April 30, 1940. F. TESSÉ 2,198,846

PICKING DEVICE FOR FLAT HOSIERY KNITTING FRAMES HAVING HOOKED NEEDLES

Filed April 11, 1938 6 Sheets-Sheet 1

Fig.1

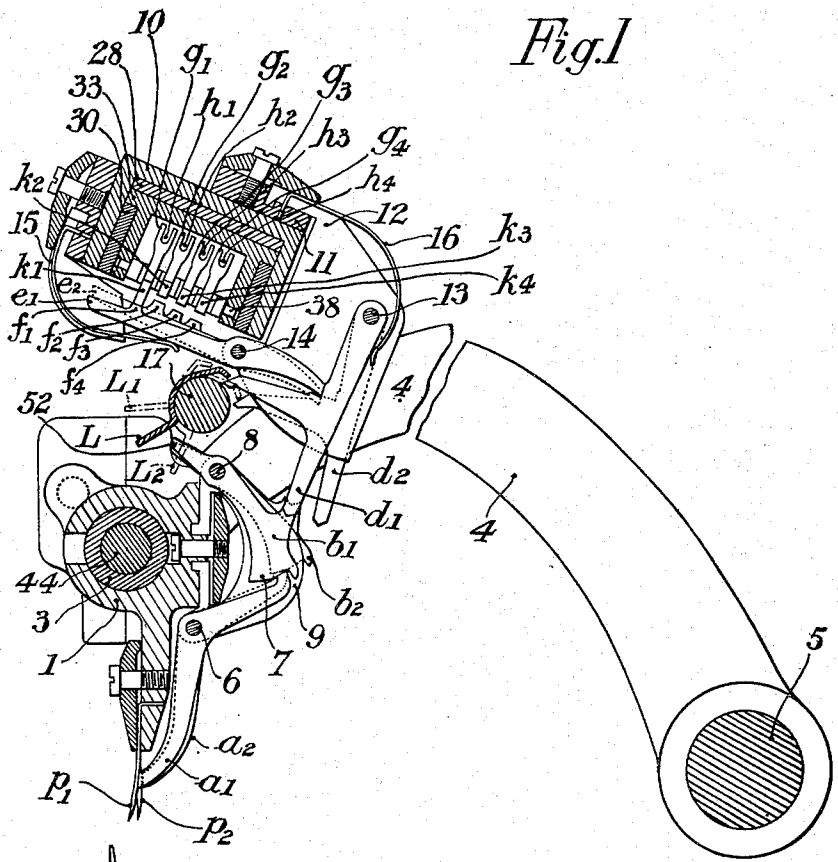
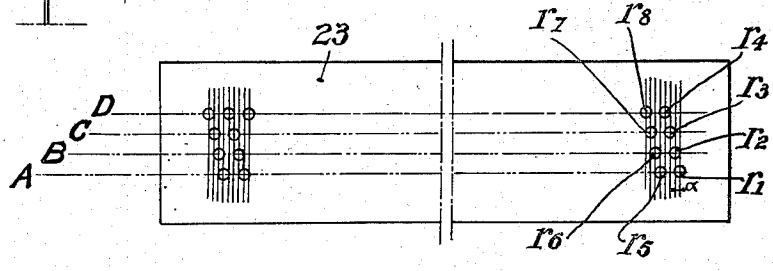


