

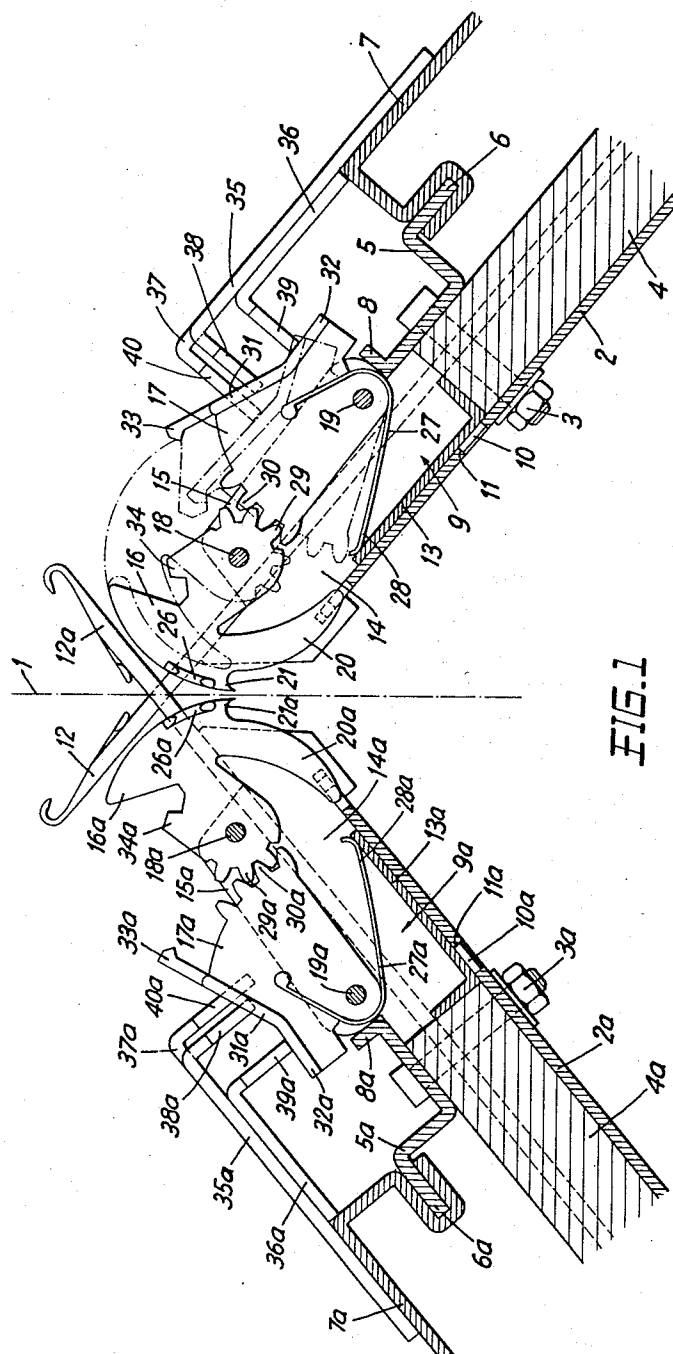
June 20, 1967

K. TSCHÜMPERLIN ET AL
DOUBLE-BED KNITTING APPARATUS

3,326,017

Filed Nov. 6, 1964

3 Sheets-Sheet 1



June 20, 1967

K. TSCHÜMPERLIN ET AL

3,326,017

DOUBLE-BED KNITTING APPARATUS

Filed Nov. 6, 1964

3 Sheets-Sheet 2

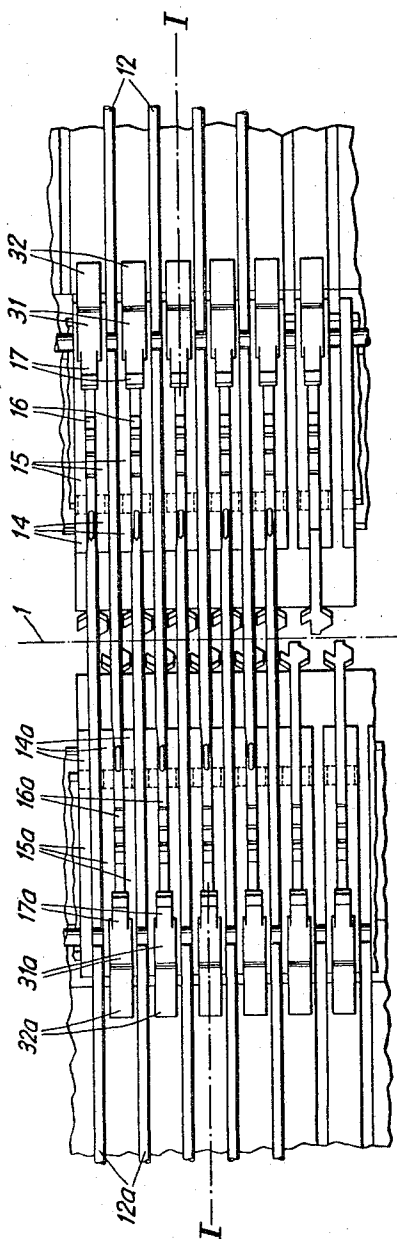


FIG. 2

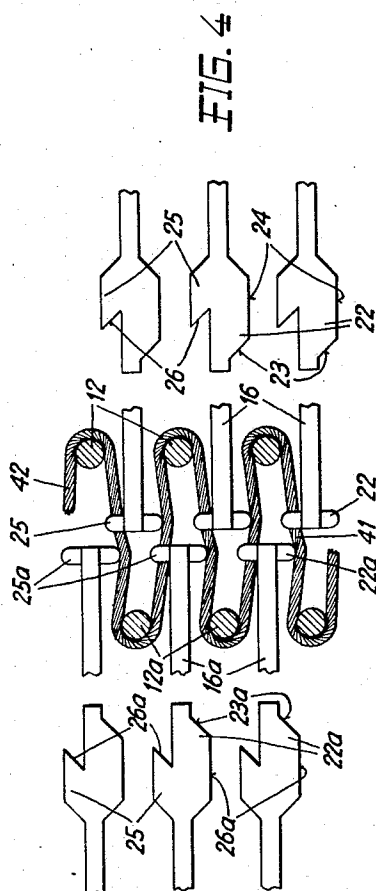


FIG. 4

June 20, 1967

K. TSCHÜMPERLIN ET AL

3,326,017

DOUBLE-BED KNITTING APPARATUS

Filed Nov. 6, 1964

3 Sheets-Sheet 3

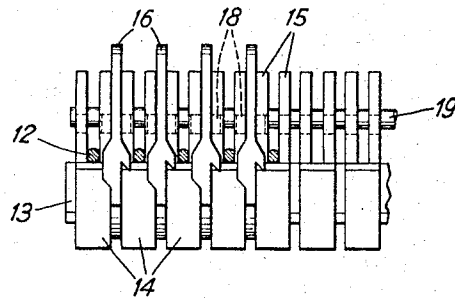


FIG. 3

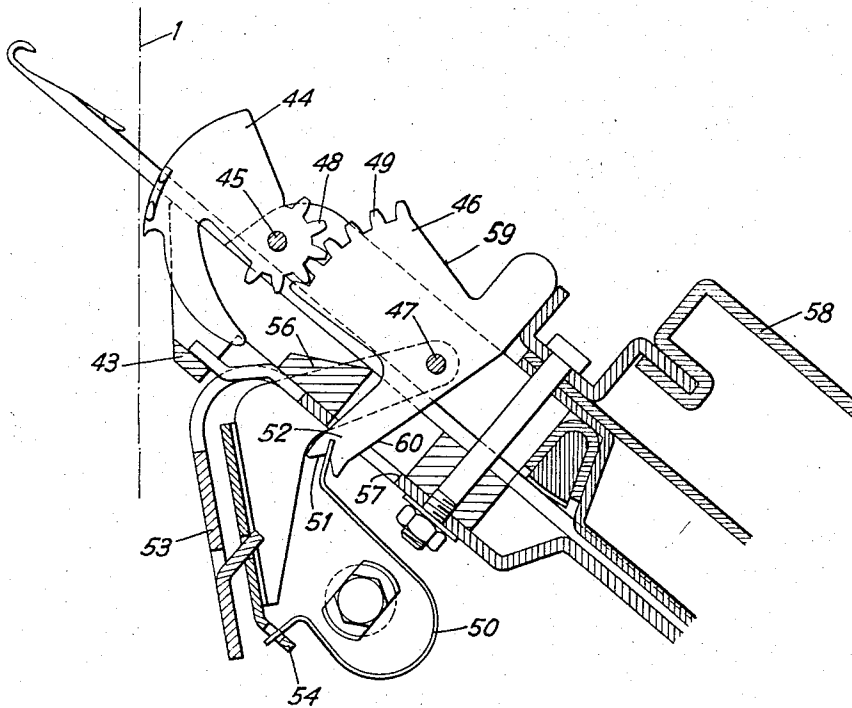


FIG. 5

1

3,326,017

DOUBLE-BED KNITTING APPARATUS

Karl Tschümperlin and Willy Wiederkehr, Diefikon, Switzerland, assignors to Paliz A.G., Zug, Switzerland, a limited company of Switzerland

Filed Nov. 6, 1964, Ser. No. 409,387

Claims priority, application Switzerland, Nov. 15, 1963, 14,018/63

3 Claims. (Cl. 66—64)

The present invention relates to improvements in double-bed knitting apparatus of the type comprising two needle beds inclined relatively to each other, and on each needle bed a set of holding-down sinkers staggered with respect to the needles by one linear pitch.

