United States Patent

[11] **3,591,952**

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[33] **Czechoslovakia**
[31] **5820-68**

[54] **OPEN END SPINNING APPARATUS**
10 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **57/58.95**
[51] **Int. Cl.** **D01h 1/12**
[50] **Field of Search** 57/58.89, 58.95, 50

[56] **References Cited**

UNITED STATES PATENTS

3,119,223	1/1964	Meimberg	57/50
3,370,413	2/1968	Rajnoha et al.	57/58.95
3,455,097	7/1969	Rajnoha et al.	57/58.95
3,511,044	5/1970	Stary	57/58.91

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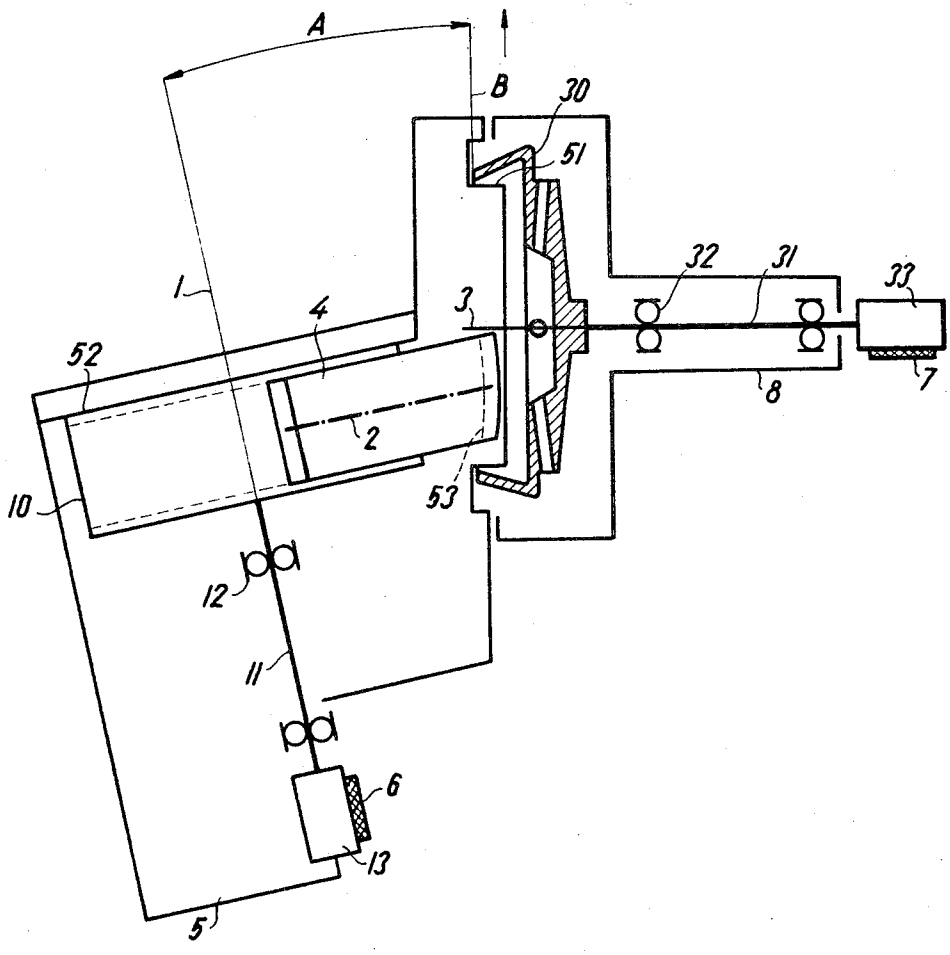
ABSTRACT: A spinning apparatus comprises a rotary spinning chamber mounted for rotation about a first axis and having in its interior an internal circumferential slip surface concentric with this first axis and onto which fibers to be spun are to be deposited. A carding roller is mounted for rotation about a second axis, and a fiber supply channel connects the carding roller with the interior of the spinning chamber to transmit fibers from the carding roller to the spinning chamber. The outlet opening of the supply channel is located in a plane paralleling the first axis of rotation of the spinning chamber and is so configurated as to discharge fibers at right angles to this first axis onto an area of the slip surface which corresponds in outline at least substantially to the configuration of the outlet opening.