Fig.3



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Inventor

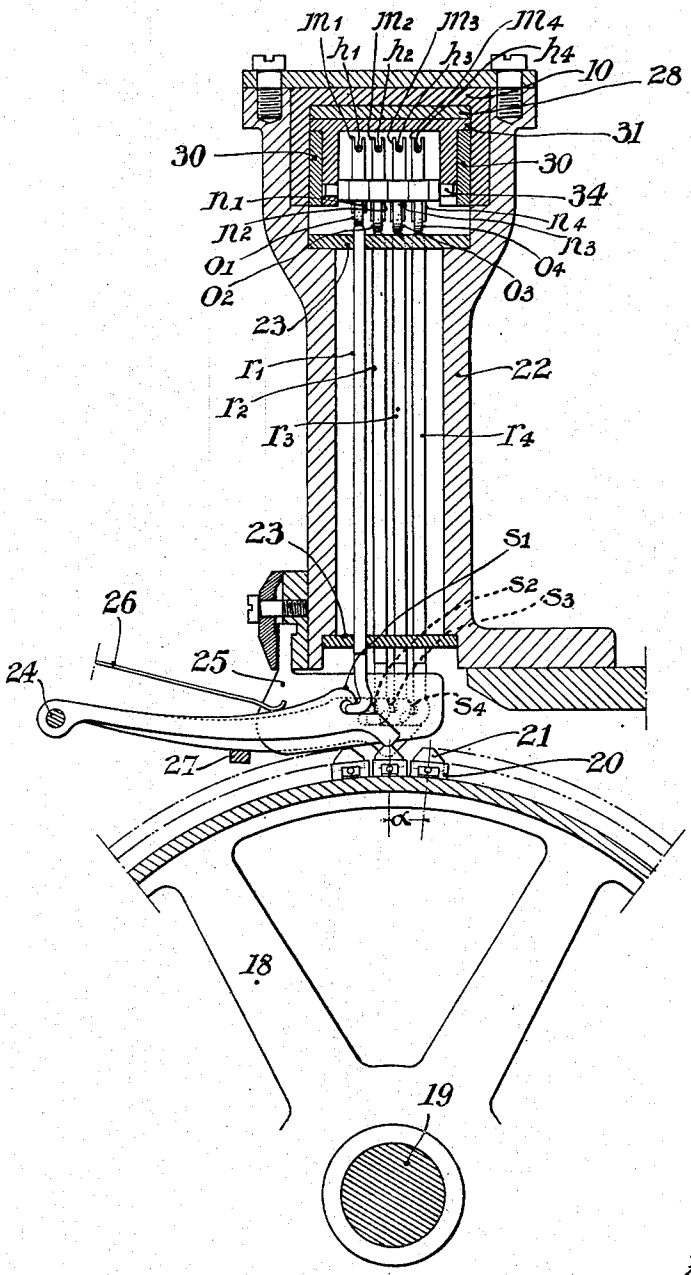
By: Glascock Downing & Seebold
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April 30, 1940. F. TESSÉ 2,198,846

PICKING DEVICE FOR FLAT HOSIERY KNITTING FRAMES HAVING HOOKED NEEDLES

Filed April 11, 1938 6 Sheets-Sheet 2

Fig. 2



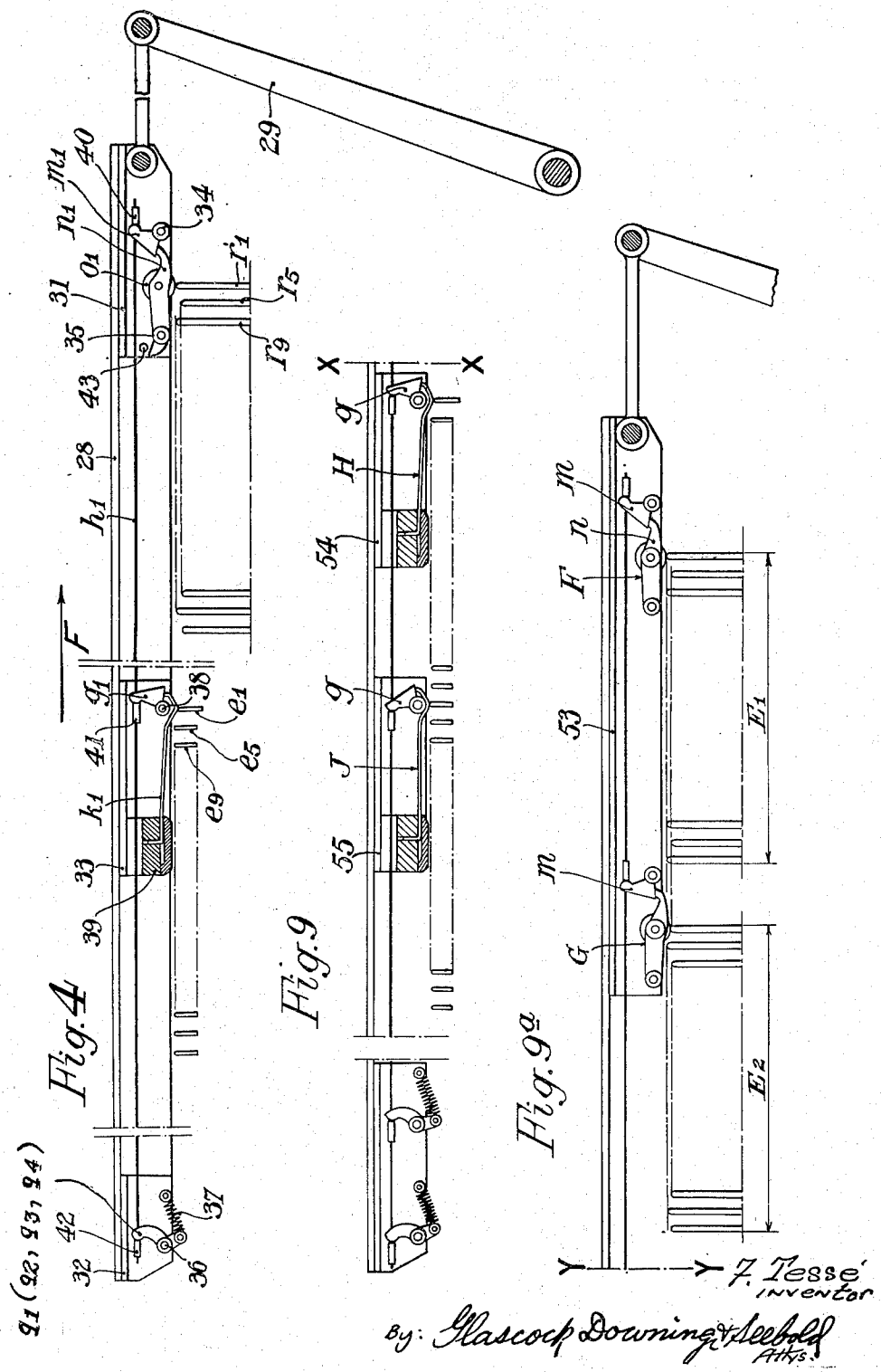
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April 30, 1940. F. TESSÉ 2,198,846