Such sinkers, as known, exert an elastic downward tension on the topmost thread of the fabric being knitted and thus allow of a weightless knitting operation.

In one-bed knitting apparatus the same effect was obtained, for example, by strippers, retainers and holding-down levers or hangers, which means were disposed on the cam assembly that is movable at right angles to the needles, and urged the topmost loops against the underside of the knocking-over comb and exerted a downwardly inclined tension on the loops. In double-bed apparatus where there is but little space left between the knocking-over combs of each bed, such strippers and the like, however, lead to complicated constructions so that the designer was forced to revert to the holding-down sinkers that were considered as having been superseded long ago.

Double-bed knitting apparatus comprising holding-down sinkers have been proposed before, per se. Such an apparatus is described and shown, for example, in the German Patent No. 1,087,743 in which the sinkers are translatorily movable and also parallel to the axis of symmetry of the apparatus between an upper and a lower position. These known machines had the disadvantages that the needles of one bed could not be arranged opposite to a sinker of the other bed, since the sinkers in their high-shift position protrude into the track of the respective needles. For this reason, such relative position of the two beds had to be chosen in which the needles are opposite each other, and therefore only every other needle could take part in the knitting operation. Therefore, it was not possible with these known knitting machines to produce small-mesh knitted goods. Further and as known, a normal knitting pattern is obtained in the case of double-bed knitting apparatus, when the gap width between the two beds corresponds to the needle spacing. When now, as is the case in said known machines, only every other needle can be used for common knitting, such conformity between needle spacing and gap width is lacking, and thus also the prerequisite for obtaining a normal knitting pattern.

The task at the bottom of the present invention was the provision of a double-bed knitting apparatus comprising holding-down sinkers, in which each needle may take part in the knitting operation and which, therefore, allows the knitting of small-mesh fabrics and goods of normal knitting pattern.

