in series not only improves the uniformity of spreading and the filling out as well as the texture of the fibres, but also makes it possible to increase the degree of spreading of the fibres if one gives to the curvilinear sections of the additional spreading device or additional rotary vibrator 16 located downstream of the first spreader device 6, a different width and radius of curvature and, for example, greater than those of the curvilinear sections of the first spreader device 6. The directions of rotation of the spreader devices 6 and 16 are opposed to each other when one acts on one of the surfaces and the other acts on the other surface of the lap of fibres 1a. However, as in the example previously described, the directions of rotation of the two devices
6, 16 are such that their directions are those of travel of the lap of fibres 1a in the zones of contact between the fibres 1a and the spreader devices 6 and 16.

Downstream and below the additional outlet rollers 17 there may also be provided a pneumatic device whose outlet aperture 8 is located below the rollers 17 between the fibres 1a and the upper surface of the guide plate 10, which, as in the case of the apparatus according to FIGS. 1 and 2, allows the sheet or curtain of gaseous fluid leaving the aperture 8 to form a type of air cushion support for the fibres 1a due to the above mentioned Coanda effect.

FIGS. 9 and 10 show curvilinear sections 21 and 121, one of which, for example forms part of the first spreader device 6 and the other of which forms part of the second spreader device 16 of the apparatus illustrated in FIG. 7. It can be clearly seen from FIGS. 9 and 10 that the width and radius of curvature of the curvilinear section 21 of FIG. 9 are less than those of the curvilinear section 121 of FIG. 10.

In another embodiment, the curvilinear section 21 or 121 illustrated in FIGS. 9 and 10 instead of being constituted by a full blade, may be constituted by at least one stiff strip of wire substantially in the shape of an arc of a circle defining a single plane, and secured at its ends to mounting tabs 24, 124 intended to be mounted in slots provided in support discs 23 (see FIG. 3). The spreader device or rotary vibrator 6 or 16 generally comprises several curvilinear sections preferably located in planes tangential to the drive shaft 20.

The curvilinear section members whose face which comes into contact with the fibres 1a is convex with respect to these fibres may have different configurations from one sectional member to the other of the same spreader device 6 or 16.

Thus, as may be seen from FIGS. 11a-11c a first curvilinear sectional member 221 constituted by a full blade comprises a contact and spreader face 221a, whose configuration is that of an arc of a circle terminating laterally in two vertical straight portions, a second sectional member 221' comprising a contact and spreading face 221'a having a configuration constituted by undulations or scallops, the axes of which are located on an envelope line located in space and with respect to the drive shaft 20 on a curved line identical to that described by the contact face 221a of the first sectional member 221. Moreover, a third sectional member 221'' may also have a contact face 221'a'' having an undulated or scalloped configuration, the apices of these undulations or scallops also being located on the same envelope as that of the preceding section members 221 and 221'. But, in this case, the apices of the contact faces 221a'' of the spreader device 221' are staggered laterally with respect to the apices of the undulations of the preceding sectional member 221' in such a way that these apices are located, for example, opposite the hollows of the undulations of the contact face 221a of the preceding sectional member 221' (see in particular contact faces in broken line 221a and 221'a and full line 221a' of FIG. 11c).

By virtue of these different scalloped sectional members 221, 221' and 221'', the transverse vibrations are applied selectively and alternately to various bunches of fibres of the section of stretched sliver and the direction of the resultants of the vibrations varies progressively between a direction passing towards the centre and the direction passing towards the edge of the stretched sliver or lap of fibres which results.

The curvilinear sectional members 21 may be made of different materials for example of a light alloy such as an alloy of aluminum and copper containing small amounts of magnesium and manganese.

FIGS. 12 and 13 show blades which make it possible to produce swirling air currents. These blades 21 comprise on the rear face, taken in the direction of rotation of the rotary vibrator, at least one deflector 30 for example of sheet metal, one plate 30a of which, inclined with respect to the blade 21 obliquely towards the shaft 20 of the rotary vibrator 6, is integral with said blade 21, and with respect to the peripheral surface 21a of this blade diverges from the latter. FIG. 12 shows a blade 21 comprising three deflectors 30 distributed uniformly and staggered in height depending on the curvilinear shape of the peripheral face 21a of the blade 21. According to the embodiment illustrated in FIG. 13 the blade 21 is perforated and comprises for example a circular aperture 31 opposite the inclined plate 30a of the deflector 30.

