

DRAW COMB FOR RECTILINEAR KNITTING MACHINE

The invention relates to a draw comb for a rectilinear knitting machine and to a rectilinear knitting machine as such incorporating such a draw comb. It also relates to a hook plate for a draw comb and to a yarn placing method, also called a yarn laying method, for use in the initial stages of knitting.

10 Traditional rectilinear knitting machines comprise at least a minimum of a front needle bed and rear needle bed on which needles are positioned, while a cam carriage moves back and forth above them to operate certain needles and thus make rows of stitches. The
15 resulting fabric appears between the two needle beds and is drawn down by a device employing rollers, known as take-down reelers, as knitting proceeds. A problem that occurs when knitting first begins is that the fabric is not yet long enough for any part of it to
20 hang between the reelers and thus be taken down. Fabric take-down is however essential to efficient knitting with uniform stitches, and to ensure that the resulting fabric does not fall into the wrong position inside the knitting machine and does not become damaged or cause
25 the knitting machine to jam.

Document FR 2646176 provides a device in which a take-down or set-up comb carries hooked or set-up needles which rise between the needle beds to grip the yarn,
30 which has been laid in a certain way between the plates on the first passage of the cam carriage. The comb then gradually descends, pulling the fabric down until it is taken over by the take-down means. The set-up needles are made up of two parts which slide relative to each
35 other. The two parts comprise a hook or a protuberance at their upper end, the protuberance of one part defining a recess comprising the yarn and the hook of the other part being able to slide down to bring about

release of this yarn when necessary. The problem with this device is its great complexity, since each set-up needle has a complex structure. Moreover, the main protuberances or hooks of these set-up needles face toward one of the needle beds of the machine, necessitating a large gap between these two beds to allow the set-up needles to be housed and moved between the two beds. This large gap between the two needle beds is a serious limitation on the resulting knitting machine. What is more, this orientation toward one of the two needle beds forms an asymmetrical geometry, and the two needle beds cannot be used equally conveniently in relation to these set-up needles. It is another limitation of this device.

Document US 2007/0180864 provides another device in which the set-up needles comprise a bolt for closing or opening a housing in which the yarn is positioned in the hook of the needle. When the set-up needles are in a low enough position, the hook is unlocked so that the yarn which it contains can be released automatically, owing to the traction applied to it and the orientation of the needle. However, this device is not very effective because the yarn often remains caught in the hook of the needle despite the fact that the bolt is opened, because this yarn release is passive. Furthermore, all these needles have a hook oriented parallel to the beds in a single direction, so the geometry is asymmetric. Globally, the knitted yarn experiences a traction with a component toward the center of the fabric. With such a device, the yarn is retained by the needle hook on one of the two sides of the fabric, while on the other side it tends to escape and has to be retained by the bolt. This asymmetric construction is not therefore ideal.

Document EP0979892 discloses a device in which a draw comb consists of two hook plates of similar geometry

that interact to first hook and then release a fabric.
The two draw combs are movable relative to each other
in the longitudinal direction and this relative
movement allows the fabric to be released when this is
5 required.

A general object of the present invention is to provide
a rectilinear knitting machine that has a device for
the stage of commencement of knitting that represents
10 an improvement by comparison with the problems of the
previous devices.

More specifically, a first object of the present
invention is to provide a draw comb for a knitting
15 machine compatible with a very small gap between the
needle beds of the knitting machine.

A second object of the present invention is to provide
a draw comb for a knitting machine that first grips and
20 then releases the trapped yarns with great reliability.

To this end, the invention is based on a draw comb for
a rectilinear knitting machine comprising at least one
hook plate comprising at least one hook, extending
25 mainly in a vertical longitudinal plane so as to be
thin in the transverse direction, and comprising at
least one unhooker that is movable relative to at least
one hook plate in such a way as to be able to release a
yarn from the at least one hook, characterized in that
30 the at least one unhooker is mounted so as to be
movable translationally in an essentially vertical
direction relative to at least one hook plate.

The draw comb may comprise at least two hook plates and
35 an unhooker between each hook plate or comprise at
least one hook plate and, superposed on each hook
plate, an unhooker.

The draw comb may comprise at least two hooks facing in essentially opposite directions.