The machine of the present invention is characterized in that the sinkers are pivoted to the frontmost end of the knocking-over comb.

Two embodiments of the invention are shown in the drawing, in which

FIG. 1 is a section on the line I—I of FIG. 2 of the first example, vertically to the plane of symmetry;

FIG. 2 is a partial top plan view, the cam plate having been removed;

FIG. 3 is a front view of the knocking-over comb with a needle and a sinker;

FIG. 4 schematically shows the mode of operation of the sinkers; and

2

FIG. 5 is a section corresponding to the right-hand portion of FIG. 1, through the knocking-over comb of the needle bed of the second example.

The first embodiment, shown in FIGS. 1 to 3, comprises two bedplates 2, 2a that are inclined to the plane of symmetry 1 and to which are secured the needle beds 4 and 4a respectively, by means of screws 3 and 3a respectively. These bedplates are conventionally fixed in their mutual inclined positions, for example by a frame that is not shown. The screws 3, 3a at the same time serve to fix the guide bars 5, 5a to the respective needle beds in each of which are longitudinally movable a number of parallel needles 12 and 12a respectively. While the inner web 6, 6a of the guide bars serves for guiding the cam plate 7, 7a (which is reciprocable transversely of the respective needles and carries the needle control means that are not shown on the drawing), the outer web 8, 8a forms the upper abutment for the knocking-over comb 9, 9a of which the underside is urged against the front portion of the bedplate 2, 2a and is engaged in corresponding holes 11, 11a thereof through stop studs 10, 10a (of which only one is shown).

Each of the one-piece knocking-over combs 9, 9a (FIG. 3) comprises a supporting angle 13, 13a which holds together a number of riblike elements 14, 14a said number corresponding to the width of the needle beds. Each of said elements comprises on its upper side two relatively thin blades 15, 15a; and between any two adjacent elements 14, 14a are pivotably mounted a sinker 16, 16a and an actuating means 17, 17a. Each intermediate space between the two blades 15, 15a of each element 14, 14a forms the front end of the needle-guide. All the sinkers 16, 16a appertaining to a needle bed are pivoted to the foremost end-portion of the blades 15, 15a on laterally protruding axle pins 18, 18a, while the actuating means 17, 17a in their turn are pivotably mounted on a common axle pin 19, 19a that passes through the blade rear ends. As mentioned above, a sinker 16, 16a and its appurtenant actuating means 17, 17a are arranged in each intermediate space between two riblike elements 14, 14a. Each sinker and each actuating means comprises a toothed segment 29, 29a and 30, 30a respectively, which mesh so that a rotary movement of an actuating element is transmitted to the appurtenant sinker in the reverse sense.

The length of the blades 15, 15a and thus the spacing of the axles 18, 18a from the plane of symmetry 1 as well as the angle enclosed by the two needle beds 4, 4a is chosen such that the space swept by the sinkers in the pivotal movement thereof is situated within an angle enclosed by the plane defined by the undersides of the needles of the other needle bed and the plane of symmetry 1. Consequently the needle of the other bed opposite each sinker is freely movable along its entire path even when the sinker is in its upper position, i.e. raised from the fabric being knitted (as shown in FIG. 1 in dash-and-dot lines). The needles of said other bed thus may take part in the knitting operation to an unlimited extent.

In each actuating means 17, 17a is firmly anchored a spring 27, 27a which through its free end 28, 28a is supported on one leg of the supporting angle 13, 13a. This spring causes the respective actuating element 17, 17a to turn clockwise with respect to the needle bed shown on the right in FIG. 1 and, therefore, and by virtue of the transfer of motion through the toothed segments 29, 29a and 30, 30a, causes the appurtenant sinker 16, 16a to turn anticlockwise. The latter thus engages by its nose 26, 26a a section of the fabric being knitted and bears down on the fabric with a force corresponding to the spring and pulls same downwardly. On the upper side of each actuating means 17, 17a is provided a control edge 31, 31a of which the end 32, 32a remote from the ap-

3

purtenant sinker is angularly bent downwardly and is forwardly extended to a spring hook 33, 33a that is destined to engage, in a special mutual position of an actuating means and the appurtenant sinker, said sinker through a hump 34, 34a thereof and to hold the actuating means and sinker in this position.