FIGS. 17 and 18 show another means for producing air currents. In this particular case, the shaft 20 of the rotary vibrator 6 comprises a blind axial bore 32 which, at one of the ends of the shaft is connected by a rotary seal to a source of fluid under pressure. Radial bores 33 which are distributed along the cylindrical support or shaft 20 of the rotary vibrator open into this blind axial bore 32. The cross section of these radial bores may be circular, oval, rectangular, constant or variable from the axial bore 32 towards the outside. The axes of these radial bores 33 are disposed with respect to the blades 21 which as previously mentioned are tangential to a cylinder concentric with the shaft 20, in such a way that they touch the marginal zone, i.e. the peripheral zone of the blades 21, at the very least in their central part.

As already mentioned, the method and apparatus according to the invention may be applied to the manufacture of laps formed by continuous chemical fibres. Slivers of fibres whose overall titre may be comprised between 5 and 100 Ktex and whose titre of the elementary fibres is comprised between 0.3 and 30 dtex are used successfully. All known chemical textile materials such as viscose polamides, polysters etc. may be used as fibres. The choice of these materials varies within very wide limits and depending on the final applications envisaged for the laps thus produced.

Due to the fact that they are based on continuous fibres, the laps thus prepared may have numerous applications. As an example, there may be mentioned: non woven laps of light weight used for reinforcing paper, laps for the manufacture of disposable articles, laps for the reinforcement or support of coated products, laps for bedding and furnishings, laps for reinforcing laminated products, and finally laps for forming floor coverings by stitching.

The following examples given as an illustration but without any limitation of scope show the manner in which the invention may be used and the advantages which result therefrom.

EXAMPLE 1

Apparatus according to the invention in accordance with FIG. 1 having the following characteristics is used:
diameter of the inlet rollers 5 : 68mm
speed of the rollers 5 : 120m/min
diameter of the outlet rollers 7 : 66mm
speed of the roller 7 : 115m/min
diameter of the drive shaft 20 : 20mm
length of the metal blades 21 : 420mm
external radius of curvature of the curvilinear scal-
loped blades 21 : 360mm
number of blades 21 : 8
speed of rotation of the shaft 20 : 2400 rpm
width of the aperture 8 : 10mm
length of the aperture 8 : 500 mm
approximate opening angle of the curtain of fluid at
the outlet of the divergent aperture 8° : 35°
approximate air flow from the pneumatic device 9 : 1.2 m³/min
radius of curvature of the plate 10 : 1m
By means of this apparatus a sliver of viscose fibres of
28Ktex is treated, the titre of the continuous fibres
being 1.7 dtex and the initial width of the sliver being
approximately 10cm.
The passage of the sliver 1 through the sets of bars 3
and 4 is quite winding in order to avoid slipping.
The lap of fibres obtained has a width of approxi-
mately 60cm, good uniformity and good cohesion
which makes it possible to use it for the manufacture
doing disposables.

EXAMPLE II

The operation is as previously, this time using a sliver
of crimped polyester fibres 22 Ktex (titre of the ele-
mentary fibres 1.6 dtex), the initial width of this sliver
also being of the order of 10 centimetres.
A lap which has filled out and which is very soft to
touch with an average width of 90cm is obtained.

EXAMPLE III

Example II is repeated but without using the spreader
device 6.
A lap or approximately 10cm width is obtained which
is not filled out and whose fibres remain in groups.

EXAMPLE IV

Example II is repeated but using, in place of the
spreader device 6, a standard spreading device formed
by a curved tube, which is 50 centimetres long and
whose radius of curvature is 36cm, the lap of fibres
being withdrawn directly after the pair of rollers 7 with-
out being subjected to the action of a pneumatic device
9. The initial width of the sliver was of the order of 20
centimetres.
A lap of approximately 30 centimeters width, which
is also not filled out and has little cohesion, is obtained.
Examples II to IV illustrate perfectly the unexpected
advantages which result from using the method and ap-
paratus according to the invention, since widths of 10
to 30 cm are respectively obtained in place of 90 cm in
Example I according to the invention.

