United States Patent

Didek et al.

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[54] BREAK-SPINNING MACHINE

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[21] Appl. No.: **138,954**

[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **57/58.95**

[51] **Int. Cl.** **D01h 1/12**

[58] **Field of Search** 57/58.89–58.95

[56] **References Cited**

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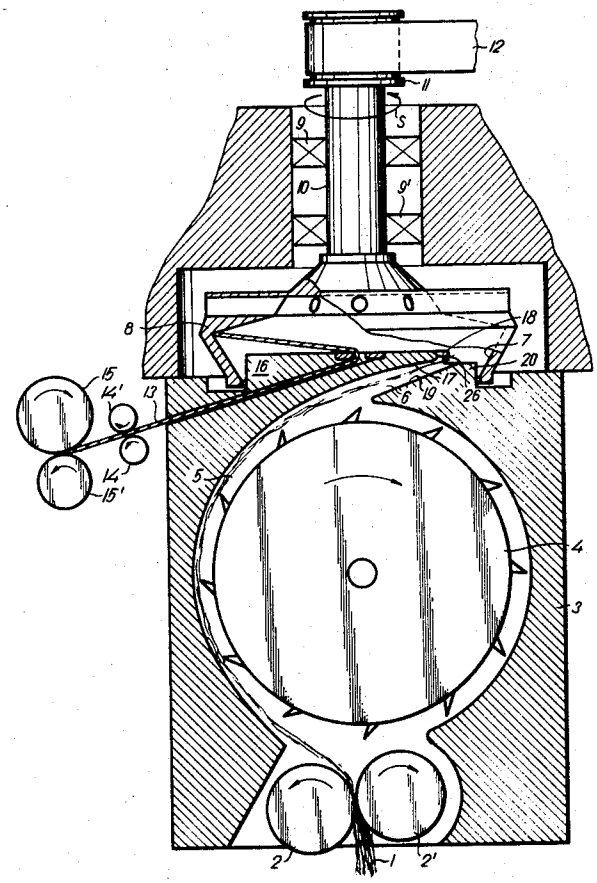
[57] **ABSTRACT**

A rotary spinning chamber has a hollow interior accessible through an open side. A stationary body is located adjacent the open side and has a portion projecting into the same, this portion being either cylindrical or frustoconical in outline and having a transverse surface extending transversely of the axis of rotation of the spinning chamber and a circumferential surface which surrounds this axis. A fiber channel is formed in the stationary body having an upper and a lower boundary surface, an inlet receiving fibers from a fiber feed means and an outlet provided in the projecting portion. The outlet is so located in the projecting portion that the upper and the lower boundary surfaces of the fiber feed channel respectively intersect the transverse and the circumferential surface of the projecting portion.