PICKING DEVICE FOR FLAT HOSIERY KNITTING FRAMES HAVING HOOKED NEEDLES

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PICKING DEVICE FOR FLAT HOSIERY KNITTING FRAMES HAVING HOOKED NEEDLES

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Fig. 5

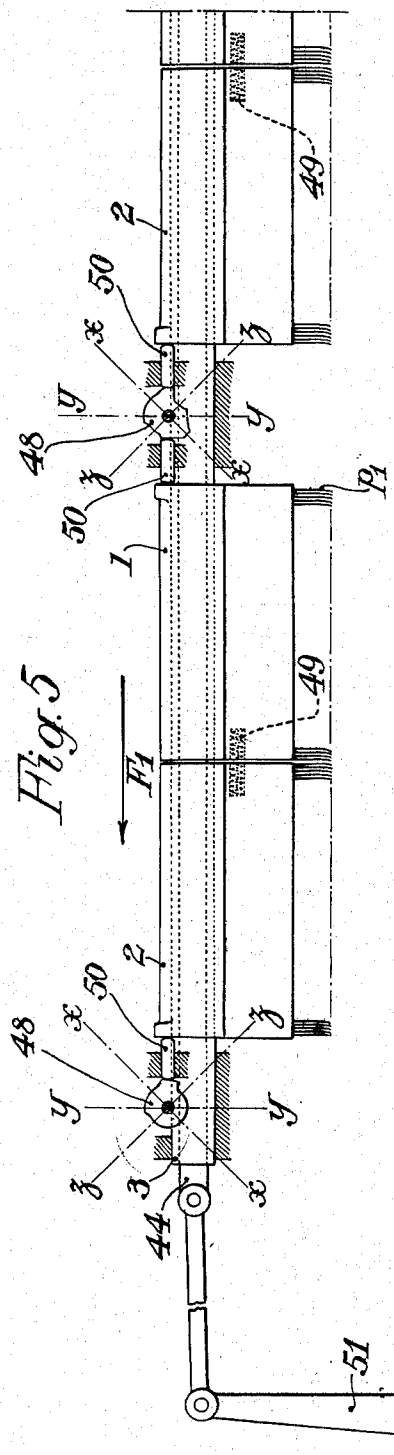
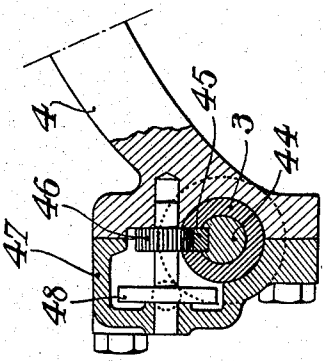


Fig. 6



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PICKING DEVICE FOR FLAT HOSIERY KNITTING FRAMES HAVING HOOKED NEEDLES