EXAMPLE V

By means of the apparatus in FIG. 7 and with the
same settings in Example I, two slivers of fibres of an
initial width of approximately 10 centimetres are intro-
duced into the set of rollers 5:
one of viscose of 28Ktex (titre of the strand 1.7 dtex)
the other in polyester of 22Ktex (titre of the strand
1.6 dtex).
In this way a lap of 70 centimetres width is obtained
in which the elementary fibres are partially mixed so
that they are particularly suitable for the manufacture
of double-sided articles.
Naturally the various embodiments previously de-
scribed may be subjected to a certain number of modi-
fications within the scope of the man skilled in the art
without diverging from the framework of the invention.

What is claimed is:
1. Method of manufacturing a lap of fibres from a
sliver of continuous chemical fibres comprising the fol-
lowing steps:
continuously feeding said sliver from a pair of inlet
rollers to a pair of outlet rollers while controlling
the peripheral speeds of said rollers so as to main-
tain said fibres in said sliver under tension suffi-
cient to stretch the fibres intermediate said inlet
and outlet rollers,
between said inlet rollers and said outlet rollers, addi-
tionally tensioning said fibres as they are fed from
said inlet to said outlet rollers by intermittently ap-
plying forces thereto directed not only transversely
to the direction of feed but also in a plurality of di-
vergent directions extending at angles to each other
whereby the fibres are vibrated and spread
apart and the sliver is curved in a cross-section
transverse to said direction of feed and at the por-
tion thereof subjected to said forces, and
directing air under pressure on said fibres after they
have passed said inlet rollers
2. Method as set forth in claim 1, wherein said air
under pressure is directed on the fibres at said portion
of said sliver which is subjected to said forces.
3. Method as set forth in claim 2, wherein said air
under pressure is directed on the fibres at said portion
of said sliver intermittently and in synchronism with
the application of said forces.
4. method as set forth in claim 2, wherein said air is
supplied in the form of whirling air currents.
5. Method as set forth in claim 2, wherein the axes of
rotation of said inlet rollers are substantially parallel to
the axes of rotation of said outlet rollers and said air is
directed on the fibres at said sliver in a direction sub-
stantially perpendicular to a plane parallel to said axes.
6. Method as set forth in claim 1, wherein said air is
directed on the fibres after they have passed said outlet
rollers and at least a portion of said air flows generally
parallel to the direction of movement of said fibres.
7. Method of manufacturing a lap of fibres from a
sliver of continuous chemical fibres comprising the fol-
lowing steps:
continuously feeding said sliver from a pair of inlet
rollers to a pair of outlet rollers while controlling
the peripheral speeds of said rollers so as to main-
tain said fibres in said sliver under tension suffi-
cient to stretch the fibres intermediate said inlet
and outlet rollers,
between said inlet rollers and said outlet rollers, addi-
tionally tensioning said fibres as they are fed from
said inlet to said outlet rollers by intermittently ap-
plying forces thereto directed not only transversely
to the direction of feed but also in a plurality of di-
vergent directions extending at angles to each
other whereby the fibres are vibrated and spread apart and the sliver is curved in a cross-section transverse to said direction of feed and at the portion thereof subjected to said forces, and similarly feeding a second sliver of said fibres superimposed on said first-mentioned sliver.