5 The at least one hook plate may comprise two hooks and the draw comb may comprise an unhooker capable of releasing a yarn from two adjacent hooks facing in essentially opposite directions.

10 The draw comb may comprise at least two hook plates each comprising two hooks facing toward each other in opposite directions and may comprise an unhooker located between each hook plate.

15 As a variant, the at least one hook plate may comprise two hooks facing in opposite directions outward from the hook plate and may comprise an unhooker superposed on the at least one hook plate.

20 Moreover, the at least one unhooker may be movable translationally upward relative to the at least one hook plate.

25 The draw comb may comprise a multitude of hook plates and the at least one unhooker may comprise a groove on each lateral edge extending in the vertical direction in order to accommodate a hook plate in each groove and guide the relative translational movement between the at least one unhooker and the hook plates. This draw comb may comprise a multitude of unhookers in the form
30 of vertical bars having an upper end moving very close to the hooks in such a way as to be able to directly release a yarn hooked around one or more hooks.

35 The draw comb may comprise a multitude of plates and unhookers, all the plates being firmly mounted at their bottom end to one common support, and all the unhookers being firmly mounted on a common base, the base and the support being movable relative to each other, extending

longitudinally, and being positionable essentially parallel to a needle bed of a knitting machine.

5 The invention also relates to a rectilinear knitting machine characterized in that it comprises at least one needle bed and a draw comb as described above.

10 The draw comb may be capable of a downward vertical movement, there being a stop that blocks the downward movement of the at least one unhooker and brings about its relative upward movement with respect to the at least one hook plate.

15 The rectilinear knitting machine may comprise a fabric take-down device comprising two belts driven in opposite directions, passing around two small-diameter rollers positioned close to at least one the needle so that the fabric has to be pulled for a short distance by draw comb.

20 The spacing between the hooks of the draw comb may be compatible with several different gauges of the knitting machine.

25 The rectilinear knitting machine may comprise at least two needle beds and the draw comb may be adapted to fit through a gap whose width is greater than or equal to a few tenths of a millimeter for the formation of a starter net.

30 As a variant, the relative movement of the at least one unhooker with respect to the at least one hook plate may be brought about with the aid of at least one motor.

35 Lastly, the invention relates to a hook plate for a draw comb, characterized in that it comprises at least two hooks facing in opposite directions and extending

mainly in a vertical longitudinal plane so as to be thin in the transverse direction.

These objects, features and advantages of the present invention will be set forth in detail in the following description of one particular embodiment, no limitation being implied, in relation to the attached figures, in which:

10 figure 1 is a diagrammatic front view of a draw comb showing the comb pulling down a fabric in one embodiment of the invention;

15 figure 2 is a diagrammatic side cross section through a knitting machine in a configuration for forming a starter net in the embodiment of the invention;

20 figure 3 is a diagrammatic side cross section through a knitting machine in an intermediate position close to the configuration of release of the yarn from the draw comb in the embodiment of the invention;

25 figure 4 is a diagrammatic side cross section through a knitting machine in a configuration in which the yarn is being released from the draw comb in the embodiment of the invention;

30 figures 5a and 5b are diagrammatic front and side views of hook plates for the device of the invention in a configuration corresponding to figure 2 in which a starter net is being formed;

35 figures 6a and 6b are diagrammatic front and side views of hook plates for the device of the invention in a configuration in which the yarn is beginning to be released;

figures 7a and 7b are diagrammatic front and side views of hook plates for the device of the invention in a yarn releasing configuration corresponding to figure 4;

- 5 figure 8 is a diagrammatic front view of hook plates in a variant of the embodiment of the invention;

figure 9 is a diagrammatic front view of hook plates in another variant of the embodiment of the invention; and

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figure 10 is a diagrammatic front view of hook plates in another variant of the embodiment of the invention.

- For the sake of clarity of the following description,
15 the longitudinal direction x is the direction parallel to the plane of the needle beds of the knitting machine, the vertical direction z is the upward direction perpendicular to the longitudinal direction, and the transverse direction y the direction
20 perpendicular to the previous two directions. The same references and directions would also be used when describing the draw comb and its elements, independently of the knitting machine, with reference to the position they are designed to occupy within a
25 knitting machine when the comb is pulling the fabric.