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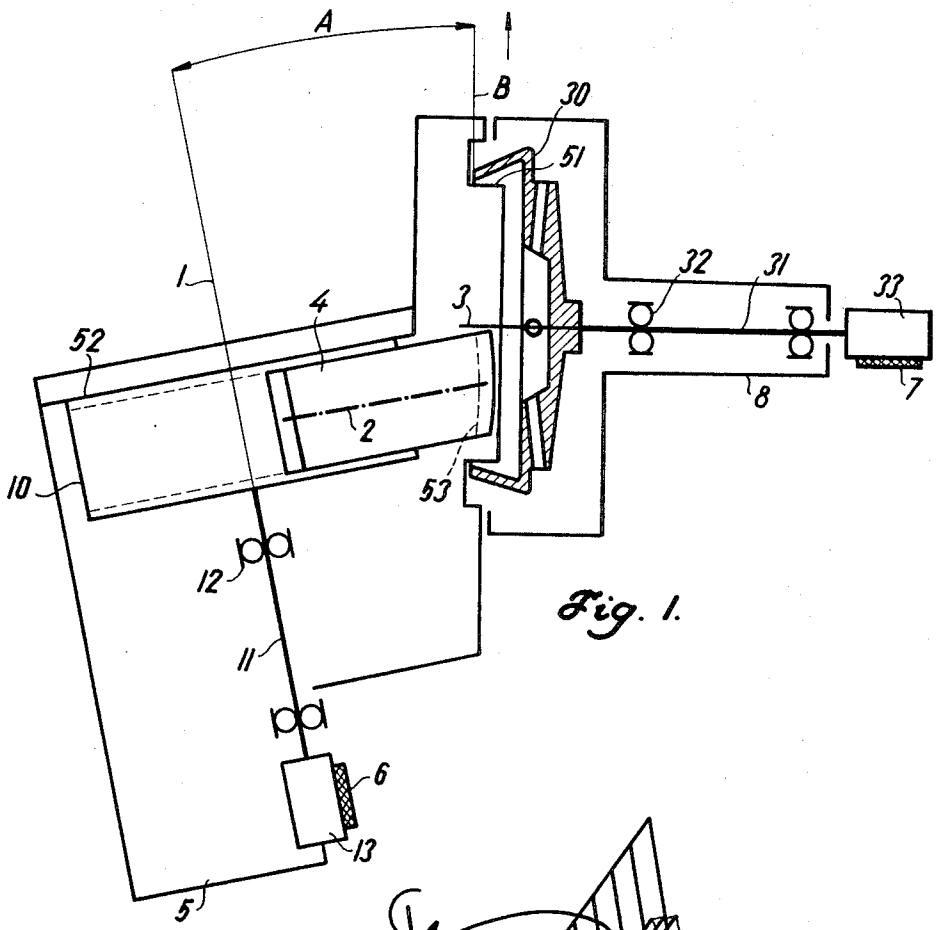

Fig. 1.

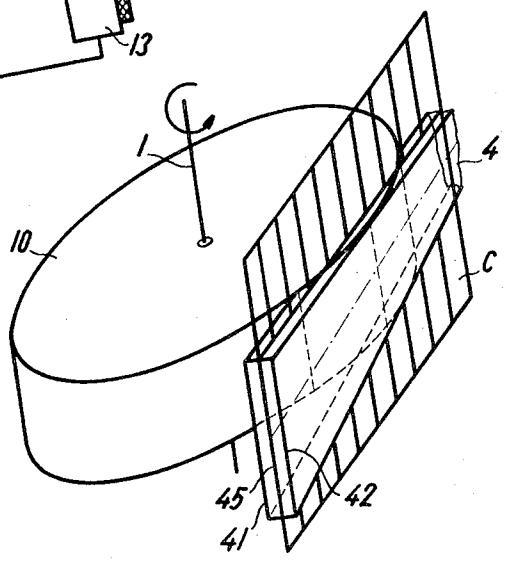

Fig. 2.

