

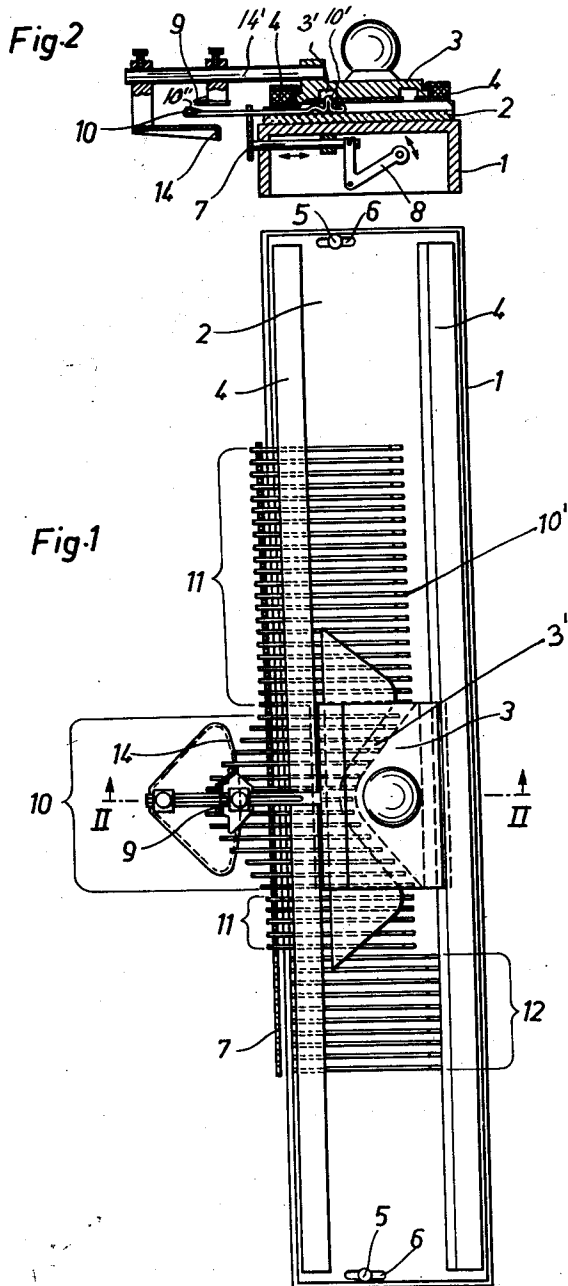
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HAND KNITTING APPARATUS

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HAND KNITTING APPARATUS

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The present invention relates to a hand knitting apparatus, and more particularly to a hand knitting apparatus having a vertically arranged retaining needle comb, and a set of horizontally movable needles.

It is an object of the present invention to provide a hand knitting apparatus, wherein new loops are formed by pulling a thread through old loops retained by a stationary needle comb.

It is another object of the present invention to provide means for adjusting the distance between the retaining needle comb and the needle hooks holding a new thread in order to vary the size of new loops.

It is a further object of the present invention to provide movable retaining means for pulling loops out of needle hooks while the needles advance.

It is a still further object of the present invention to provide a hand knitting apparatus of simple and inexpensive construction which is easily and reliably operated.

With these objects in view, the present invention mainly consists in a knitting apparatus, in combination, a first elongated retaining means, a second retaining means extending parallel to the first retaining means, a row of parallel needles having hooked ends, each of the needles being movable transversely to the retaining means from a retracted position with the hooked end thereof located on the outside of the first retaining means through the space inside the first and second retaining means to an advanced position with the hooked end located on the outside of the second retaining means and back again so that a knitted piece suspended on the inside of the first retaining means on loops passing through the hooked ends of the needles in the retracted position is retained on the inside of the second retaining means when the needles move towards the advanced position and the loops are pulled out of the hooked ends of the needles by the second retaining means; means for inserting a thread into the hooked ends of the needles when the needles are in the advanced position so that the thread is pulled through the loops to form new loops when the needles return to the retracted position and the knitted piece is retained on the inside of the first retaining means suspended by the new loops; and means for adjusting the distance between the second retaining means and the line defined by the hooked ends of the needles in retracted position.