8. Apparatus for forming a lap of fibres from a sliver of continuous chemical fibres comprising:
   a pair of adjacent inlet rollers for receiving said sliver therebetween with the width of the latter extending in the axial direction of said rollers, said rollers having substantially parallel axes and being engageable with said sliver at the nip of said rollers,
   a pair of adjacent outlet rollers spaced from said inlet rollers for receiving said sliver from said inlet rollers, said outlet rollers having their axes of rotation substantially parallel to the axes of rotation of said inlet rollers and being engageable with said sliver at the nip of said outlet rollers,
   driving means for rotating said inlet and outlet rollers and for rotating said outlet rollers at a peripheral speed different from the peripheral speed of said inlet rollers and thereby tensioning said sliver,
   a rotary vibrator having its axis of rotation substantially parallel to the axes of said rollers and mounted between said inlet and outlet rollers, said vibrator having a plurality of axially extending, peripherally spaced members thereof engageable at the radially outermost surfaces thereof with a surface of the sliver intermediate said inlet and outlet rollers, each of said surfaces of said members being convexly curved in a plane extending parallel to the axis of said vibrator with the apex of the curve disposed substantially centrally of the width of said sliver,
   driving means for rotating said vibrator, and
   means for directing air under pressure on said fibres intermediate said inlet and outlet rollers to further vibrate said fibres, said means for directing air compressing means for directing said air outwardly of said axis of rotation and intermediate said members.

9. Apparatus as set forth in claim 8, wherein said vibrator comprises a rotatable shaft coaxial with said axis of rotation of said vibrator and said members are solid blades mounted on said shaft and extending outwardly therefrom, each said blade being substantially imperforate from its said radially outermost surface to said shaft and said means for directing said air under pressure comprises at least one air deflector mounted on each member and extending outwardly from a surface thereof and in a direction circumferentially of said shaft.

10. Apparatus as set forth in claim 8, wherein said vibrator comprises a rotatable shaft co-axial with said axis of rotation of said vibrator and said members are solid blades mounted on said shaft and extending outwardly therefrom, each said blade being substantially imperforate from its said radially outermost surface to said shaft, whereby upon rotation of said vibrator by said driving means, said blades act as fan blades forcing air under pressure on said fibres and form said means for directing air under pressure on said fibres.

11. Apparatus as set forth in claim 8, wherein said members extend in planes tangential to a circle concentric with the axis of said vibrator.

12. Apparatus as set forth in claim 8, wherein said surfaces of said members have undulations therein, the apices of said undulations lying on an arc.

13. Apparatus as set forth in claim 12, wherein said surfaces of said members are of the same shape and the corresponding apices of the undulations of each member lie in a plane perpendicular to the axis of said vibrator.

14. Apparatus as set forth in claim 12, wherein the apices of the undulations of peripherally alternate members lie in different planes perpendicular to the axis of said vibrator.

15. Apparatus as set forth in claim 8, further comprising a further pair of rollers spaced from said outlet rollers for receiving said sliver from said outlet rollers and having their axes of rotation substantially parallel to the axes of rotation of said outlet rollers, a further rotary vibrator similar to said first-mentioned rotary vibrator similarly mounted between said outlet rollers and said further rollers for engaging a surface of said sliver opposite to the surface thereof engageable by said first-mentioned vibrator, and driving means for rotating said further vibrator.

16. Apparatus for forming a lap of fibres from a sliver of continuous chemical fibres comprising:
   a pair of adjacent inlet rollers for receiving said sliver therebetween with the width of the latter extending in the axial direction of said rollers, said rollers having substantially parallel axes and being engageable with said sliver at the nip of said rollers,
   a pair of adjacent outlet rollers spaced from said inlet rollers for receiving said sliver from said inlet rollers and thereby tensioning said sliver,
   a rotary vibrator having its axis of rotation substantially parallel to the axes of said rollers and mounted between said inlet and outlet rollers, said vibrator having a plurality of axially extending, peripherally spaced solid blades thereon engageable at the radially outermost surfaces thereof with a surface of the sliver intermediate said inlet and outlet rollers, each of said surfaces of said members being convexly curved in a plane extending parallel to the axis of said vibrator with the apex of the curve disposed substantially centrally of the width of said sliver,
   driving means for rotating said inlet and outlet rollers and for rotating said outlet rollers at a peripheral speed higher than the peripheral speed of said inlet rollers and thereby tensioning said sliver,
   a rotary vibrator having its axis of rotation substantially parallel to the axes of said rollers and mounted between said inlet and outlet rollers, said vibrator having a plurality of axially extending, peripherally spaced solid blades thereon engageable at the radially outermost surfaces thereof with a surface of the sliver intermediate said inlet and outlet rollers, each of said surfaces of said members being convexly curved in a plane extending parallel to the axis of said vibrator with the apex of the curve disposed substantially centrally of the width of said sliver and each of said blades having at least one deflector mounted thereon and extending outwardly from a surface thereof for producing currents of air on said fibres intermediate said inlet and outlet rollers and having an aperture therefore through adjacent and deflector thereon, and
   driving means for rotating said vibrator.