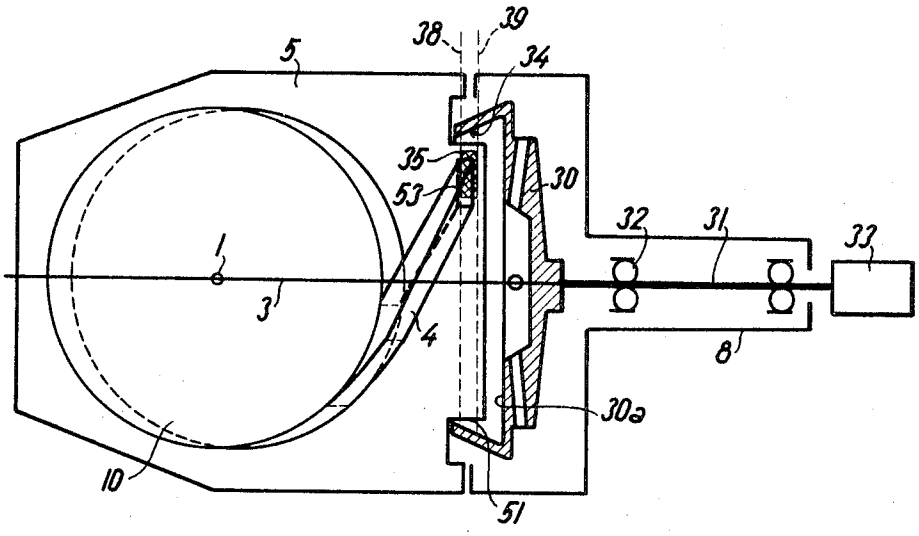

Fig. 3.

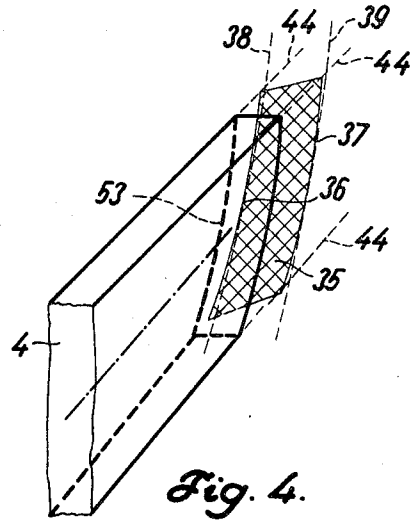

Fig. 4.

OPEN END SPINNING APPARATUS

BACKGROUND OF THE INVENTION

The present invention relates generally to a spinning apparatus, and more particularly to an apparatus for break sprinning.

As used in the present application, the expression "break spinning" describes a spinning operation wherein yarn is formed of fibers which are twisted in a rotary spinning chamber subsequently to being deposited onto an inner surface of the latter. The operation of such spinning chambers, and of the associated components, as well as the break spinning of fibers with such equipment, are already known. A detailed description of such equipment, and a discussion of the operation thereof, may be found for instance in U.S. Pat. No. 3,455,097 in the name of J. Rajnoha et al. Reference therefore may be had to this patent for background information.

Generally speaking, known break-spinning equipment includes a rotary spinning chamber, a carding or combing-out roller which receives roving and separates the same into fibers, and a supply channel through which the carded fibers pass from the carding roller to the spinning chamber. Conventionally, the axis of rotation of the carding roller extends at right angles to the axis of rotation of the spinning chamber, and of course the outlet opening of the fiber supply channel, from which the fibers issue onto the slip surface of the spinning chamber in the interior of the latter, is located eccentrically with respect to the axis of rotation of the spinning chamber.

However, with this known arrangement problems have been encountered in the deposition of the fibers onto the slip surface of the spinning chamber. It will be appreciated that the term slip surface refers to a surface provided on the inner circumferential wall bounding the cavity of the rotary spinning chamber, which slip surface is so inclined as to assure that fibers deposited thereon will slip or slide under the influence of centrifugal force along the surface until they reach a collecting surface where they are converted in known manner into a coherent yarn. The problem with the aforementioned prior art constructions is in the fact that with them it is difficult to keep the fibers which issue from the outlet of the fiber supply channel from moving directly to the collecting surface—without first becoming deposited on the slip surface—and there fouling the yarn which is being formed. One attempt to overcome this problem provides for the use of a separator. However, the use of a separator is not always possible. Specifically, a separator cannot be used in a type of construction wherein a body in which the supply channel is formed extends in part into the interior cavity of the rotary spinning chamber, with the outlet of the channel being provided in a surface portion of this body which is located within the cavity. In such a construction it is possible to obtain the desired result, that is to prevent the issuing fibers from becoming deposited on the collecting surface and thereby on the yarn being formed thereon, by giving the fiber supply channel a rather complex configuration which need not be discussed herein because it does not have a bearing on the invention, other than to say that the complexity makes such a channel very difficult and expensive to manufacture.