11 Claims, 9 Drawing Figures



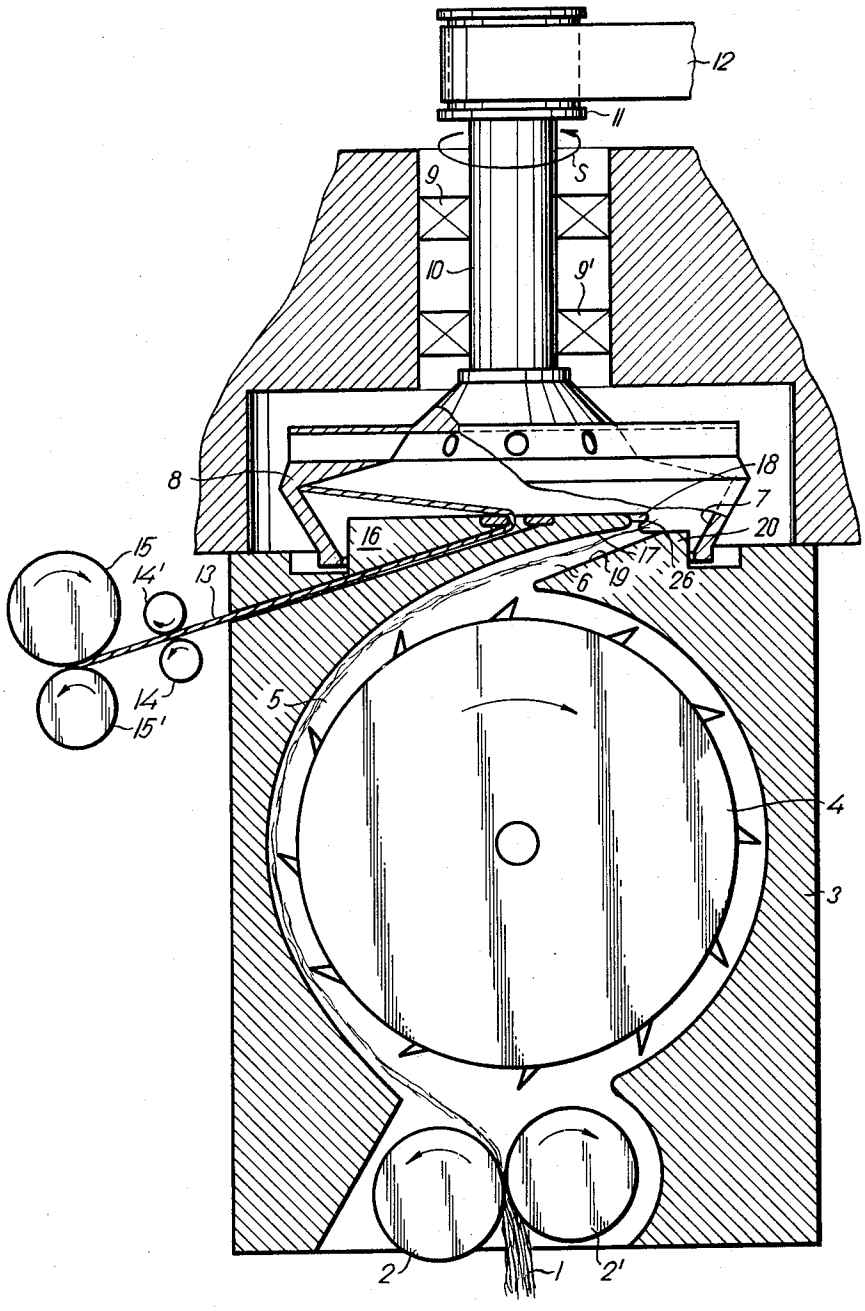


Fig. 1.

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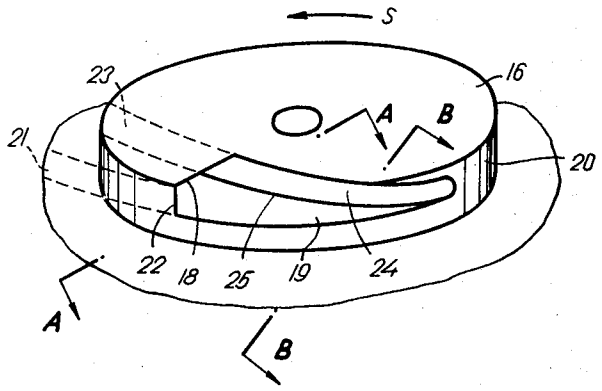

Fig. 2.

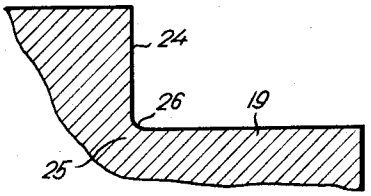

Fig. 3a

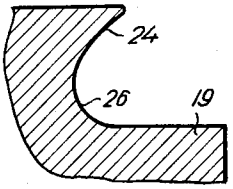

Fig. 3b.

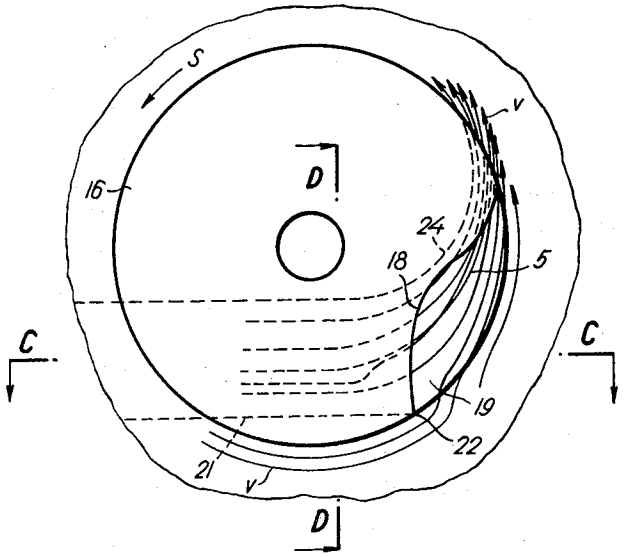

Fig. 4.