- The draw comb 11 in one embodiment of the invention, shown in a partial front view in figure 1, is composed of an alternation of hook plates 13 and unhookers 23.
30 For a large part of its width, measured in the longitudinal direction x, each hook plate 13 is housed in a groove 25 in each of its two adjacent unhookers 23, in such a way as to allow a relative translational movement by the unhookers 23 sliding relative to the
35 needles 13 along their grooved connection. All these elements 13, 23 are securely attached at their base, by the plate support 12 in the case of the hook plates 13, and by the base 22 in the case of the unhookers 23, as

can be seen in figures 2-4, in such a way that all the hook plates 13 on the one hand, and all the unhookers 23 on the other, remain at an identical height and form an indissociable assembly that moves as one. This construction provides relative translational mobility of all of the hook plates 13 and all of the unhookers 23, this relative movement being guided by the interaction of the two assemblies of elements by their grooved connection, the clearance being small to ensure precise control of the translational movement. In a variant, any other mechanical connection capable of producing this translational movement between these two assemblies may be envisioned.

In this embodiment, each hook plate 13 takes the form of an elongated flat bar with a small thickness of less than 1 millimeter in the transverse direction y, a width of around one centimeter in the longitudinal direction x, and a height slightly greater than ten centimeters in the vertical direction z. Each hook plate 13, also called a comb plate, comprises a head 14 at its upper end designed to engage a yarn 9. For this purpose the head 14 comprises two lateral arms 15 extending vertically and ending in an upper point 17. In addition, the two arms 15 each form a hook 16 in their upper part: this hook is turned toward the center of the plate so that the two hooks 16 are turned toward each other in essentially opposite directions along the x direction of the width of the plate. The two hooks 16 have a geometry defined in a vertical longitudinal plane xz. A yarn 9 positioned in these hook plates 13 during the formation of the starter net forms a loop around two adjacent hooks 16 belonging to two different and adjacent hook plates 13. A yarn 9 can thus be hooked around the hooks 16 of the hook plates 13. When the draw comb 11 moves down, a fabric 10 is therefore pulled down with it.

The unhookers 23 are mounted so as to be movable translationally in the direction parallel to the hook plates 13, in an essentially vertical direction. Each unhooker 23 also takes the form of a flat metal bar, but its thickness is greater than the thickness of the hook plates, in order to include two grooves 25 running all the way along their height in a vertical longitudinal plane xz. The depth, measured in the longitudinal direction x, of the lateral grooves of the unhooker 23, which run along their lateral edges, corresponds to approximately one-half of the width of a hook plate 13. Each groove in the unhooker 23 houses a hook plate 13. Each unhooker 23 is thus distributed symmetrically in the transverse direction y on each side of the hook plates 13, which offers a symmetrical solution relative to the two needle beds 2 of the knitting machine and the loop obtained with the yarn 9 may thus come equally easily from either of the two needle beds 2. Each unhooker 23 has a head 24 in its upper part which terminates in a point 27. The head 24 also has an inclined surface 28 becoming thinner and thinner toward the point 27 of the unhooker. This point 27 of the unhooker 23 is thus thinner, narrower and positioned as close as possible to the surface of the hook plates 13 by the fact that it is connected with little play to the plates, as ensured by the grooves. Each unhooker 23 performs a function of releasing the yarn 9 from the hooks 16 of the hook plates 13 by an upward movement, as will be detailed later, and may also be referred to as a yarn release means or releaser.

In the configuration of the draw comb pulling on a fabric 10, as shown in figure 1, the points 17 of the hook plates 13 are higher than the points 27 of the unhookers 23, so that the heads 14 of the hook plates 13 project a few centimeters from the points 24 of the unhookers 23 in order to be able to collect the starter

net of the fabric and then pull the fabric 10 without difficulty and without the unhookers 23 getting in the way.

5 Figures 2-4 are a simplified diagram of an embodiment of the invention in which a rectilinear knitting machine contains a draw comb 11 as described above. The knitting machine comprises two needle beds 2 carrying needles 3. A gap 4 between these beds allows a fabric
10 10 to escape in the downward direction as it is being knitted. The machine is also equipped with a fabric 10 take-down device 5 based on reelers, such as those described in patent FR2368672. The take-down device 5 is used to draw down the fabric 10 once the latter is
15 long enough, as is the case in the configuration shown in figure 4.