Until now, no other possibility was known for providing a construction which is not possessed of the aforementioned disadvantages.

SUMMARY OF THE INVENTION

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

More particularly it is an object of the present invention to provide an apparatus for break spinning of fibers which is not possessed of these disadvantages.

A further object of the present invention is to provide such an apparatus wherein the fiber supply channel may be of simple configuration and is therefore easy and inexpensive to manufacture.

In pursuance of the above objects, and others which will become apparent hereafter, one feature of the invention resides, briefly stated, in the provision of a spinning apparatus of the type in question which comprises a rotary spinning chamber mounted for rotation about a first axis of rotation and having an internal circumferential slip surface concentric with this first axis and onto which fibers to be spun are to be deposited. A carding roller is mounted for rotation about a second axis of rotation which defines with a plane normal to the first axis of rotation a predetermined acute angle. Fiber supply channel means connects the carding roller and the spinning chamber for receiving fibers from the former and for supplying them to the latter. The supply channel has an outlet opening which is located in a plane paralleling the first axis of rotation and which is configurated so as to discharge fibers at right angles to the first axis onto an area of the slip surface which corresponds in outline at least substantially to the configuration of the outlet opening. In this manner the fibers are deposited onto the slip surface substantially without any freedom of lateral deviation as they issue from the outlet opening of the supply channel, that is deviation in direction towards the collecting surface on which the yarn is being formed, prior to their deposition onto the slip surface. Of course, once they are deposited on the slip surface they will then move in the direction towards the collecting surface in the manner described earlier.

We thus obtain the desired advantages, namely the elimination of the undesirable deviation of the fibers, the provision of a fiber supply channel of simple configuration and the non-radial entry of the fibers into the interior of the spinning chamber, by having the rotational axis of the carding roller form with a plane intersecting the rotational axis of the spinning chamber at right angles, an acute angle of such magnitude that a projection of extended surface lines of the inner surfaces bounding the supply channel defines an area on the slip wall whose lateral limits—corresponding to the minimum cross-sectional dimension of the supply channel as opposed to the maximum cross-sectional dimension of the supply channel which is in direction normal to the minimum dimension—extends substantially along the contour lines of the slip wall, at least one of the wider walls of the channel corresponding to the maximum cross-sectional dimension, or a plane passing both through this wider dimension and the longitudinal axis of the channel, being substantially parallel to the axis of rotation of the carding roller.

The embodiment of the invention which is most advantageous from the point of view of manufacture has the axis of rotation of the carding roller and the axis of rotation of the spinning chamber located in a common plane.

A further possibility, particularly advantageous from the point of view of obtaining reduced scattering of the fibers when the same impinge onto the slip wall, provides for the acute angle formed between the axis of rotation of the carding roller and the plane which extends at right angles to the axis of rotation of the spinning chamber, to be in the range of between substantially 5° and substantially 25°.

When it is desired to obtain maximum narrowing of the impingement area of the fibers onto the slip wall, it is advantageous for the angle formed between the axis of rotation of the carding roller and the plane at right angles to the axis of rotation of the spinning chamber, to be on the order of 12°.

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 diagrammatic illustration showing the positioning of the elements of an apparatus according to the present invention, with reference to one another;

FIG. 2 is a diagrammatic illustration showing the relative positions of the carding roller and the fiber supply channel with respect to one another, in accordance with one embodiment of the invention;

FIG. 3 is a diagrammatic plan view showing a further embodiment of the invention; and

FIG. 4 is a diagrammatic detail view, on an enlarged scale, showing a portion of the fiber supply channel, the outlet opening thereof and the impingement area of fibers issuing from the outlet opening and becoming deposited on the slip wall of a rotary spinning chamber.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Discussing now the drawing in detail, and firstly FIG. 1 thereof, it will be seen that this Figure is an illustration showing the overall disposition of the components of a spinning apparatus according to the present invention. A housing or basic body 5 has mounted therein a shaft 11 in bearings 12. A carding roller 10 of known construction is associated with the shaft 11 for rotation thereby, and a belt pulley 13 is provided on the shaft 11 so that the latter may have motion transmitted to it via a belt 6 which is driven in any suitable manner not important for purposes of the present invention.

