Sept. 9, 1952 J. DOMENECH TARAFA 2,609,675

AUTOMATIC APPARATUS FOR THE MANUFACTURE BY HAND OF ALL KINDS OF KNITTED FABRICS

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FIG. 1.

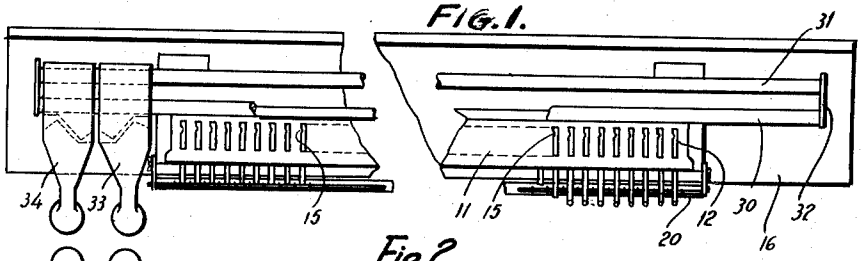


Fig. 2

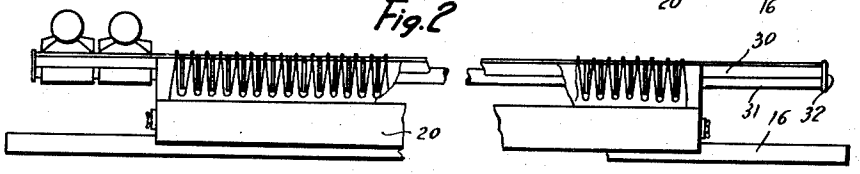


Fig. 3

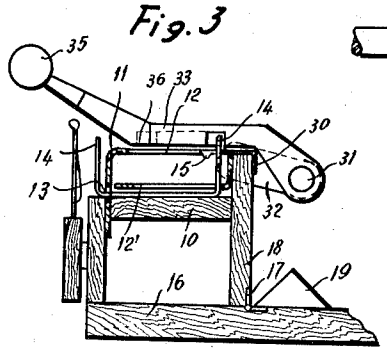


Fig. 4

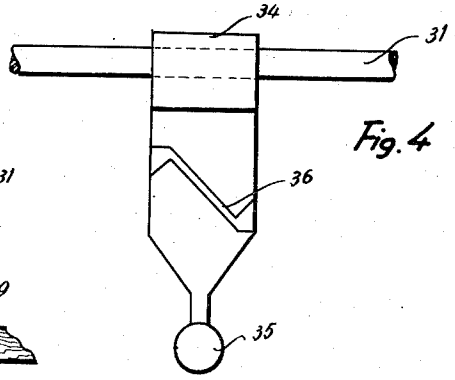


Fig. 5

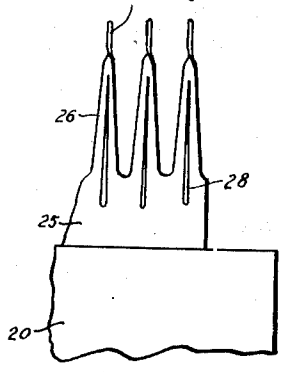


Fig. 6

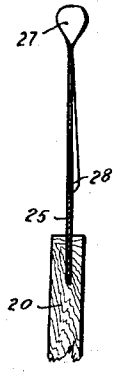


Fig. 7

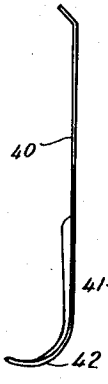
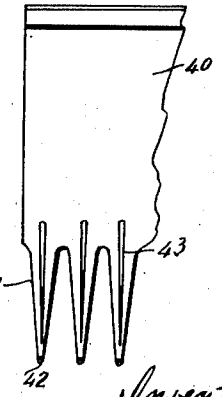