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Fig.13

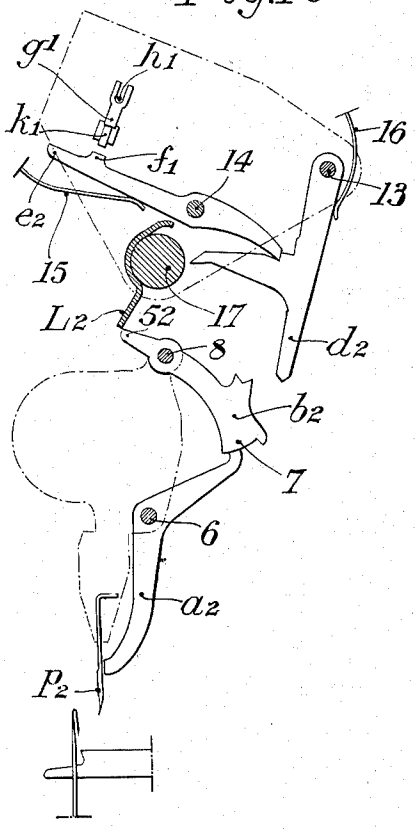


Fig.14

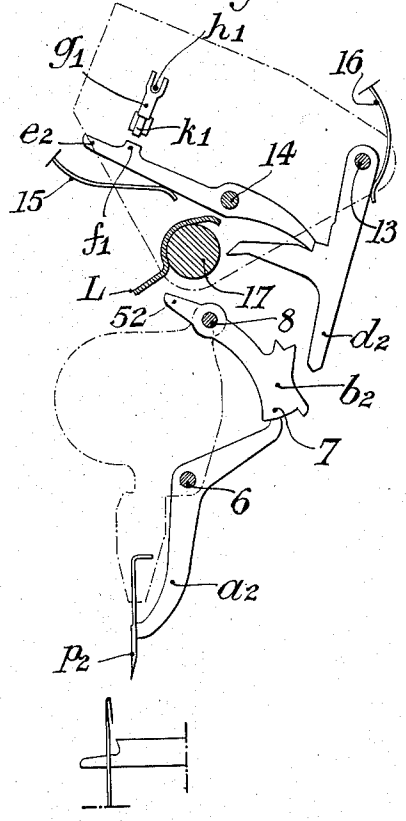


Fig.7

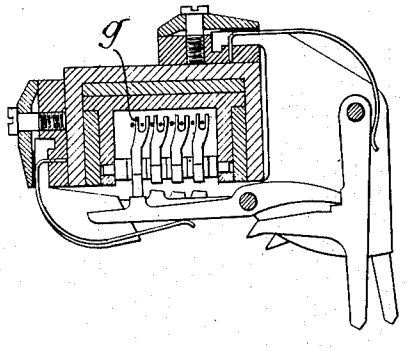
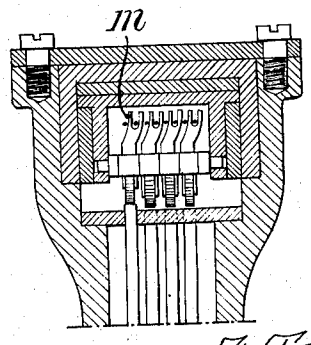


Fig.8



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PICKING DEVICE FOR FLAT HOSIERY KNITTING FRAMES HAVING HOOKED NEEDLES

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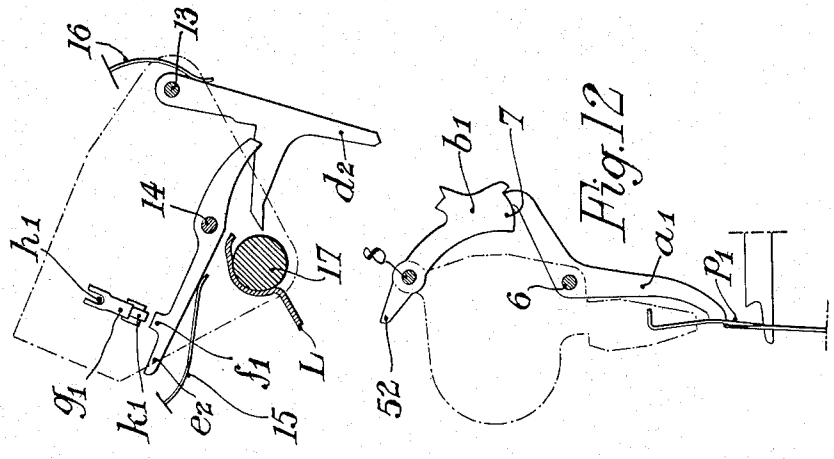