According to a preferred embodiment of the present invention, the hand knitting apparatus

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mainly comprises elongated supporting means, an elongated needle board mounted on the supporting means, an elongated needle comb including a row of vertical parallel spaced needles located in front of the supporting means mounted thereon movably in a transverse direction, a row of spaced parallel horizontal needles transversely movably mounted on the needle board and projecting therefrom with a free hooked end portion and a shaft portion, movable actuating means having cam means engaging a group of horizontal needles for moving consecutively each of the horizontal needles from a retracted position with the free hooked end portion thereof located behind the vertical needles to an advanced position between two adjacent vertical needles with the free hooked end portion and a shaft portion located in front of the vertical needles, and then back again to the retracted position, retaining means secured to the movable actuating means movably therewith and having an operating face located below the plane defined by the row of horizontal needles and extending intermediate the advanced and the retracted position of the free hooked end portion of the horizontal needles substantially parallel to the line defined by the hooked ends of the horizontal needles in advanced position and having a length substantially equal to the length of the cam means of the movable actuating means and adapted to pull loops out of the hooked end portions of the horizontal needles onto the shaft portions when the hooked end portions are advanced by the actuating means beyond the operating face, means secured to and movable with the movable actuating means for inserting a thread into the hooked end portions of the horizontal needles in advanced position thereof after the hooked end portions are freed of the loops by the retaining means so that new loops are formed by pulling the thread through the loops retained by the row of vertical needles when the horizontal needles are retracted by the movable actuating means to the retracted position, and adjusting means for transversely moving the needle comb for adjusting the distance between the needle comb and the hooked ends of the horizontal needles in retracted position.

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 connec-

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tion with the accompanying drawings, in which:

Fig. 1 is a plan view of the hand knitting apparatus according to the present invention; and

Fig. 2 is a cross-sectional view on line II—II of Fig. 1.

Referring now to the drawings, a needle board 2 is mounted on a supporting means 1 and is secured thereto by bolts and nuts 5. The bolt 5 passes through transversal slots 6 in the needle board 2 so that the same may be adjusted transversely on the supporting means 1. A stationary needle comb 7 constituting a retaining means is mounted on the supporting means 1, and the distance between the supporting means and the needle board 2, on one hand, and the needle comb 7 on the other hand may be gradually adjusted by lever means 8.

A longitudinally movable actuating member 3 is guided by rails 4 and provided with an eccentric groove 3' in which the projecting portions 10' of the horizontal needles 10 are guided. The walls of the groove 3' constitute cam means for consecutively moving the needles 10 in a transversal direction when the movable actuating member 3 is longitudinally moved. The horizontal needles 10 indicated in inactive position by reference numeral 12 are movable independently of each other from a retracted position indicated by the reference numeral 11 to an advanced position, and each horizontal needle 10 passes during such movement between two adjacent vertical needles of the needle comb 7. The horizontal needles have hooked ends which are closed by pivoted tongues 10''.

The movable actuating member 3 is provided with an arm 14' on which a retaining means 14 is mounted. The retaining means 14 is provided with an operating face which is located below the plane defined by the row of horizontal needles and extends intermediate the needle comb 7 and the line defined by the hooked ends of the horizontal needles 10 in advanced position. Thread inserting means 9 are mounted on the arm 14' so as to move with the movable actuating means exactly above the hooked end portion of the most advanced needle 10 and adapted to insert a new thread therein.

The operation of the device is as follows:

A knitted piece is suspended by loops on the hooks of the needles 10 in retracted position 11 thereof. Since in the retracted position 11 of the horizontal needles the hooked ends thereof are located closely behind the needle comb 7, the knitted piece hangs in front of the needle comb 7. When the horizontal needles are consecutively advanced by the movable actuating means 3, each loop is carried towards the thread inserting means 9, and while the hooked end is passing over the retaining means 14, the knitted piece is retained by the retaining means 14 whereby the loop is pulled out of the hooked end of the advancing needle so as to slide onto the shaft thereof. Consequently, the advancing needle arrives at its most advanced position under the thread inserting means free of a loop, and in this position a new thread is inserted into the hooked end thereof.

Further movement of the movable actuating means causes retraction of the needles, and when the hooked end of a retracted needle passes through the needle comb 7, the old loop by which the knitted piece is suspended from the shaft of the needle is retained by the vertical needles of the needle comb so that it passes over the hooked end of the horizontal needle whereby

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the new thread is pulled therethrough and a new loop is formed. This new loop passes through the hooked end of the horizontal needle in retracted position behind the needle comb while the knitted piece is suspended thereon in front of the needle comb. Thereupon, the operation is repeated.

The hooked ends of the horizontal needles are provided with pivoted tongues 10'' which are opened by the old loops when the same are pulled out of the hooked ends by the retaining means 14, and are closed again when the old loop on the shaft of the needle is pulled over the hooked end when a new loop is formed and the old loop is retained by the needle comb.