Fig. 8



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Fig. 9

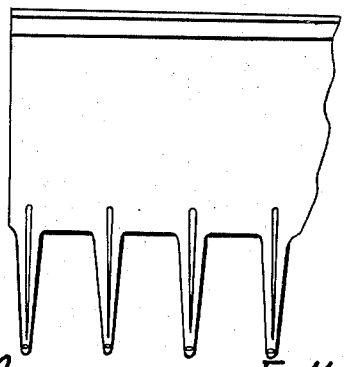


Fig. 10

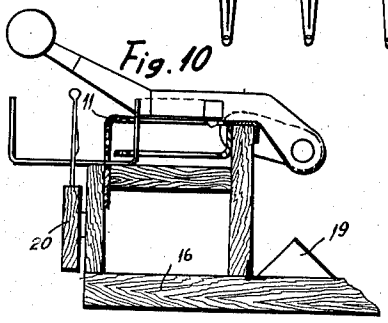


Fig. 11

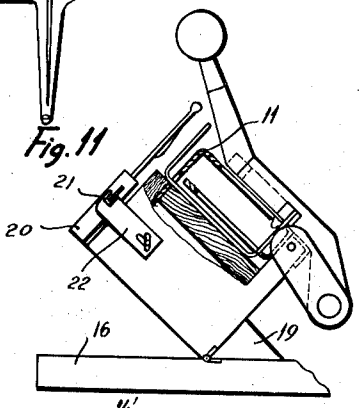


Fig. 12

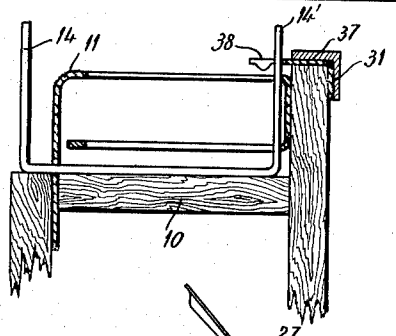


Fig. 13

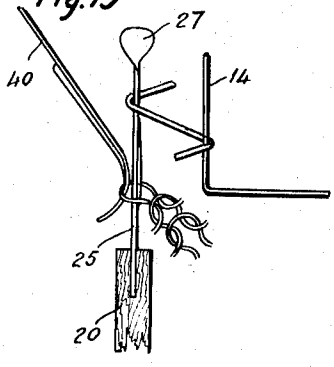
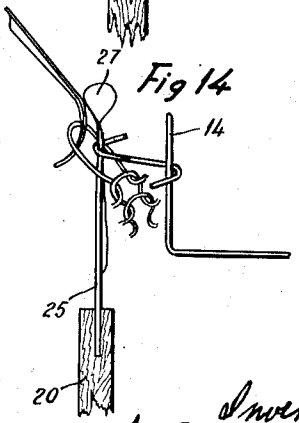


Fig 14



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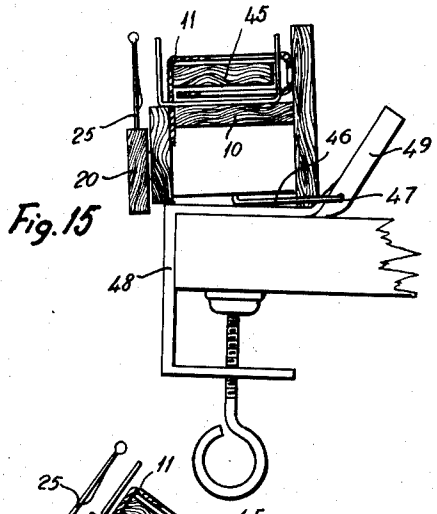


Fig. 15

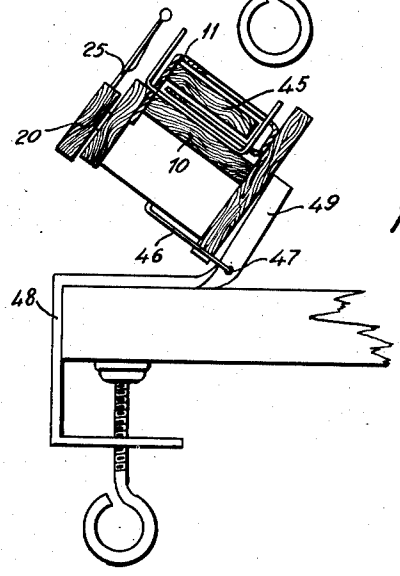


Fig. 16

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UNITED STATES PATENT OFFICE

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AUTOMATIC APPARATUS FOR THE MANUFACTURE BY HAND OF ALL KINDS OF KNITTED FABRICS

Josefina Domenech Tarafa, Barcelona, Spain

Application May 6, 1949, Serial No. 91,754
In France February 22, 1949

7 Claims. (Cl. 66—4)

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This invention relates to an automatic apparatus for the production by hand of all kinds of knitted articles of clothing in both the so-called back stitch and plain stitch, and by means of which patterns, lace or open work, reliefs and other ornamentation can also be made in the fabric.