A conventional spinning chamber 30 of the rotary type, such as is disclosed in detail in the aforementioned U.S. Pat. No. 3,455,097, is mounted on a horizontal shaft 31 which also is provided with a belt pulley 33 to which motion is transmitted by a suitably driven belt 7. Bearings 32 support the shaft 31 in a housing 8 for the rotary spinning chamber.

The axis of rotation of the spinning chamber 30 is identified with reference numeral 3, and that of the carding roller 10 is identified with reference numeral 1. It will be seen that the axis 1 is inclined at an angle A with respect to a plane B which extends normal or at right angles to the axis 3 about which the spinning chamber 30 rotates.

The carding roller is received in a recess provided in the basic body 5 and a lid 52 serves to close the open side of the recess to prevent escape of fibrous material therefrom.

Associated in usual manner with the carding roller 10 is a fiber supply channel 4 which receives fibers from the carding roller 10—after the same has separated these from a roving which is not illustrated and which is supplied to the carding roller in usual manner—and for transporting these fibers to the interior of the rotary spinning chamber 30. In known manner the fiber supply channel 4 is eccentric which is to say that the longitudinal axis 2 of the channel 4, or at least of the downstream end portion thereof which is provided with the outlet opening from which fibers issue onto the inner slip surface of the rotary spinning chamber 30, passes laterally of the axis of rotation 3 of the rotary spinning chamber 30. Fibers deposited on the slip surface of the spinning chamber 30 are therefore deposited tangentially rather than radially with respect to the axis 3.

The position of the fiber supply channel 4, which may be formed directly within the basic body 5 housing the carding roller 10, is affected by the inclination of the carding roller 10 and the channel must then be inclined relative to both the vertical and the horizontal.

As shown in FIG. 1, the channel 4 discharges into the interior of the spinning chamber 30 from a lateral wall 51 of the body 5 which extends into the interior of the spinning chamber 30. In other words, a portion of the body 5 extends into the interior of the spinning chamber through the open end of the latter, and the outlet opening of the channel 4 is provided in a lateral wall 51 of that portion of the body 5 which is so located in the interior of the spinning chamber 30. The discharge of the channel 4 in this lateral wall 51 is limited by a closed curve 53, as shown in FIGS. 3 and 4. The body 5 may

be so configurated that the lateral wall 51 from which the fibers issue through the outlet opening provided therein, will have at the location of the outlet opening a cylindrical, conical or otherwise shaped surface.

FIG. 4 shows in detail how fibers are discharged from the outlet opening of the channel 4. As mentioned before, the discharge is defined by the closed curve 53 and fibers are discharged onto a clearly delimited area 35 of the slip wall 34 of the spinning chamber 30. The configuration of the area 35 corresponds at least substantially to the configuration of the outlet opening of the channel 4. The direction of rotation of the spinning chamber 30 is indicated by the double-headed arrow in FIG. 4, that is the chamber may rotate in one or the other of the directions indicated by this arrow. The upper and lower limits of the area 35—as seen with respect to the direction of rotation of the spinning chamber 30—are defined by the extended surface lines 44 constituting continuations of the narrower walls bounding the channel 4. The lateral limits 36 and 37 of the area 35 are substantially coincident with the contour lines 38 and 39 of the slip surface, that is with that annular portion of the inner circumferential surface of the rotary spinning chamber 30 onto which the fibers are to be deposited and from which they are to "slip" or slide axially towards the collecting surface 30*a* where they are converted into a yarn in known manner. These limits 36 and 37 constitute continuations of the wider walls 41 and 42 of the channel 4. In other words, by projecting extensions of the narrower and wider walls of the channel 4, that is of the various walls which together surround and define the channel 4, onto the slip surface 34, the area 35 is obtained and defined.

FIG. 2 shows one of the possible positions of the channel 4 with respect to the carding roller 10. Here, the wider walls 41, 42—that is those extending in the direction of the larger cross-sectional dimension of the channel 4—or a symmetry plane C of the channel 4 which passes through the larger cross-sectional dimension 45 and through the longitudinal axis of the channel 4, extend in parallelism with the axis of rotation 1 of the carding roller 10.