By adjusting the relative position of the needle comb with respect to the line defined by the horizontal needles in retracted position, the size of the newly formed loops may be varied. Such adjustment may be carried out by transversely adjusting the needle comb 7, or the needle board 2.

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 hand knitting apparatus differing from the types described above.

While the invention has been illustrated and described as embodied in a hand knitting apparatus having an adjustable vertically arranged needle comb and a set of horizontally movable needles, 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 adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

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

1. A hand knitting apparatus, comprising in combination, elongated supporting means; an elongated needle board mounted on said supporting means; an elongated needle comb including a row of vertical parallel spaced needles located in front of said supporting means; a row of spaced parallel horizontal needles transversely movably mounted on said needle board and projecting therefrom with a free hooked end portion and a shaft portion; movable actuating means for moving consecutively each of said horizontal needles from a retracted position with said free hooked end portion thereof located closely behind said vertical needles to an advanced position between two adjacent vertical needles with said free hooked end portion and a shaft portion located in front of said vertical needles, and then back again to said retracted position; retaining means secured to and movable with said actuating means and having an operating face located below the plane defined by said row of horizontal needles and extending intermediate the advanced position of said free hooked end portions of said horizontal needles and said row of vertical needles, said retaining means being adapted to pull loops out of the hooked end portions of said horizontal needles onto said shaft portions when said hooked end portions are advanced by said actu-

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ating means beyond said operating face; and means secured to and movable with said movable actuating means for inserting a thread into said hooked end portions of said horizontal needles in said advanced position thereof after said hooked end portions are freed of said loops by said retaining means so that new loops are formed by pulling said thread through said loops retained by said row of vertical needles when said horizontal needles are retracted by said movable actuating means to said retracted position.

2. A hand knitting apparatus, comprising in combination, elongated supporting means; an elongated needle board mounted on said supporting means; an elongated needle comb including a row of vertical parallel spaced needles located in front of said supporting means mounted thereon movably in a transverse direction; a row of spaced parallel horizontal needles transversely movably mounted on said needle board and projecting therefrom with a free hooked end portion and a shaft portion; movable actuating means for moving consecutively each of said horizontal needles from a retracted position with said free hooked end portion thereof located closely behind said vertical needles to an advanced position between two adjacent vertical needles with said free hooked end portion and a shaft portion located in front of said vertical needles, and then back again to said retracted position; retaining means secured to and movable with said actuating means and having an operating face located below the plane defined by said row of horizontal needles and extending intermediate the advanced and the retracted position of said free hooked end portions of said horizontal needles and said row of vertical needles, said retaining means being adapted to pull loops out of the hooked end portions of said horizontal needles onto said shaft portions when said hooked end portions are advanced by said actuating means beyond said operating face; means secured to and movable with said movable actuating means for inserting a thread into said hooked end portions of said horizontal needles in said advanced position thereof after said hooked end portions are freed of said loops by said retaining means so that new loops are formed by pulling said thread through said loops retained by said row of vertical needles when said horizontal needles are retracted by said movable actuating means to said retracted position; and adjusting means for transversely moving said needle comb and said needle board relative to each other for adjusting the distance between said needle comb on one hand and said needle board and the hooked ends of the horizontal needles in retracted position on the other hand.

3. A hand knitting apparatus, comprising in combination, elongated supporting means; an elongated needle board mounted on said supporting means; an elongated needle comb including a row of vertical parallel spaced needles located in front of said supporting means mounted thereon movably in a transverse direction; a row of spaced parallel horizontal needles transversely movably mounted on said needle board and projecting therefrom with a free hooked end portion and a shaft portion; movable actuating means having cam means engaging a group of horizontal needles for moving consecutively each of said horizontal needles from a retracted position with said free hooked end portion thereof located behind said vertical needles to an advanced position between two adjacent vertical needles with said free

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hooked end portion and a shaft portion located in front of said vertical needles, and then back again to said retracted position; retaining means secured to said movable actuating means movable therewith and having an operating face located below the plane defined by said row of horizontal needles and extending intermediate the advanced position of said free hooked end portions of said horizontal needles and said row of vertical needles, said operating face being substantially parallel to the line defined by said hooked ends of said horizontal needles in advanced position and having a length substantially equal to the length of said cam means of said movable actuating means and adapted to pull loops out of the hooked end portions of said horizontal needles onto said shaft portions when said hooked end portions are advanced by said actuating means beyond said operating face; means secured to and movable with said movable actuating means for inserting a thread into said hooked end portions of said horizontal needles in advanced position thereof after said hooked end portions are freed of said loops by said retaining means so that new loops are formed by pulling said thread through said loops retained by said row of vertical needles when said horizontal needles are retracted by said movable actuating means to said retracted position; and adjusting means for transversely moving said needle comb and said needle board relative to each other for adjusting the distance between said needle comb on one hand and said needle board and the hooked ends of the horizontal needles in retracted position on the other hand.