Fig. 12

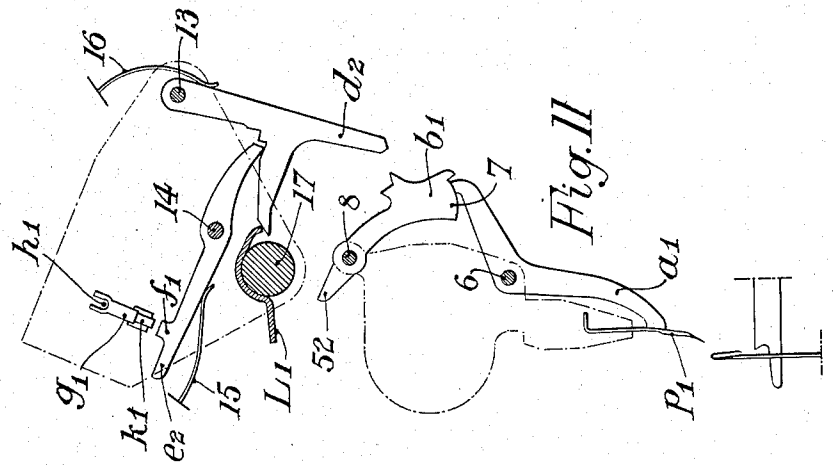


Fig. 11

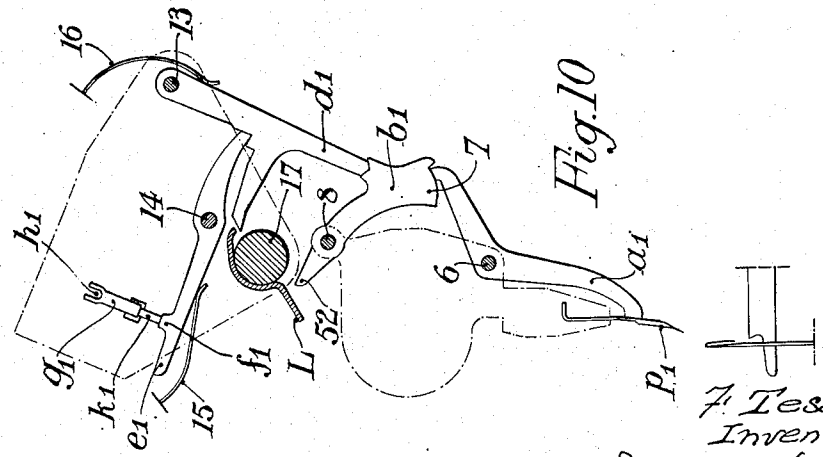


Fig. 10

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Patented Apr. 30, 1940 2,198,846

UNITED STATES PATENT OFFICE

2,198,846

PICKING DEVICE FOR FLAT HOSIERY KNITTING FRAMES HAVING HOOKED NEEDLES

Félix Tessé, La Courneuve, France, assignor to Société dite: Societe Generale De Bonneterie, Troyes, (Aube), France

Application April 11, 1938, Serial No. 201,448
In France April 14, 1937

3 Claims. (Cl. 66—96)

My invention relates to devices controlled by a single drum in order to obtain on all sections of a hosiery knitting frame, whatever the number of same may be, every fashioning and widening operation, picot edge and all sorts of lace patterns.

One of the objects of the invention consists in relieving all the sections from the devices which heretofore allowed to perform, on the hosiery knitting frames, said various operations: cradle frame for picot edge points, picker-bars of fashioning or narrowing attachments, and drum lace attachments.

It is a fact that suggestion has been made to substitute for all these attachments, in every section, a single cradle frame carrying pickers set in or out of action by a single Jacquard device. But said Jacquard selecting devices use either string devices, or electromagnetic means.

The Jacquard string devices use as many strings as there are pickers in the whole of the sections of the frame, thereby intricating to a considerable extent the frame and reducing its rate of operation.

The Jacquard electromagnetic selecting devices also complicate the machine in an expensive manner; no guarantee is given that an electromagnet which, according to the drawings, is to act upon a picker, without acting upon the next one, will not in fact act upon said two pickers, in virtue of their closeness. Finally, in order to secure the operation, it is necessary for the contact pieces to be everywhere perfectly clean, and this requires a careful maintenance.

It has also been suggested to cut in two the single fashioning and lace cradle frame of every section of a Jacquard hosiery knitting frame in order to obtain either fashioning, or lace patterns, in a single dive of the points cradle frame. However, the disadvantages of the Jacquard pattern controlling attachments which have been hereinbefore mentioned still remain and moreover the proposed arrangement does not secure the required accuracy in the position of the picker-bars for picking and transferring the meshes.

My invention allows to carry out safely and at the highest rates which can be obtained with the present hosiery flat knitting frames, with a single Jacquard selecting device, with a single mechanical device for setting into action, as desired, for all the sections, the pickers used for fashioning or for lace patterning, due to jacks in a number equal to the one of the pickers, with a single picker board made of two parts at every points cradle frame, all sorts of picking operations (fashioning, widening, picot, lace patterns).

My invention may also be utilised in connection with a flat embroidered hosiery knitting frame having a large number of needle-beds in which all of the thread-guides would thus be set in action by a single Jacquard selecting device, such as are operated the lace needles in the hereinafter described embodiment.

In the drawings accompanying the present specification and forming part of same, a fashioning and lace attachment, in which our invention is carried out, is shown, by way of example, as applied to a flat knitting machine.