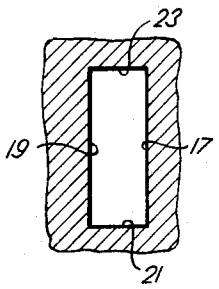

Fig. 6.

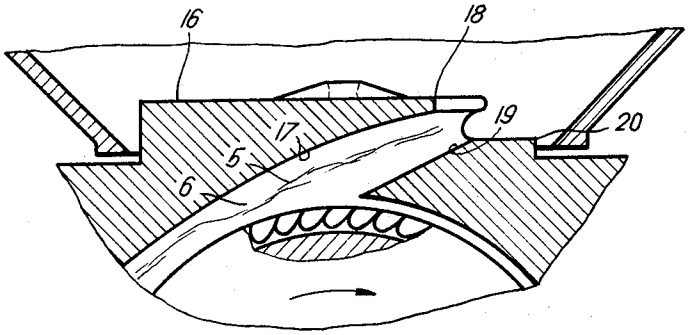

Fig. 5.

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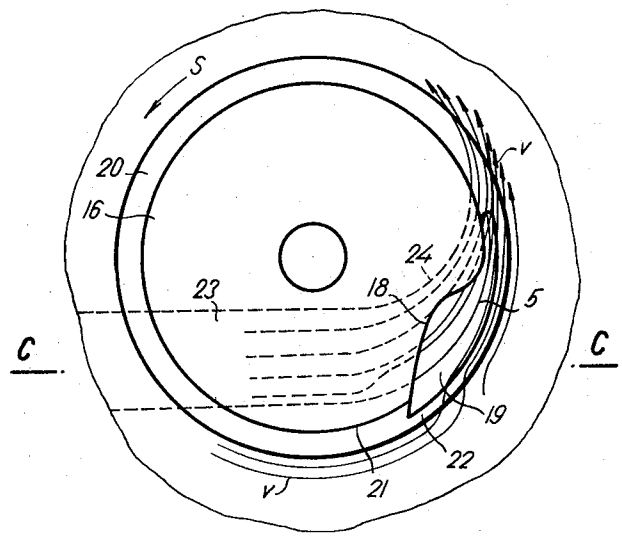

Fig. 4a.

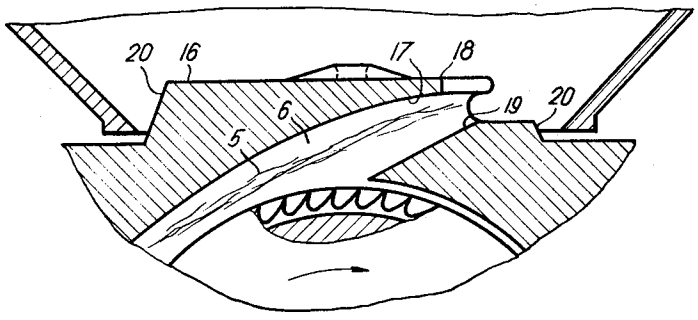

Fig. 5a.

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BREAK-SPINNING MACHINE

BACKGROUND OF THE INVENTION

The present invention relates generally to spinning machines, and more particularly to so-called break-spinning machines. Still more specifically the invention relates to continuous break-spinning machines utilizing a rotary spinning chamber.

The construction and operation of rotary spinning chambers in spinning machines is already well known. Briefly, such rotary spinning chambers are of substantially cup-shaped configuration and have a open side and a closed side or transverse wall. They rotate about an axis intersecting both of these sides and fibrous material is introduced through the open side, being aspirated by sub-atmospheric pressure created in the interior of the rotary spinning chamber due to the expulsion by centrifugal force of air contained in the spinning chamber. This aspirates the fibers which become deposited on a fiber deposition or collecting surface located in the interior of the spinning chamber and surrounding the axis of rotation thereof, and on this surface the deposited fibers form a ribbon which becomes twisted and converted into a yarn which can be continuously withdrawn from the spinning chamber.

It is already known to supply the fibers into the interior of the spinning chamber via a channel provided in a cover or a body which extends across and covers the open side of the spinning chamber. The fiber supply channel is so positioned and arranged that it discharges into a gap constituted by a stationary disc, known as a separator, located in the interior of the spinning chamber via a neck provided in the stationary body and extending within the axis of rotation of the chamber. The separator is intended to direct the incoming fibers onto the collecting surface of the chamber, and to separate the incoming fibers from the yarn which is being formed to prevent incoming fibers from adhering to the already formed yarn over the length thereof.