17. Apparatus for forming a lap of fibres from a sliver of continuous chemical fibres comprising:
   a pair of continuous inlet rollers for receiving said sliver therebetween with the width of the latter extending in the axial direction of said rollers, said rollers having substantially parallel axes and being engageable with said sliver at the nip of said rollers,
a pair of adjacent outlet rollers spaced from said inlet rollers for receiving said sliver from said inlet rollers, said outlet rollers having their axes of rotation substantially parallel to the axes of rotation of said inlet rollers and being engageable with said sliver at the nip of said outlet rollers,

a rotary vibrator having its axis of rotation substantially parallel to the axes of said rollers and mounted between said inlet and outlet rollers, said vibrator having a plurality of axially extending, peripherally spaced members thereon engageable at the radially outermost surfaces thereof with a surface of the sliver intermediate said inlet and outlet rollers, each of said surfaces of said members being convexly curved in a plane extending parallel to the axis of said vibrator with the apex of the curve disposed substantially centrally of the width of said sliver and said vibrator comprising a central tubular support for said members, said support having radially extending openings through the wall thereof distributed axially and peripherally thereof and said members having at least a portion thereof radially aligned with said openings,

means for producing currents of air on said fibres intermediate said inlet and outlet rollers comprising means for supplying air under pressure to the interior of said support, and

18. Apparatus for forming a lap of fibres from a sliver of continuous chemical fibres comprising:

pair of adjacent inlet rollers for receiving said sliver therebetween with the width of the latter extending in the axial direction of said rollers, said rollers having substantially parallel axes and being engageable with said sliver at the nip of said rollers,

a pair of adjacent outlet rollers spaced from said inlet rollers for receiving said sliver from said inlet rollers, said outlet rollers having their axes of rotation substantially parallel to the axes of rotation of said inlet rollers and being engageable with said sliver at the nip of said outlet rollers,

driving means for rotating said inlet and outlet rollers and for rotating said outlet rollers at a peripheral speed higher than the peripheral speed of said inlet rollers and thereby tensioning said sliver,

a rotary vibrator having its axis of rotation substantially parallel to the axes of said rollers and mounted between said inlet and outlet rollers, said vibrator having a plurality of axially extending, peripherally spaced members thereon engageable at the radially outermost surfaces thereof with a surface of the sliver intermediate said inlet and outlet rollers, each of said surfaces of said members being convexly curved in a plane extending parallel to the axis of said vibrator with the apex of the curve disposed substantially centrally of the width of said sliver, driving means for rotating said vibrator, a source of gas, a guide plate located below said output rollers and on the side thereof opposite from said inlet rollers, said guide plate having a surface extending substantially parallel to and below said axis of said outlet rollers, and

means for directing gas from said source across said surface of said guide plate for maintaining said sliver above said surface of said guide plate.
UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION


Inventor(s) JEAN-LOUIS NEVEU

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 4, line 6 "transmission" should read --transmission--
line 19 "the" should read --a--
line 24 "member" should read --members--
line 60 "practically" should read -- practically--
line 63 "inlet" should read --outlet--

Col. 7, line 49 "221" should read --221"--
line 53 "section" should read --sectional--

Col. 9, line 14 "8°" should read --8--
line 40 "or" should read --of--

Col. 10, line 41 "method" should read --Method--

Col. 11, line 3 "ffed" should read --feed--
line 22 "different from" should read --higher than--

Col. 12, line 37 "roller" should read --rollers--
line 58 "and" should read --the--
line 62 "continuous" has been change to -- adjacent --.

Signed and Sealed this
eighteenth Day of November 1975

[SEAL]

Attest:

RUTH C. MASON 
Attesting Officer

C. MARSHALL DANN 
Commissioner of Patents and Trademarks