Slotted pieces 35 to 37, 35a to 37a detachably secured to the cam plate 7, 7a are destined to coact with the control edge 31, 31a. All of these slotted pieces comprise angular free ends that have oblique control faces 38 to 40, 38a to 40a of which the dimensions are so chosen that upon movement of the cam unit or respectively, of the cam plate 7, 7a these faces one after the other hit the control edges 31, 31a of the individual actuating means 17, 17a and thereby trip the pivotal movement of the respective sinkers 16, 16a.

In common knitting, the slotted pieces 36, 37 and 36a, 37a are omitted, i.e. removed from the cam plate 7, 7a so that only the working slotted-piece 35, 35a remains connected to this cam plate.

When, now, the cam units with their plates 7, 7a are moved along the needle beds 4, 4a i.e. transversely to the needles 12, 12a, the control face 38, 38a hits the control edges 31, 31a of the various actuating means 17, 17a one after the other. Said means, being under the influence of the springs 27, 27a are in their operating position in which the respective sinkers 16, 16a through their noses 26, 26a have engaged the yarn and resiliently pull down the fabric being knitted. This position is shown in FIG. 1 in solid lines. As the point of impingement of control face 38, 38a against the control edges 31, 31a is situated on the control edges 31, 31a on that side of the axle pin 19, 19a that is remote from the cam plate 7, 7a such impingement causes the actuating means 17, 17a to swing counter-clockwise (FIG. 1, right-hand bed) against the action of the spring. Thereby the sinker 16, 16a is turned from the working position shown to the position of rest, and from the latter position again to the working position as soon as the working piece 35, 35a has left the range of the actuating means 17, 17a or of its control edge 31, 31a respectively.

In this manner it is possible to swing the sinkers one after the other high to the position of rest and subsequently low again to the working position.

In various modes of knitting, such as in racked knitting, the sinkers 16, 16a have to be held in their high-swing position of rest during a certain length of time. For these modes of knitting, the slotted-pieces 36, 37 and 36a, 37a are connected to the cam plate, additionally to the slotted-piece 35 and 35a, one thereof (37, 37a) acting as stopping piece and the other (36, 36a) as tripping piece. These pieces 36, 37 and 36a, 37a thereby are arranged in pairs towards the two ends of the cam plate, one stopping piece 37, 37a and a tripping piece 36, 36a together forming a pair of which the former is on the outside and the latter is on the inside. The stopping piece 37, 37a in its arrangement corresponds substantially to the piece 35, 35a with the difference that the angled end thereof is somewhat longer so that this stopping piece turns the actuating means 17, 17a through a somewhat greater angle. The dimensions are so chosen that by virtue of this greater pivotal movement of the actuating means the spring hooks 33, 33a become engaged over the humps 34, 34a of the respective slotted-piece and thereby hold the sinkers in the position of rest, against the action of the springs 27 as shown in the right-hand portion of FIG. 1 in dash-and-dot lines. The tripping pieces 36, 36a that in each direction of movement of the cam unit are arranged behind the respective stopping pieces 37 and 37a, with their angled control faces 39, 39a only extend into the range of the rear angled portion 32, 32a of the control edge 31, 31a. Said control faces are so directed that the respective actuating means 17, 17a by the impingement of the respective control face against the control edge is lifted by a small amount which owing to the backlash or play of the mesh between the toothed segments 29, 30 and 29a, 30a

4

does not cause any transmission of the pivotal movement on to the respective sinker, but which suffices to disengage the spring hook 33, 33a from the hump 34, 34a. Consequently, the respective actuating means 17, 17a and thus the respective sinker 16, 16a under the action of the respective spring 27, 27a are swung back into the working position as soon as the tripping piece 36, 36a has moved out of the range of the control edge 31, 31a.