4. In a knitting apparatus, in combination, elongated supporting means; a row of spaced parallel transverse needles mounted on said supporting means movable in transverse direction, each needle having a shank portion and a free hooked end portion projecting from said supporting means; movable actuating means mounted on said supporting means movable in longitudinal direction and engaging said parallel needles consecutively during such movement for moving each of said needles consecutively from a retracted position to an advanced position and back again; first retaining means mounted on said supporting means and projecting into the path of said hooked end portions of said needles, said first retaining means being adapted to retain a knitted work piece which is suspended on said needles when said needles move to said retracted position of the same; a second retaining means secured to said actuating means and being movable therewith in longitudinal direction, said second retaining means having an operating portion located between said first retaining means and said hooked end portions of those of said needles which are moved by said actuating means to said advanced position, said operating portion being adapted to engage said knitted work piece during movement of said needles to said advanced position of the same for pulling the loops by which said work piece is suspended out of said hooked end portions and onto said shank portion; and thread inserting means for inserting a thread into said hooked end portions of said needles in said advanced position of the same, said thread being pulled through said loops on said shank portions to form new loops when said needles return to said retracted position, and when said work piece and said loops on said shank portions are retained by said first retaining means.

5. In a knitting apparatus, in combination, elongated supporting means; a row of spaced

parallel transverse needles mounted on said supporting means movable in transverse direction, each needle having a shank portion and a free hooked end portion provided with a pivoted latch tongue, and projecting from said supporting means; movable actuating means mounted on said supporting means movable in longitudinal direction and engaging said parallel needles consecutively during such movement for moving each of said needles consecutively from a retracted position to an advanced position and back again; first retaining means mounted on said supporting means and projecting into the path of said hooked end portions of said needles, said first retaining means being adapted to retain a knitted work piece which is suspended on said needles when said needles move to said retracted position of the same; a second retaining means secured to said actuating means and being movable therewith in longitudinal direction, said second retaining means having an operating portion located between said first retaining means and said hook end portions of those of said needles which are moved by said actuating means to said advanced position, said operating portion being adapted to engage said knitted work piece during movement of said needles to said advanced position of the same for pulling the loops by which said work piece is suspended out of said hooked end portions and onto said shank portion, said loops pivoting said latch tongues to an open position; and thread inserting means for inserting a thread into said hooked end portions of said needles in said advanced position of the same, said thread being pulled through said loops on said shank portions to form new loops when said needles return to said retracted position, and when said work piece and said loops on said shank portion are retained by said first retaining means, said latch tongues being closed by said loops when the same pass from said shank portions over said hooked end portions.

6. In a hand knitting apparatus, in combination, elongated supporting means; a row of spaced parallel horizontal transverse needles mounted on said supporting means movable in transverse direction in a horizontal plane, each horizontal needle having a shank portion and a free hooked end portion provided with a pivoted latch tongue and projecting therewith from said supporting means; movable actuating means mounted on said supporting means movable in longitudinal direction and engaging said horizontal needles consecutively during such move-

ment for moving each of said horizontal needles consecutively from a retracted position to an advanced position; an elongated needle comb secured to said supporting means and including a row of vertical spaced needles, said row of vertical needles being located in the path of said hooked end portions of said horizontal needles, each of said horizontal needles passing between two adjacent vertical needles during the transverse movement thereof so that said vertical needles are adapted to retain a knitted work-piece which is suspended on said horizontal needles when said horizontal needles move to said retracted position of the same; a retaining means secured to said actuating means and being movable therewith, said retaining means having an arcuate operating face having a center face portion projecting towards and extending substantially parallel to said needle comb, said operating face being located below said horizontal plane and between said needle comb and said hooked end portions of those of said needles which are moved by said actuating means to said advanced position, said operating face being adapted to engage said knitted work piece during movement of said horizontal needles to said advanced position of the same for pulling the loops by which said work piece is suspended out of said hooked end portions and onto said shank portions, while said loops pivot said latch tongues to an open position; and thread inserting means for inserting a thread into said hooked end portions of said horizontal needles in said advanced position of the same, said thread being pulled through said loops on said shank portions to form new loops when said horizontal needles return to said retracted position, and when said work piece and said loops on said shank portions are retained by said vertical needles while said latch tongues are closed by loops passing from said shank portions over said hooked end portions.

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