This take-down device 5 essentially comprises two endless belts, made of rubber or similar material,
20 driven by two tubular drums in their lower part, and in their upper part passing around two rollers consisting for example of simple small-diameter cylindrical metal bars. This configuration enables the take-down device 5 to be arranged close to the needle beds 2 and optimally
25 reduces the length of fabric required before it is drawn by the reelers. The fabric 10 is engaged between the belts immediately beneath the stitch-forming zone by the plates. Between each of the drums and the rollers is a frame, consisting of a prismatic block
30 running all the way along the drums and having a groove of cylindrical surface by which it slides with pressure against the drum, and a second groove serving as a bearing for the rollers. On the sides of the blocks are
35 two planar faces for guiding the rectilinear paths of the belts. The drums of the belts are turned in opposite directions, which not only has the effect of driving the belts but also encouraging the frames to rotate similarly, so that they tend to lean toward each

other, via their belts, and pinch the fabric which is thus pulled down by friction and sliding contact. In a variant, any other take-down device could be used.

- 5 The operation of the draw comb 11 will now be detailed. The knitting commencement stage can be divided into three stages.

10 Firstly, figure 2 shows the formation of a starter net, in which a yarn 9 is laid onto the hooks 16 of the draw comb. In this step the draw comb 11 is positioned in its highest position, so that the hooks 16 of its hook plates 13 pass through the gap 4 between the two needle beds 2, until they are higher than these two needle
15 beds 2. Here, it is well positioned to collect a yarn 9 between its hooks 16 to give a configuration as illustrated in figures 5a and 5b. In this configuration the unhookers 23 remain in a low position beneath the gap 4 between the needle beds, so it is possible to
20 reduce the size of the part of the draw comb positioned in the gap 4 between the beds.

Once this starter net has been made, the draw comb is capable of pulling a fabric 10 downward. Toward the end
25 of the period of pulling by the draw comb 10, as shown in figure 3, the draw comb 11 has descended out of the reeler, taking with it the fabric 10, which continues to be knitted conventionally by the needles 3 on the needle beds 2. After the hook plates 13 have passed
30 between the reeler, the path of the draw comb 11 deflects slightly sideways. In this configuration the fabric 10 is already mainly being drawn by the reeler.

Figure 4 shows the fabric 10 release stage. In this
35 stage the base 22 of the unhookers 23 is bearing upon a stop 6 while the support 12 of the hook plates 13 continues its downward path. This configuration causes a relative translational movement between the unhookers

23 and the plates 13. The latter 13 descend while the unhookers 23 remain at a constant height defined by the stop 6. The points 27 of the unhookers thus slide into the loops formed by the yarn 9 on the hooks 16 of the hook plates 13 until these loops 9 are released from the hooks 16 causing final release of the fabric 10 from the grip of the draw comb 11. A lateral stop 7, where the upper part of the draw comb is positioned in this stage, ensures that the end of the released fabric 10 does not become oriented in the wrong direction where it could become stuck, for example sideways, and forces it back to the center underneath the machine. The fabric 10 is then simply taken down by the reelers 5, moving down in the center of the machine, and the stage of starting to knit is completed. The draw comb 11 which was moved laterally at the end of its path is now out of the way and does not interfere with the path of the fabric 10.

Figures 5-7 show more precisely the geometry of part of the end of the draw comb 11 and its various configurations during the stage when the comb is pulling the fabric.

Figures 5a and 5b show in particular two adjacent hook plates 13 in the high position and an unhooker 23 in the low position. A yarn 9 is positioned in these plates 13 and forms a loop around two adjacent hooks 16 belonging to two different neighboring plates. Each groove in the unhooker 23 houses a hook plate 13. The unhooker 23 is thus distributed symmetrically in the transverse direction y on either side of the hook plate 13. The whole of the upper part of the draw comb 11 therefore has symmetry about a longitudinal central plane xz and the loop made by the yarn 9 can thus come equally easily from either of the two needle beds 2.