In transposed knitting, where the sinkers outside of the respective range of the cam unit have been raised from the fabric being knitted, are in their entirely swung-back position (in FIG. 1 indicated on the right in dash-and-dot lines) and are stopped in this position, the leading stopping piece during a movement of the cam unit thus hits first a certain actuating means, without however attaining any effect whatever, after the respective sinker already is in the entirely swung back position of rest. The following tripping piece disengages the respective actuating means so that the sinker under the action of the spring associated with its actuating means is turned to the working position. The working piece that becomes effective as the next control means, raises and lowers the sinker in the range of the forwardly moved needles. The tripping piece of the rear pair of slotted-pieces, which now follows, is ineffective, while the last stopping piece again turns the sinkers to the position of rest where they remain up to the next-following passage of the cam unit.

Each sinker 16, 16a comprises a lower beak 20, 20a which extends substantially along the circular arc of motion and to the upper end of which is joined a projecting nose 21, 21a that tapers downwardly to a tip. Above said nose each sinker on its end face of different sides comprises two lateral projections staggered in height. The lower of these projections 22, 22a (FIG. 4) is bounded on its underside by a slanted spreading edge 23, 23a while the lateral limit is formed by an edge 24, 24a that is parallel to the plane of the sinker. The upper projection 25, 25a that protrudes over the other sinker side, comprises on its underside a notch 26, 26a that represents the catch. The sense or meaning of this configuration is apparent from FIG. 4 in which is schematically shown the mode of operation of the sinker when the needle beds have been swung into a plane, and in which behind each sinker is shown a front elevation thereof.

When, now, a sinker is swung low in the manner described from its upper position of rest into the working position, the sinker first enters with the lower lateral projection 22, 22a between two adjacent sections 41 of the yarn 42 that is stretched zigzag-like about the various needles 12, 12a. The spreading edge 23, 23a thus moves the adjacent yarn section 41 away from the respective sinker towards the laterally adjacent sinker. Thereby is increased the angle α included on one hand by that portion of the respective yarn portion 41 which is situated between the opposite needle and the side-edge 24, 24a of the respective lateral projection 22, 22a and, on the other hand, by the geometrical axis of the needle. Such angle increment in prior known knitting apparatus only could be obtained by a greater spacing of the working needles. The purpose of such angle increment is to bring the respective yarn section safely and reliably into the range of the catch 26, 26a of that sinker of the other needle bed which is arranged on that side of the opposite needle bed which corresponds to the respective yarn section.

In the course of the further swing or angular movement of the sinker considered here, the catch thereof engages on its other side the respective yarn section which by the spreading edge of that sinker of the counterbed which extends on the side of the opposite needle corresponding to this yarn section, has been moved to a position which ensures a safe engagement of the yarn by the catch.

The swing or angular movement to the working position lasts until the sinker is balanced between the swing-

5

ing force caused by spring 27, 27a and the yarn tension.

By the means described is attained the use of all the needles for knitting and such increment of the angle α as to allow the sinkers to engage the yarn and fulfill their task.

The constructive assembly of the embodiment according to FIG. 5 corresponds in a far-reaching extent to that of the first embodiment, so that the illustration thereof may be limited to only one of the two needle beds. Here also is provided a knocking-over comb 43 to which are pivoted on one hand a plurality of sinkers 44 on the axle pin 45 and, on the other hand, appurtenant actuating elements 46 on the axle pin 47, the swing or angular movement of the actuating element 46 being transmitted to sinker 44 through two toothed segments 48 and 49. The only substantial difference between these two embodiments is the arrangement and mode of operation of the spring 50 that acts on the actuating element and in the second embodiment is formed as snap spring. Spring 50 on one hand is braced against a notch 51 in a lower extension 52 of actuating element 46, while its other end is anchored in a bearing hanger 54 that is secured to bedplate 53. A further difference is of a structural character in knocking-over comb 43; in place of the angular carrier 13, 13a is provided a rectangular carrier as well as a stop member 56 that comprises an oblique stop face 57.