Fig. 1 is a section of the picking device of a needle bed (movable part: picker board and members for directly actuating the pickers; fixed part: swinging blade and selector fingers actuated by the connecting mechanism).

Fig. 2 is a section of the single control device (for example: drum) including the keys which act on the connecting mechanism.

Fig. 3 is a plan view of a perforated plate.

Fig. 4 is a diagrammatical view of the connecting mechanism between the single control device (drum) and the fixed part of the picking devices of each needle bed.

Fig. 5 is a diagrammatical view of the control of the lateral movement of the picker boards for the transfer of the loops.

Fig. 6 is a section of a part of said control.

Figs. 7, 8, 9 and 9*a* show modifications of various parts of the device; Figs. 9 and 9*a* are two parts of one and the same view, the line X—X of Fig. 9 should in reality be located on the left of the line Y—Y of Fig. 9*a*.

Figs. 10 to 14 are views of the device which is the object of Fig. 1, reduced to its essential elements, at the different instants of a picking operation.

At each needle bed the device according to the invention comprises a movable part and a fixed part.

The movable part comprises two boards 1 and 2 (Figs. 1, 5 and 10 to 14) each carrying a number of pickers, such as p_1 and p_2 equal to half the number of needles of the needle beds.

To each needle of the needle bed corresponds a picker located in the same vertical plane.

The picker boards 1 and 2 are carried by the tube 3 which is secured to the arms 4 fast on the shaft 5.

The picker boards 1 and 2 can slide along the tube 3, but cannot rotate about its axis.

On the spindle 6, one of which is secured to

each board, are pivoted levers a_1—a_2 each of which corresponds to a picker p_1—p_2. The lower parts of said levers a_1—a_2 are in contact with the pickers p_1—p_2 and their upper parts are in contact with the lower ends 7 of rockers such as b_1—b_2 which are pivoted on the pin 8. Stays 9, fixed on the board (1 or 2), ensure the lateral guiding of the levers a and of the rockers b.

When the rockers occupy the position b_1 (Figs. 1, 10, 11 and 12), the levers occupy the position a_1, bear on the corresponding pickers and cause them to bend as indicated at p_1. This position of the picker is the operative position.

When the rockers take up the position b_2 (Figs. 1, 13, and 14), the pickers, by resiliency, return to the inoperative position p_2 and carry the levers back to the position a_2.

The whole arrangement which has just been described can swing about the shaft 5 (Figs. 1, 10, 11 and 12) as known; only the bent pickers p_1 can couple themselves with the corresponding needles and effect the picking operations.

The fixed part of the device opposite each needle comprises a sill 10 (Figs. 1 and 2) which is secured to the frame of the machine and on which are fixed as many parts 11 (Fig. 1) as there are groups of adjacent boards 1 and 2 (Fig. 5), that is to say as there are needle beds.

The parts 11 carry stays 12 (Fig. 1) in two holes of which are engaged two rods 13 and 14 (Figs. 1 and 10). On the rod 13 are pivoted fingers d such as d_1, d_2. On the rod 14 are pivoted levers e such as e_1, e_2; the arms of said levers in contact with the fingers d are all identical; their other arms are each provided with a heel f which, in Fig. 1, can occupy one of the four positions f_1, f_2, f_3, f_4.

The levers, such as e, can, by pivoting about the rod 14, occupy two positions which are designated by e_1 and e_2 in Fig. 1. They are urged back towards their position e_2 by springs 15.

When they occupy the position e_2 (Figs. 1, 11, 12, 13 and 14), they hold the fingers in the position d_2.

When pressure is exerted downwardly on the heel f of one of the levers, the corresponding finger d is released and, responsive to the action of the springs 16, occupies the position d_1 (Figs. 1 and 10).

In the position d_1, the fingers d engage their lower ends in notches of the corresponding rockers b (Figs. 1 and 10), whereas, in the position d_2 they are not in contact with the rockers (Figs. 1 and 14).

A spindle 17, which is mounted in bearings secured to the machine, carries a blade L opposite each needle bed.

The spindle 17 can swing on itself between two extreme positions corresponding to two positions L_1 and L_2 of the blade L (Figs. 1 and 10). The function of the blade L will be defined hereinafter.

On the rim of a single drum 18, which can rotate about the spindle 19 (Fig. 2), are fixed bars 20 on which studs 21 can be fastened in grooves, in the known manner. The distance or pitch α between the axes of two consecutive studs on the same bar is the same as that of two consecutive needles of one of the needle beds.