Figures 6ab and 7ab illustrate two conditions in the stage of releasing the yarn 9 from the grip of the draw comb 11. As shown in figures 6a and 6b, after an upward movement of the unhooker 23, its point 27, which is shaped like an upward V, with the point cut off, so as not to damage the yarn 9, positions itself where the yarn 9 has formed a loop around the hooks 16 of the hook plate 13. This point 27 is thin, narrow and positioned very close to the surface of the plates 13 because the connection between the plates 13 and the unhookers 23 has little play. It thus invariably fits without fail under the loop of yarn 9 present around the hooks 16 as the point continues its upward path relative to the hook plates 13. In fact, as they continue their descent, the hooks 16 of the plates 13 end up in a lower position than the point 27 of the unhooker, inside the grooves 25 of the unhooker. As the width of the unhooker 23 is less than the distance between a hook 16 and the adjacent hook 16 on the adjacent plate, the loop of yarn 9, wrapped around these two hooks 16, is pushed by the point 27 of the unhooker 23 until it is wide enough to escape from the hooks 16 of the plates 13, as figures 7a and 7b illustrate. The yarn 9 and the whole of the fabric 10 is thus released from the draw comb 11. This operation is performed simultaneously on all the plates 13 of the draw comb 11 by the same upward relative movement of the unhookers 23.

In the embodiment described above, the device thus has the following advantages:

- the hook plates 13 pass through the gap 4 between the needle beds 2 in the direction of their thickness, which is their smallest dimension, and are suitable for a very small gap 4, making it conceivable to have the separation between the needle beds 2 as little as a few tenths of a millimeter. This advantage is obtained in

particular because the hooks 16 of the plates are oriented in a vertical longitudinal plane xz and have little thickness in the transverse direction y;

- 5 • as the unhookers occupy a low position at the moment of formation of the starter net in order subsequently to execute an upward movement relative to the plates, they do not encumber the upper end of the draw comb, which is located between the needle beds;
- 10 • the hook plates 13 have two hooks 16 that are symmetrical with respect to a vertical central plane yz at right angles to the hook plates 13. This allows a loop of yarn 9 to be hooked around two hooks facing in
- 15 different directions, which form an arrow-like assembly. This arrangement enables a yarn 9 to be retained effectively and identically on each lateral side of the knitting machine;
- 20 • the use of an unhooker 23 to grip the yarn 9 and release it from the hooks 16 of the hook plate 13 ensures reliable release of the fabric 10 and prevents blockages of the machine by poor release of the fabric and/or damage to the fabric due to involuntary and
- 25 undesirable tugging in situations of poor release;
- the combination of the draw comb 11 of the invention with the take-down device 5 described above, positioned very close to the needle beds, minimizes
- 30 this pulling stage by the draw comb and the distance to be covered by the draw comb before yarn release. This therefore reduces the length of fabric produced by this principle of traction specific to the start-up stage. This length may be around 60 millimeters, and is at all
- 35 events less than 70 millimeters. This represents a big advantage because the transfer from traction by the draw comb 11 of the fabric 10 to its traction by the take-down device 5 in the next phase of the knitting

process introduces differences which are visible in the knitted stitches. It is therefore important to reduce the amount of fabric produced during the beginning phase of traction by comb in order to avoid producing a
5 fabric with an ugly divide between two large areas of different stitches;

- the relative movement between the unhookers and the plates is simply mechanical and requires no motor,
10 which represents a simple and cheap solution. However, it is possible to devise any other relationship between the two components with relative drive by means of one or more motors.

15 Clearly, the invention is not limited to the geometries of hook plates 13 and unhookers 23 described above.

Also, the combination of hooks oriented symmetrically with respect to a vertical transverse plane yz has the
20 advantage of retaining the yarn properly. This advantage could be obtained by other embodiments, by choosing for example plates having a single hook, each receiving a yarn, with their orientations reversed on either side of the machine so that the hooks all face
25 away from the machine on each of the two sides of the machine. Another arrangement, still using hook plates with a single hook, would be to alternate the orientation of the adjacent hooks of neighboring hook plates so that a yarn can be looped around these two
30 neighboring hooks forming an arrow, while an unhooker would be housed between these two neighboring hook plates. In the variant illustrated in figures 8-10, each plate 13 could have two hooks 16 facing outward from the plate, either on two separate arms 15 or on a
35 single arm. In such a variant, the yarn 9 forms a loop around these two hooks of the same plate. The unhookers 23 are thus not necessarily positioned between two adjacent hook plates 13 but one unhooker 23 could be