FIG. 3 is a plan view of an apparatus according to the present invention wherein the axes 1 and 3 about which the carding roller 10 and the spinning chamber 30 respectively rotate, are located in a common plane.

The carding roller 10 receives the staple material, such as sliver or roving, in known manner and separates it into its individual fibers which are conveyed through the channel 4 onto the slip surface 34 of the rotary spinning chamber 30 from which they slip onto the collecting surface 30*a* where they are converted into a yarn in known manner. Because of the disposition of the components with reference to one another, the fibers impinge onto the slip surface 34 only in the precisely defined area 35 and the disadvantageous bypassing of the slip surface 34 by fibers issuing from the outlet of the channel, and direct deposition of such fibers onto the collecting surface, is thereby avoided.

It goes without saying, of course, that the yarn formed on the collecting surface 30*a* is withdrawn in known manner by a withdrawing mechanism through a suitably provided opening, and wound by a takeup device which is also not illustrated. These devices form no part of the present invention and are well known to those skilled in the art.

The apparatus according to the present invention provides the possibility of a common drive of the various spinning devices in a machine, there being of course many such spinning devices providing in a single spinning machine, by the use of belt drives. Furthermore, it is of compact construction and, because the sliver entering the device for processing by the carding roller does not need to change its direction very sharply, conditions for passage of the sliver to the carding roller and from there in form of fibers to the rotary spinning chamber, are enhanced. The nonradial entry of the fibers relative to the rotating slip surface 34, which is desirable as has been established for instance in the aforementioned U.S. Pat. No. 3,455,097, is preserved. The channel 4 is simple in its con-

figuration and therefore readily manufactured, and in addition its simplicity avoids the possibility that the channel might contain spaces in which fibers could accumulate. Similarly, the manner in which the channel discharges within the confines of the rotary spinning chamber **30**, avoids the possibility of the presence of such spaces in the spinning chamber **30**. The path of the fibers from the carding roller to the slip surface **34** is straight and unambiguous.

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 spinning apparatus, 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.

We claim:

1. A spinning apparatus comprising, in combination, a rotary spinning chamber mounted for rotation about a first axis of rotation and having an internal circumferential slip surface concentric with said first axis and onto which fibers to be spun are to be deposited; a carding roller mounted for rotation about a second axis of rotation which defines with a plane normal to said first axis of rotation a predetermined acute angle; and fiber supply channel means connecting said carding roller and said spinning chamber for receiving fibers from the former and supplying them to the latter, said channel means having an outlet opening located in a plane paralleling said first axis of rotation and configurated for discharging fibers at right angles to said first axis onto an area of said slip surface which corresponds in outline at least substantially to the configuration of said outlet opening.

2. An apparatus as defined in claim **1**, wherein said channel means has a longitudinal axis and a major and a minor cross-sectional dimension, and wherein a plane coincident with said longitudinal axis and with said major cross-sectional dimension is at least substantially parallel to said second axis of rotation of said carding roller.

3. An apparatus as defined in claim **1**, wherein said channel means has a major and a minor cross-sectional dimension and is bounded by two wider sidewalls extending in direction of said major, and two narrower sidewalls extending between said wider sidewalls in direction of said minor cross-sectional dimension, and wherein at least one of said major sidewalls at least in the region of said outlet opening is at least substantially parallel to said second axis of rotation of said carding roller.

4. An apparatus as defined in claim **1**, wherein said first and second axes are located in a plane common to them both.

5. An apparatus as defined in claim **1**, wherein said acute angle is in the range between substantially 5° and 25°.

6. An apparatus as defined in claim **1**, wherein said acute angle corresponds at least substantially to 12°.

7. An apparatus as defined in claim **1**; further comprising a mounting element mounting at least said carding roller for rotation, said channel means being provided in said mounting element.

8. An apparatus as defined in claim **1**, wherein said channel means has a longitudinal axis eccentric with reference to said first axis of rotation.

9. An apparatus as defined in claim **1**; and further comprising drive means for rotating said spinning chamber and said carding roller.

10. An apparatus as defined in claim **1**, wherein said channel means has an inlet portion communicating with said carding roller, and wherein said channel means is at least substantially straight at least downstream of said inlet portion.