This prior-art construction has the disadvantage that the incoming fibers—particularly long-staple fibers—frequency overlap the separator neck, that is the portion on which the separator is mounted, causing the production of low-grade yarn and finally requiring stopping of the spinning device for manual clearing. Also, the separating frequently causes the incoming fibers to follow irregular paths causing undesirable interfrictional fiber contact which also results in lower yarn quality, not to mention the poor economic effectiveness which results from this.

According to another prior-art construction fibers are provided through a channel which opens in a projecting portion provided in the stationary body, with the projecting portion having a cylindrical circumferential surface adjacent the collecting surface of the rotary spinning chamber. The outlet of the fiber supply channel opens in this cylindrical surface and the fibers are then discharged onto the collecting surface. This construction, however, is not only quite complicated to manufacture but also it has been found that the fibers are partially caught adjacent the outlet on lateral wall portions of the fiber supply channel, and after they finally become released they are abruptly deposited on the collecting surface of the rotary spinning chamber. This results in the formation of fiber agglomerations and causes thread breakages and nubs in the thread.

According to still another prior-art embodiment the fiber supply channel is so arranged as to include an acute angle with the transverse plane—that is the transverse surface extending across and transversely of the axis of rotation of the rotary spinning chamber—of a projection provided on the stationary body and extending into the interior of the spinning chamber through the open side thereof. The arrangement is such that the outlet of the fiber supply channel discharges on an imaginary cylindrical surface below the transverse surface or front plane of the projection. This arrangement has the disadvantage that, as a result of an unbaffled air flow caused by the rotation of the rotary spinning chamber, the fibers have a tendency to become twisted and then to become deposited on the collecting surface of the rotary spinning chamber in a disaligned non-parallel condition. This means that the number of fibers in the cross-section of the fibrous ribbon—and subsequently of the yarn into which the ribbon is converted—is less than normally desired and as the ribbon gets thinner, the yarn gets thinner and the result is a low-grade irregular yarn.

SUMMARY OF THE INVENTION

It is, accordingly, an object of the present invention to overcome the aforementioned disadvantages.

More particularly it is an object of the present invention to provide an improved arrangement which avoids these disadvantages.

A concomitant object of the invention is to provide such an improved arrangement which effects uniform and regular directing of the incoming fibers onto the collecting surface of the rotary spinning chambers so that the fibers will not adhere to the yarn being formed over the length thereof.

Still another object of the invention is to provide such an improved arrangement which avoids the development and formation of fiber agglomerations.

A concomitant object of the invention is to provide such an arrangement which assures that the fibers will be perfectly aligned in ribbon form even before they contact the fiber-collecting surface of the rotary spinning chamber.

In pursuance of the above objects, and of others which will become apparent hereafter, one feature of the invention resides in a break-spinning machine, particularly a continuous machine, which comprises a rotary spinning chamber mounted for rotation about an axis having a hollow interior accessible through an open side. Fiber feed means feeds fibers towards the open side for entry into the spinning chamber. A stationary body is provided adjacent the open side and has a projection which extends into the latter, this projection being bounded by a transverse surface extending transversely of the axis and by a lateral circumferential surface which surrounds the axis. The fiber channel is provided in the stationary body and has an upper and a lower boundary surface, an inlet which receives fibers from the feed means and an outlet which is provided in the projection. The upper and the lower boundary surfaces of the fiber supply channel respectively intersect at the outlet the transverse and the lateral circumferential surface of the projection.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims.

The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a somewhat diagrammatic sectional view of an apparatus embodying the present invention;

FIG. 2 is an axonometric view showing the discharge of the fiber supply channel in the projecting portion of the stationary body; said projection portion being of cylindrical outline;

FIG. 3*a* is a sectional view showing an intersection of the lower wall of the feed channel with the curved lateral wall thereof, the section bein taken on line A—A of FIG. 2;

FIG. 3*b* is a section analogous to FIG. 3*a*, but taken on line B—B of FIG. 2 and showing a different intersection of the lower wall of the feed channel with the curved lateral wall;

FIG. 4 is a front view showing the channel discharge and the air-flow direction; provided in the projection portion of cylindrical outline;

FIG. 4*a* is a similar view as FIG. 4 showing the channel discharge provided in the projection portion of frustoconical outline;

FIG. 5 is a sectional view of the channel discharge, taken on line C—C of FIG. 4; and

FIG. 5*a* is a sectional view of the channel discharge, taken on line C—C of FIG. 4*a*.