Above the drum is fixed, on the frame of the machine, a box 22 (Fig. 2) carrying two perforated plates 23 in which pass and are guided rods (keys) such as r_1, r_2, r_3, r_4 (Figs. 2 and 3). The holes of said plates 23, the total number of which is equal to that of the needles of a needle bed, are arranged in four rows A, B, C, D (Fig. 3) in such a manner that between the axis of r_1 and the projection of the axis of r_2 on the line A, there is a distance α equal to that of two consecutive needles of a needle bed; similarly between the projections of the axes of r_2 and r_3, of r_3 and r_4, etc.

It ensues that the distance between the centres of two holes of the same row (A for example) is equal to four times the distance between two consecutive needles of a needle bed.

The lower part of each of the keys r is flattened and terminates in a hook (Fig. 2). Said hooks engage in the noses of levers which have the four shapes s_1, s_2, s_3, s_4 of Fig. 2 and are pivoted about the same spindle 24, are held laterally by the stays 25 and are urged by springs 26 into contact with a single abutment 27.

The drum 18 (under the action of an actuating device not shown) successively brings the bars 20 opposite the lower heels of the levers such as s_1, s_2, s_3, s_4. At each bar, any lever s under which a stud 21 is brought, is lifted and in its turn causes the corresponding key r to move upwards, so that the single row of studs of a bar causes certain keys r to project from the four rows A, B, C, D, above the upper perforated plate 23.

The studs 21 are distributed over each bar of the drum 18 as are to be distributed the pickers to be brought into the operative position on the picker boards of all the needle beds for the picking operation to be effected in one course of the article.

A connecting mechanism enables the arrangement of the studs 21 of a bar to be shifted—through the instrumentality of the keys r which they have lifted above the perforated plate 23—in order to place predetermined pickers, on the picker boards of each needle bed, in the operative position.

Said connecting mechanism consists of a longitudinal bar 28 which undergoes, in the sill 10 (Figs. 1 and 2), at each picking operation, a translatory displacement—alternately in one direction and in the other—the amplitude of which is equal to the length of a needle bed, under the action of a lever 29 (Fig. 4) which is actuated by the rotation of the main shaft of the machine through the intermediary of a mechanism not shown.

On said bar 28 are mounted slides which are guided by fixed slide bars 30, viz.:

(a) At one of the ends of the bar 28, opposite the keys r, a slide 31 (Figs. 2 and 4);

(b) At the other end of the bar 28, the slide 32 (Fig. 4);

(c) Between the two, opposite each needle bed, a slide such as 33 (Figs. 1 and 4).

The slide 31 carries two pins 34 and 35 (Fig. 4). On the pin 34 are pivoted four levers m_1, m_2, m_3, m_4 which each have at their upper part a groove in which respectively pass the steel wires h_1, h_2, h_3, h_4. The lower parts of the levers m bear on the ends of the four levers n_1, n_2, n_3, n_4 which are pivoted on the pin 35 and respectively carry the rollers o_1, o_2, o_3, o_4.

The slide 32 (Fig. 4) carries a pin 36 on which are pivoted four levers q_1, q_2, q_3, q_4 which receive, in their upper groove, the steel wires h_1, h_2, h_3, h_4, and are retracted separately by springs such as 37.

Each of the slides 33 (Figs. 1 and 4) carries a pin 38 on which are loosely mounted four levers g_1, g_2, g_3, g_4, in the upper groove of each of which pass the steel wires h_1, h_2, h_3, h_4 and the lower

heel of which optionally pushes back one end of the releasing springs k_1, k_2, k_3, k_4 corresponding respectively to each of them. The other end of the releasing springs k is held in a part **39** secured to the slide **33**.

The parts designated above by letters are located in the same longitudinal plane when they have the same index (respectively 1—2—3—4), viz.: the levers m, n and the rollers o, the levers g, q and the springs k, and the same steel wire h passes in the grooves of the levers m, g and q which have the same index as said wire.

On sleeves **40**, **41**, **42** (Fig. 4) which are secured to the steel wires h_1, h_2, h_3 and h_4 bear, as shown in Fig. 4, the levers m, g and q.

In a translation of the bar **28** and of the whole group of slides, the rollers o_1, o_2, o_3 and o_4 respectively encounter one after the other, the upper ends of those keys r alone of the rows A (for o_1), B (for o_2), C (for o_3) and D (for o_4), which have been lifted by the studs **21** of a bar **20** (Figs. 2 and 4).

The relative position of the slides **31** and **33** is such that when the centre of the roller o_1 is on the extension of the axis of the key r_1, the lowest part of the spring k_1 is just above the heel f_1 of the lever e_1 (Fig. 1); and this is the case for all the needle beds.