The apparatus object of this invention comprises essentially a framework made of wood or of any other suitable material, articulated or hinged onto a suitable base or support so that it can be swung backwards and taking a sloping position, the said framework being provided with a guide member for a series of displaceable needles, said guide being constituted by a box made of sheet metal or other material which has a series of transverse slots, in each of which a U-shaped wire needle is lodged so that one branch projects from the front of the case and the other from the top, the whole forming a series of parallel needles that can move backwards and forwards, in combination with a front bar provided with a set of fixed needles in such a way that the displaceable needles are able to move forward and coming between the fixed needles and pass beyond them.

The displaceable needles as stated above, can move backwards and forwards, acted successively and guided by the slots in the guide box. The apparatus comprises the means of bringing about this displacement, such means being constituted by two independent slide pieces mounted on a guide bar situated on the rear of the apparatus, these sliding pieces laying over the apparatus and acting on a protruding end of the U-shaped needles in such a way that, when the slides move in one direction, one of them acts on the moveable needles and sends them forwards whilst the other one moves them backwards, and when they move in the contrary direction they act reciprocally. When the displaceable needles are moved backwards by the slide piece, they are retained by some small elastic clamps formed at the end of the slots themselves or else on an independent piece. The moveable needles being advanced in respect of the fixed spindles, a thread is laid down between them, and then said needles displaced backwards, the thread forming a series of loops in zig-zag form.

The needles on the fixed bar are made of some sheet material in form of a comb, preferably of sheet metal, each needle having a plain body with a vertical groove in its center line and a broadened head bent on a plane of 90° in respect of the plane of the body. This bar

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of fixed needles is mounted on supports in front of the apparatus, said supports being displaceable to vary the distance between the bar and the apparatus.

The fabric is formed on the fixed needles of the comb and is constantly held up by the said comb; in some cases it is situated in front of the comb and in others at the back, that is to say, between the comb and the framework of the apparatus. In the former case, when the fabric is in the front of the comb, the loops of the last mesh of the fabric are passed over the loops that have just been formed, making the whole of the fabric to pass backwards over the head of the needles; the comb is then lifted from the apparatus whereby the loops that have just been formed come away from the displaceable needles, the fabric thus passing to the inside of the comb, which is turned side by side to return the fabric on front of the comb. In this case the purl stitch is formed.

In the second case, the fabric is always kept at the back of the comb, the loops being formed in the same way as described above, and an auxiliary hand comb is used to catch up the loops of the last row of the fabric and pass it over the loops already formed without touching the fabric. This hand comb is made with curved needles that offer a plain body similar to that of the needles of the fixed bar and provided with a longitudinal groove in the reverse side, the needles having a sharp point bent in the form of a hook. This operation is carried out by tilting the apparatus backwards, which facilitates the work. The fabric does not move from the back of the comb, and thus the knit stitch is obtained.

The annexed drawings show a preferred construction of the apparatus solely as an example.

Figures 1 and 2 show the assembled apparatus as seen respectively from above and from in front.

Figure 3 represents a transverse section of the apparatus and its support.

Figure 4 shows one of the sliding pieces seen on the inner face.

Figures 5 and 6 are details on a larger scale of the spindles of the fixed spindle bar, as seen respectively from the front and from the side.

Figures 7 and 8 show in detail the disposition of the auxiliary comb.

Figure 9 shows a form of auxiliary comb with alternating spindles.

Figure 10 and 11 show the positions of the apparatus in different phases of the work.

Figure 12 represents, on a larger scale, a

variant of the arrangement for retention of the needles.

Figures 13 and 14 show how the auxiliary comb acts to interlace the knitted loops.

Figures 15 and 16 represent a more simplified construction of the apparatus.

The apparatus is made up of a framework 10 made of wood or of any suitable material, on which there is mounted a needle support forming a hollow body 11 preferably rectangular with a lower projecting flange in front face and provided with a series of slots 12, 12' in its upper and lower faces respectively as well as some small slots or openings 13 in the front of it. In each of the slots there is lodged a hook 14, 14' (Figs. 3 and 12) formed by wire bent into the shape of a U, the prismatic box being fixed onto the frame, but slightly separated from it to leave room in the intervening space for the lower part of the U, whilst the branch 14 remains free on the front of the apparatus and constitutes the working needle, and the rear branch 14' is introduced into the upper and lower slots, with its ends projecting from them. In this way the needles are able to slide and move from their place, being guided by the slots.

Each of the upper slots has, near its upper end, a small elastic tongue 15 bent downwards that keeps the spindles in their retracted position.