positioned centrally and superimposed on each hook plate 13, as illustrated in figures 9 and 10. The relative movement of the two elements can be provided by having a vertical central groove 19 running essentially the full height of each hook plate 13, and housing through-elements (not shown) of the unhookers, in such a way as to exhibit little play and ensure a translational movement in which the point 27 of each unhooker is very close to the surface of the hook plates. In another variant, each hook plate may comprise two hooks facing in the same direction. Other variants may be obtained by combining the arrangements set out above, for example using hook plates with four hooks, each carrying at least one superposed unhooker and/or an unhooker positioned between the plates.

Any hook plate 13 having a spur, hook or other shape capable of hooking a yarn would be suitable, provided this yarn hooking means is principally oriented in a vertical longitudinal plane xz , in order to stay as thin as possible in the transverse direction y . However, there is nothing to prevent a person devising a hook with a three-dimensional shape, with an extension in the transverse direction y as well, for example of conical shape or a portion of a cone, in order to further improve the hooking of a yarn. This arrangement may be a variant of the invention in knitting machine configurations that have two needle beds separated by a sufficient gap. However, according to the invention, the hooks 16 of the hook plates have their maximum dimension in the longitudinal direction x and/or the vertical direction z , i.e. in the vertical longitudinal plane xz .

The arrangement illustrated comprises a multitude of hook plates with two hooks; however, these hooks could be mounted on a single body or a single plate. Finally, any arrangement comprising at least one plate and at

least one hook is possible without departing from the concept of the present invention.

Again, the unhooker may be any other shape that allows
5 it to successfully release the yarn from the hook
plates by moving relative to the plates. For example,
its upper end 27 may be rounded, as shown in figure 10,
or V-shaped with two points as shown in figure 8. More
generally, this end will be any non-cutting shape so as
10 not to damage the yarn. The release of the loop of yarn
9 from the hook of the plate is preferably achieved by
a direct action, in which the unhooker contacts the
yarn directly. Lastly, the yarn has been advantageously
illustrated as forming a loop around two hooks to make
15 it easy for the unhooker to grip. However, any other
arrangement of the yarn may be envisioned.

This arrangement is advantageous on a rectilinear
knitting machine with two needle beds. However, there
20 is no reason why it should not be implemented on a
knitting machine with a single needle bed or more than
two needle beds, such as 4 or 6.

The components of the draw comb will preferably be made
25 of metal but may also be made of rigid plastic if
desired.

The invention also makes it possible to carry out two
methods for forming a starter net on the hook plates
30 13.

In a first method the yarn used to initialize the
knitting, which usually has a particular elastic
property, is firstly distributed between the needles 3
35 of the knitting machine in such a way that it forms a
predefined net from one needle bed to the other, thus
having parts which traverse the gap 4 between the
needle beds. When this net of yarn 9 is complete, the

draw comb 11, which was occupying a low position, is raised to position its plates 13 between the needle beds 2 level with the prepared yarn 9. The draw comb is then lowered, and in this downward movement its plates 5 13 pick up the yarn, whose net has been designed to correspond to the geometry of the hooks 16 of the plates 13. For this purpose, the yarn is made to traverse from one needle bed to the other level with the hook by which it is to be grasped. Moreover, in one 10 advantageous embodiment the geometry, specifically the width of the hooks of the plate and of the whole of the draw comb, may be such as to correspond to a multiple of several different gauges of knitting machines, the gauge representing the distance between the needles 3 15 mounted on the needle beds. In this way the same draw comb 11 is adapted to several different gauges of knitting machine.

In a second method of forming the starter net, the draw 20 comb 11 may first be positioned in a high position in which the hooks 16 of its hook plates project above the needle beds 2. Only then is the yarn 9 introduced and directly knitted with on the one hand certain needles 3 from the needle beds 2 and on the other hand with the 25 hook plates 13, so that it becomes held by the draw comb 11.

Claims

1. A draw comb (11) for a rectilinear knitting machine comprising at least one hook plate (13) comprising at least one hook (16), extending mainly in a vertical longitudinal plane (xz) so as to be thin in the transverse direction (y), and comprising at least one unhooker (23) that is movable relative to the at least one hook plate (13) in such a way as to be able to release a yarn (9) from the at least one hook (16), characterized in that the at least one unhooker (23) is mounted so as to be movable translationally in an essentially vertical direction (z) relative to the at least one hook plate (13).