FIG. 6 is a view of the channel discharge in a section taken on line D—D of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in FIG. 1 of the drawing, a rotary spinning chamber of known construction is provided and designated with reference numeral 8. It is fixedly attached to a shaft 10 which is mounted for rotation in bearings 9, 9' and carries at its free end portion remote from the rotary spinning chamber 8 a pulley 11 to which motion is transmitted by a drive belt 12 driven by non-illustrated drive means whose particular construction is of no importance for the present invention. The direction of rotation of the shaft 10 and thereby of the spinning chamber 8 is identified by the arrow S.

A fibrous sliver 1 is supplied in the direction towards the rotary spinning chamber 8 by a pair of oppositely rotating feed rollers 2, 2' between which the sliver 1 is nipped and advanced. Before arriving at the spinning chamber 8, the sliver 1 is supplied to a carding or combing-out roller 4 which separates the sliver 1 into its constituent fibers 5 and which, together with the feed rollers 2, 2', is received in a recess provided in a stationary body 3. A feed channel 6 connects the recess housing the carding roller 4 with the interior of the rotary spinning chamber 8, and separated fibers 5 advance through the channel 6 and become deposited on the inner circumferential fiber-collecting surface 7 of the rotary spinning chamber 8. On this surface they become collected and form a fibrous ribbon which is twisted and converted into a yarn 13, the latter being withdrawn from the interior of the spinning chamber 8 by means of a pair of oppositely rotating withdrawal rollers 14 and 14' which supply the yarn to the diagrammatically illustrated pick-up device designated with reference numerals 15 and 15'.

The stationary body 3 is provided with a projection 16 of either cylindrical (FIGS. 1, 2, 4 and 5) or frustoconical configuration (FIGS. 4*a* and 5*a*) and which projects through the open side of the essentially cup-shaped rotary spinning chamber 8 into the interior of the latter. The feed channel 6 passes through the projection 16 in such a way that the upper boundary wall 17 of the feed channel 6 intersects the projection at the location designated with reference numeral 18, whereas the lower boundary wall 19 of the channel intersects the cylindrical or slightly conical lateral circumferential surface 20 of the projection 16. As the remaining Figures show, particularly FIGS. 2 and 4, the channel 6 further has two lateral boundary walls 21 and 23. Of these, the lateral boundary wall 21 intersects the surface 20 of the projection 16 within the location 22 illustrated in FIGS. 2, whereas the lateral boundary wall 23 merges continuously with a curved surface portion 24 of the surface 20, which continues smoothly in or intersects the remainder of the surface 20. FIGS. 3 and 3a show that the intersecting edge 25 at which the surface 24 and the lower boundary wall 19 of the feed channel 6 join, merges in an elongated groove 26 of variable profile (compare FIGS. 3 and 3*a*).

In conventional manner, the carding roller 4 is provided on its outer circumference with needles or similar projections (not shown because they are well known) and, as the fibrous sliver 1 is supplied by the feed rollers 2, 2' to the carding roller 4, engagement of the needles thereof separates the fibrous sliver into its individual constituent fibers 5 which are carried along by the air-flow through the feed channel 6 into the interior of the spinning chamber 8. It is recalled here that due to the high-speed rotation of the spinning chamber 6, and as a result of the presence of the illustrated (see FIG. 1) air-escape apertures in the wall of the spinning chamber 8, centrifugal force causes air in the spinning chamber 8 to be ejected through these apertures with additional air being aspirated through the channel 6 along with the fibers 5.

The fibers 5 are advanced across the entire cross-section of the feed channel 6 and as a result of the air-flow acting in the direction on the arrows V shown in FIG. 4, they are flung against the curved surface portion 24 and thereon advanced to the collecting surface 7 of the rotary spinning chamber 8. In this manner the motion of the fibers 5 is controlled and their trajectory determined. In view of the fact that the air in the rotating rotary spinning chamber 8 rotates at a relatively high speed and offers considerable resistance to the air-flow which is discharged from the feed channel 6, that is from the outlet thereof at which it enters the spinning chamber 8, the air curtain which is thus being formed must be destroyed and overcome to permit entry of the fibers in the desired manner.

This is successfully achieved according to the present invention, particularly in the region 22, downstream of which a considerable acceleration of the air flow in the direction corresponding to that prevailing in the feed channel 6 is obtained, as evident from the arrows V in FIG. 4. This also provides sufficient energy for the transport of the fibers 5 from the channel 6 into the spinning chamber 8 and onto the collecting surface 7 thereof.