In the drawing, the working position of the actuating means and sinkers is shown in solid lines, in which position the actuating means and the sinkers are in equilibrium between the yarn tension and the spring force. In this second embodiment also, the sinkers are swung high by slotted-pieces (not shown) secured to the cam plate 58 the upper edges 59 of the actuating means 46 extending into the path of said pieces and said edges being formed as control edges. The slotted piece used for plain knitting is so dimensioned and arranged that it turns the respective actuating means only through such an angle that the dead-center position of snap spring 50 will not be exceeded, so that as soon as the slotted-piece has left the range of the respective actuating means, the latter is swung back again to the working position by the snap spring.

In alternating or racked knitting, here also two additional pairs of slotted-pieces are used of which each comprises a stopping piece and a releasing piece, the former being arranged outside and the latter inside.

Each stopping slotted-piece imparts to the actuating means a pivotal movement or swing beyond the dead-center position of the snap spring, which swing is limited by the impingement of the edge 60 of the actuating means against the surface 57 of the bedplate. In contrast thereto, the releasing slotted-pieces impart only a relatively slight rearward swing to each actuating means, which suffices to turn back again the snap spring 50 beyond the dead-center position so that said spring again may restore the respective actuating means and the associated sinker to the working position. By this arrangement is replaced the spring hook (33, 33a) of the actuating means according to the first embodiment, which hook coacts with the hump (34, 34a) of the sinker.

6

Otherwise, however, the apparatus shown in FIG. 5 operates in exactly the same manner as the apparatus according to the first example, in particular with respect to the space swept by the sinker during the swing thereof, as well as to the configuration and action of the lateral sinker extensions.

We claim:

1. A double-bed knitting apparatus comprising two symmetrical needle beds inclined towards each other and each including a knocking-over comb, a set of holding-down sinkers on each needle bed, said sinkers being staggered with respect to the needles, and two cams, each of which reciprocates parallel to the plane of symmetry and parallel and adjacent to one needle bed, wherein the improvement comprises a pivotal mounting for each sinker on the end of one of said combs adjacent to the plane of symmetry, said mounting being so located that the sinker can pivot close to the plane of symmetry and close to the plane of the undersides of the needles of the opposite needle bed, and an intermediate pivoted driving member for each sinker, having a driving engagement with the sinker and having a control edge extending into the path of movement of one of said cams.

2. A double-bed knitting apparatus according to claim 1 comprising a catch projecting from one side and a spreading edge projecting from the other side of each sinker.

3. A double-bed knitting apparatus according to claim 1 wherein each intermediate pivoted member is spring loaded to drive its sinker toward the working position, and is engageable with a latch for holding its sinker away from the working position.

References Cited

UNITED STATES PATENTS

510,934	12/1893	Powell	66—106
523,867	7/1894	Powell	66—106
557,638	4/1896	Bennor	66—106
570,335	10/1896	Powell	66—106
1,339,708	5/1920	Lippitt	66—106
2,909,049	10/1959	Rees	66—106
2,960,854	11/1960	Eberl	66—60
2,972,242	2/1961	Eberl	66—64
3,018,644	1/1962	Schurich	66—64
3,024,633	3/1962	Kuntz	66—60
3,125,871	4/1964	Schurich et al.	66—60

FOREIGN PATENTS

210,548	8/1960	Austria.
215,060	5/1961	Austria.
826,393	1/1960	Great Britain.
826,394	1/1960	Great Britain.
870,260	6/1961	Great Britain.

MERVIN STEIN, *Primary Examiner*.

R. FELDBAUM, *Assistant Examiner*.