2. The draw comb (11) for a rectilinear knitting machine as claimed in the preceding claim, characterized in that it comprises at least two hook plates (13) and an unhooker (23) between each hook plate (13) or in that it comprises at least one hook plate (13) and, superposed on each hook plate (13), an unhooker (23).

3. The draw comb (11) for a rectilinear knitting machine as claimed in one of the preceding claims, characterized in that it comprises at least two hooks (16) facing in essentially opposite directions.

4. The draw comb (11) for a rectilinear knitting machine as claimed in one of the preceding claims, characterized in that the at least one hook plate (13) comprises two hooks (16) and in that the comb comprises an unhooker (23) capable of releasing a yarn (9) from two adjacent hooks (16) facing in essentially opposite directions.

5. The draw comb (11) for a rectilinear knitting machine as claimed in the preceding claim,

characterized in that it comprises at least two hook plates (13), each comprising two hooks (16) facing toward each other in opposite directions and in that it comprises an unhooker (23) located between each hook
5 plate (13).

6. The draw comb (11) for a rectilinear knitting machine as claimed in claim 3, characterized in that the at least one hook plate (13) comprise) two hooks
10 (16) facing in opposite directions outward from the hook plate (13) and in that it comprises an unhooker (23) superposed on the at the at least one hook plate (13).

15 7. The draw comb (11) for a rectilinear knitting machine as claimed in one of the preceding claims, characterized in that at least one the unhooker (23) is movable translationally upward relative to the at least one hook plate (13).

20 8. The draw comb (11) for a rectilinear knitting machine as claimed in the preceding claim, characterized in that it comprises a multitude of hook plates (13) and in that the at least one unhooker (23)
25 comprises a groove (25) on each lateral edge extending in the vertical direction (z) in order to accommodate a hook plate (13) in each groove and guide the relative translational movement between the at least one unhooker (23) and the hook plates (13).

30 9. The draw comb (11) for a rectilinear knitting machine as claimed in the preceding claim, characterized in that it comprises a multitude of unhookers (23) in the form of vertical bars having an
35 upper end moving very close to the hooks (16) in such a way as to be able to directly release a yarn (9) hooked around one or more hooks (16).

10. The draw comb (11) for a rectilinear knitting machine as claimed in one of the preceding claims, characterized in that it comprises a multitude of plates (13) and unhookers (23), all the plates (13) being firmly mounted at their bottom end to one common support (12), and all the unhookers (23) being firmly mounted on a common base (22), the base (22) and the support (12) being movable relative to each other, extending longitudinally (x), and being positionable essentially parallel to a needle bed (2) of a knitting machine.

11. A rectilinear knitting machine characterized in that it comprises at least one needle bed (2) and a draw comb (11) as claimed in one of the preceding claims.

12. The rectilinear knitting machine as claimed in the preceding claim, characterized in that the draw comb (11) is capable of a downward vertical movement, and in that the machine comprises a stop (6) for blocking the downward movement of the at least one unhooker (23) and bringing about its relative upward movement with respect to the at least one hook plate (13).

13. The rectilinear knitting machine as claimed in either of claims 11 and 12, characterized in that it comprises a fabric (10) take-down device (5) comprising two belts driven in opposite directions, passing around two small-diameter rollers positioned close to the at least one needle bed (2) so that the fabric has to be pulled for a short distance by draw comb (11).

14. The rectilinear knitting machine as claimed in one of claims 11-13, characterized in that the spacing between the hooks (16) of the draw comb (11) is compatible with several different gauges of the knitting machine.

15. The rectilinear knitting machine as claimed in one of claims 11-14, characterized in that it comprises at least two needle beds (2) and in that the draw comb is
5 adapted to fit through a gap (4) whose width is greater than or equal to a few tenths of a millimeter for the formation of a starter net.

16. The rectilinear knitting machine as claimed in one
10 of claims 11-15, characterized in that the relative movement of the at least one unhooker (23) with respect to the at least one hook plate (13) is brought about with the aid of at least one motor.