The drawing clearly shows in FIGS. 1–6 that the outlet of the feed channel 6 discharges in the projection 16 in such a manner that the upper boundary wall 17 of the feed channel 6 intersects the projection 16 within the edge 18, whereas the lower boundary wall 19 intersects the surface 20 of the projection 16. Again, the one lateral boundary wall 21 of the feed channel 6 intersects the surface 20 within the lateral edge 22, whereas the second lateral boundary wall 23 of the channel 6 has its end portion at the outlet curved and merges in streamlined configuration into the curved surface portion 24 which is provided by recessing the surface 20 of the projection 16, as is particularly clearly evident from FIG. 2.

The intersecting edge 25 at which the surface portion 24 intersects the lower boundary wall 19 of the outlet of feed channel 6, downstream of the outlet, merges in the elongate groove 26 which flairs in profile in the direction of fiber advancement.

When the fibers 5 enter the groove 26, they become aligned and carried along to the collecting surface 7 of the spinning chamber 8. On this surface they become deposited in form of a ribbon which is finally twisted into the yarn 13 and withdrawn by the rollers 14, 14' and supplied to the take-up device 15, 15' to be wound onto a cross-wound bobbin or the like, which is not illustrated.

It will be appreciated that the belt 12 can be driven by an electromotor or the like, and that this is well enough known not to require discussion.

The illustrated exemplary embodiment does not by any means exhaust other possibilities offered by the invention. The surface portion 24 can have a variable convex profile which can, but need not necessarily merge in the elongate groove 26. The feed channel 6, which is illustrated to be of rectangular cross-section, could have a different cross-sectional configuration. Other modifications will also offer themselves to those skilled in the art without departing from the scope and concept of the present invention.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of constructions differing from the types described above.

While the invention has been illustrated and described as embodied in a break-spinning machine, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptation should and are intended to be comprehended within the meaning and range of the equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is:

1. In a break-spinning machine, in combination, a rotary spinning chamber mounted for rotation about an axis and having a hollow interior accessible through an open side; fiber feed means feeding fibers towards said open side for entry into said spinning chamber; a stationary body adjacent said open side and having a projection extending into said open side, said projection being bounded by a transverse surface extending transversely of said axis and by a lateral circumferential surface surrounding said axis; and a fiber channel in said stationary body and having an upper and a lower boundary surface, said channel having an inlet receiving fibers from said feed means and an outlet provided in said projection with said upper and lower boundary surfaces respectively intersecting said transverse and said lateral circumferential surface at said outlet.

2. In a machine as defined in claim 1, wherein said lateral circumferential surface is of cylindrical outline.

3. In a machine as defined in claim 1, wherein said lateral circumferential surface is of frustoconical outline.

4. In a machine as defined in claim 1, said channel further being bounded by two transversely spaced lateral boundary surfaces, said lateral circumferential surface comprising a portion which is curved; and wherein at least one of said lateral boundary surfaces is planar at least in the region inwardly adjacent said outlet and merges continuously into said portion of said lateral circumferential surface.

5. In a machine as defined in claim 1, said channel further being bounded by two transversely spaced lateral boundary surfaces, and said lateral circumferential surface comprising a portion which is inwardly recessed and curved in circumferential direction of said projection; and wherein at least one of said lateral boundary surfaces is curved inwardly adjacent said outlet and merges continuously with said portion of said lateral circumferential surface.

6. In a machine as defined in claim 1, said channel further being bounded by two transversely spaced lateral boundary surfaces, said lateral circumferential surface comprising an inwardly recessed circumferentially curved portion; and wherein at least one of said lateral boundary surfaces merges continuously into said portion.

7. In a machine as defined in claim 6, wherein said one lateral boundary surface is of variably convex profile over at least part of its length upstream of said outlet.

8. In a machine as defined in claim 6, wherein said portion of said lateral circumferential surface and said lower boundary surface of said channel merge downstream of said outlet and define a groove which is curved in circumferential direction of said projection and provided with a variable profile in said circumferential direction.

9. In a machine as defined in claim 6, said spinning chamber rotating in a predetermined direction; and wherein said portion extends in said predetermined direction helically between a center of said projection and said lateral circumferential surface.

10. In a machine as defined in claim 9, wherein said portion intersects said lateral circumferential surface under an obtuse angle.

11. In a machine as defined in claim 9, wherein said portion merges with said lateral circumferential surface.

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