The apparatus rests on a base 16 and is joined to it by means of the hinges 17, fixed, on the one hand, to the rear feet 18 of the frame and, on the other hand, to the above-mentioned base, in front of the sloping stop blocks 19, so that the apparatus can be swung backwards until it rests on the said stop blocks, and remains in a sloping position (Figure 11).

In the front part of the apparatus there is the bar of fixed spindles 20 mounted at a short distance from the front part. A projecting end of the bar is introduced into the vertical slots 21 of the arms 22 attached to the ends of the apparatus so that the bar can be moved vertically. The position of the arms 22 can be fixed by means of a bracket bearing 23 for the purpose of situating the bar at a suitable distance from the apparatus.

The bar 20 carries a row of spindles 25 preferably made of a flat strip of metal and from which the bodies 26 extend and are provided with a rather broadened head 27 bent on a transverse plane to the body of the spindles, as shown in Figures 5 and 6. Each spindle, in its central line, has on its inverse side a slot 28 that may be embedded in the plate itself, the lower part being wider but narrowing in proportion as it goes towards the top.

The moveable U-shaped needles are arranged in a vertical position, resting on the central table or platform of the frame 10, whilst the rear branch is guided by the slot box, and its end comes out and projects from the front edge of the box.

On the rear wall of the frame there is the metal strip 30, preferably of an angular shape, suitably attached to the frame, with its ends extending beyond the range of needles. Parallel to this strip there is the guide bar 31 fixed to the strip by means of the connecting pieces 32 attached to the framework, by any other convenient arrangement. On the said bar run two sliding pieces 33, 34 provided with an edge or rib simply resting on the strip 30, whereby both sliding pieces are able to slide easily from one end of the apparatus to the other.

The guiding means for the slide pieces may be disposed in any other arrangement that may be convenient, for instance, they may be in the form of a slotted and ribbed plate, or of fan-tail grooves, etc.

The above-mentioned slides 33, 34 extend forward over the apparatus and finish in a ball or handle 35 within reach of the hand, and each has on its inner face (Figure 4) an inclined groove 36 at an angle of 45° or any other suitable slope, the groove of one slide running in a contrary direction to that of the other. These grooves or slots are arranged in such a manner that the end 14' of the rear branch of the moveable needles is introduced into the groove, whereby when the slide is moved from one end of the apparatus to the other, the needles are caught in succession by the slide and pushed forward by the action of the sloping groove, or vice versa, according to the movement of the piece that is in action.

The knit is formed by making the moveable needles come forward until they are situated in front of the fixed spindles (Figure 10), for which purpose the slide 33 is moved towards the right, supposing they are both on the left side, and then placing a thread between the two rows of spindles. Then the other slide 34 is also moved to the right, whereby the spindles are moved back again, and the thread forms a series of loops in a zig zag (Figure 13). Supposing the fabric to be already partially formed, it is suspended from the spindles of the fixed bar and falling behind it between the bar and the frame.

The moveable needles, after forming the loops, are retained in their extreme backwards position by means of the small elastic tongues 15 that are formed in the slot itself at the rear end and bent downwards. Instead of making these tongues in the slot box itself, the same purpose can be served by arranging on the top of this same box a metal strip 37, fixed to the frame in some suitable manner, as for instance, by means of the strip 31 as shown in a detail of Figure 12, the said strip having on one of its edges a series of small tongues 38 at the same distance as the slots, these tongues forming a sort of pincer or clip for each of the rear branches of the U-shaped needles. If so desired, this strip of pincers or clips may be arranged in a slightly regulable manner backwards and forwards, which will allow the tension of the needles to be graduated so as to form tighter or looser stitches.

To link up the stitches with the new loops, an auxiliary comb is used (Figures 7 and 8) made of a plate of metal or of some other suitable material 40 and provided with a series of spindles 41 having a curved point 42 in the shape of a hook. These spindles have, on the reverse side of their body, a slot 43 similar to that of the fixed spindles and narrowing off from the base towards the point.

The stitches of the last row of the fabric (Figure 13) are caught by means of the curved points of the comb 40 and pass over the head 27 of the fixed spindles (Figure 14), whereby a new row of stitches becomes tied.

The stitches are easily caught with the comb 40 by introducing their points into the slots 28 of the fixed spindles, and at the same time the slots 43 of the comb serve as a guide over the edge of the heads 27. Combs with alternating spindles (Figure 9) can be used, which permits the stitches to be picked up alternately, thus

forming diverse patterns, and also combs with more widely separated spindles.

In the manner described above the knitting is obtained, the fabric always being on the inner side of the bar of fixed spindles, that is to say, between said bar and the apparatus. To purl the fabric already formed is disposed on the outer side, that is to say, in front of the fixed-spindle bar, and when the loops have been formed the fabric is lifted by hand to make it pass over the heads **27**. To make a new loop it is necessary to turn the bar, placing the fabric on the outer side again and then using a single slide in its backward and forward movements.

It is as well, too, to have some combs **40** with only two or three spindles or even one single one, to take any loose stitch that may have occurred.

Figures 15 and 16 show a variant of the apparatus more simply constructed. In this construction, instead of the sliding pieces, a bar **45** is used which may be introduced by hand into the ends of the prismatic guide box for the moveable needles. The ends of this bar are bevelled, and when the moveable needles are in their forward position the bar, on being inserted, acts successively on the needles, and draws them back, whereby the loops are made, the spindles being retained by the rod itself. The forward movement of the needles is carried out by hand.

The frame of the apparatus is provided, at the bottom, of two metal hooks **46** which are inserted in the openings **47** of a pair of supports in the form of clamps **48** and fixed on the edge of any table. These supports have a rear sloping extension, and the apparatus may be swung backwards, still being held by the said extensions.

The above-described apparatus makes it possible to knit or purl by simply changing the manner of working, that is, the way of carrying out the fastening of the stitches.

I claim:

1. Hand operated knitting apparatus comprising a stationary first needle set and a displaceable second needle set adapted for forming a thread receiving gap therebetween by conjointly advancing the needles of said second set between said stationary needles of said first set, a casing hingedly mounted and adapted to be swung backwards to take up a sloping position, a guiding member with a plurality of guiding slots for each needle of said second set of needles, said needles being constituted by a U-shaped wire, lodged in the slots of the guiding member, the front branch of the U needle projecting from the front of the guiding member forming a hook and the end of the rear branch projecting from the top part of said guiding member, said stationary needle set being formed by a series of sheet metal strips, each strip narrowing towards the top and forming a flat body with a channel in the center line of the strip, wider at the base and narrower towards the top, said strips having at the upper ends thereof a head bent on a plane approximately at 90° with respect to the plane of the body, the needles so formed being mounted on a bar forming a needle rake positioned in front of the apparatus in intercalated relationship with the needles of the displaceable set.

2. Apparatus according to claim 1, in which the casing forms an upper platform onto which is fastened the guiding member, said guiding

member being constituted by a rectangular hollow box formed by sheet metal and provided with a plurality of transversal slots in its upper and lower surfaces and with a bore in a protruding flange of its front surface, said member being fixed on the casing at a slight distance over the platform, the U form needles being placed with their rear branches guided by the slots of the box and with their front branches protruding through the bores of the front flange.

3. Apparatus according to claim 1, and having slide pieces arranged to slide by hand along the apparatus supported by a longitudinal guiding member so that said pieces move above the apparatus in combination with the displaceable needles, each sliding piece having a sloping slot into which fits the projecting rear end of said movable needles, which are pushed forwards or backwards according to the movement and the sloping slot of the slide pieces.

4. Apparatus according to claim 1, and including two slide pieces sliding along a bar provided in the rear of the apparatus, said slide pieces extending over the upper part of the apparatus and ending in a handle member to actuate the same, one of said slide pieces having in its lower face a sloping slot running in one direction, the other said slide piece having a sloping slot in opposite direction, so that the moveable needles are moved successively forwards by the action of one of the slide pieces and backwards by the other.

5. Apparatus according to claim 1, characterized by the fact that the bar of stationary needles is held by means of two supports fastened to the framework of the apparatus, one at each end of same, said supports having a projecting part with a vertical slot in which introduces the ends of said bar, allowing the bar to be put on or withdrawn by means of a vertical displacement, the supports being regulable to set at will the distance between the bar and the framework.

6. Apparatus according to claim 1, characterized by the fact that the slots of the guide box for the movable needles, are provided near their rear ends with a small projection bent elastically, said projection constituting a retaining element for the movable needles when they are in its retracted position, said projections being disposed in at least one of the rows of slots.

7. Apparatus according to claim 1, characterized by the provision of independent retaining means for the movable needles, said means being constituted by a piece forming a series of small elastic clips, fastened to the rear wall of the frame, said piece being in the shape of a strip having on its edge a series of slots provided with an elastic tongue, said slots corresponding with the slots of the guide box, said piece being mounted on the casing by means which permit adjusting the position of the movable needles when retained.

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