When (Fig. 4) the roller o_1, for example, encounters the key r_1 which is assumed to be lifted by a stud, it is itself lifted and acts on the lever m_1 which, through the intermediary of the sleeve **40**, pulls the steel wire h_1 in the direction of the arrow F; the sleeve **41** then causes the lever g_1 to swing and lower the end of the spring k_1; the spring k_1 acts on the heel f_1 of the lever e_1 (Fig. 1) and the corresponding finger d occupies the position d_1. At the same time, the sleeve **42**, through the intermediary of the lever q_1, tensions the spring **37**. When it has gone beyond the key r_1, the roller o_1 falls down again and the spring **37** brings back the whole arrangement in the opposite direction to the arrow F until the tail of the lever n_1 stops on the abutment **43**; the spring k_1 is released and moves upwards to bear on the bushing of the lever g_1.

The above movements recur for the roller o_1 each time that, in the row A (which corresponds to it) it encounters a lifted key r_1, (for example r_1, then r_9 in Fig. 4). The same applies to the rollers o_2, o_3, o_4 in the rows of keys B, C, D which respectively correspond to them (Fig. 3).

By means of successive movements which are equal to the distance between the needles, the rollers o_1, o_2, o_3, o_4 can respectively successively encounter r_1, r_2, r_3, r_4 and act, through the intermediary of the levers o and of the fingers d, on four consecutive pickers of all the picker boards. The same roller, o_1 for example, should move at least from r_1 to r_5 and encounter two consecutive lifted keys of the row A; it therefore only renders operative, on the picker boards, the pickers that are spaced apart at least the distance equal to the intervals between four consecutive needles or a multiple of four intervals.

Another connecting mechanism determines, for each needle bed, the position of the two picker boards at the instant when the loops are engaged and the transfer movements of said loops. It consists of a rod **44** which can slide in the tube **3** (Figs. 1, 5 and 6) and carries a rack **45** (Fig. 6), in each space between two consecutive sections of the machine. The tube **3** is grooved to allow said rack to pass and the latter meshes with a spur pinion **46**. The axle of said pinion is mounted loose on the end of the arm **4** (Figs. 1 and 6) and on its cap **47** (Fig. 6). A cam **48** (Figs. 5 and 6) is also mounted fast on the axle of the pinion **46**.

The two picker boards **1** and **2** of each needle bed tend to move apart under the effect of the spring **49** (Fig. 5) and bear, through the intermediary of the fingers **50**, on the cams **48**. Such as they are shown in Fig. 5, the cams **48** can occupy four positions, viz.: that shown in Fig. 5 and the positions in which the axes x—x, y—y, z—z are horizontal.

(a) In the position of the cams **48** which is shown in Fig. 5, the two picker boards **1** and **2** of each rib are contiguous;

(b) When x—x is horizontal, the two picker boards **1** and **2** are moved together a distance equal to the interval α or distance between two consecutive needles, in the direction of the arrow F_1;

(c) When y—y is horizontal, the two picker boards **1** and **2** are each spaced a distance equal to the interval α from the axis of the needle bed;

(d) When z—z is horizontal, the two picker boards 1 and 2 are each spaced a distance equal to two intervals α from the axis of the needle bed.

Of course, instead of the shape shown in Fig. 5 (four axes at 45°) for the cams **48**, other shapes could be conceived which would cause other integral or relative movements of the two picker boards **1** and **2** of each needle bed (for example five axes at 36°, six axes at 30°, etc.).

But the shape shown in Fig. 5 suffices for effecting, in the manufacture of a complete stocking, the various narrowings, the marks and all the open work patterns.

The various angular positions of the cams **48** can be obtained, at the required instant, by an appropriate translation of the rod **44**.

A mechanism not shown, which is responsive to the rotation of the main shaft of the machine, actuates the lever **51** (Fig. 5) and thereby causes, in the suitable direction, a translation of the rod **44** the amplitude of which may be determined either by the narrowing counter of the machine, or by special studs added on the bars of the drum **18**.

The device operates as will be explained hereinafter, starting for example from the following initial conditions:

(a) The picker boards **1** and **2** are in the high position (that of Fig. 1);

(b) Certain pickers of said boards have been placed in the operative position;

(c) The picker boards are about to move downwards to use said pickers in a picking operation.

As soon as the picker boards **1** and **2** start moving downwards, the shaft **17** (Figs. 1 and 10), which is actuated by a device not described, rotates in such a manner that the blade L (Fig. 10) occupies the position L_1 (Fig. 11). The upper edge of the blade bears on the end of the fingers d, compelling them to occupy the position d_2 (Figs. 1 and 11). Responsive to the action of the springs **15**, all the levers e then take up the position e_2 and hold the fingers d as shown in Figs. 1 and 11. The blade L then takes up the position shown in Figs. 1 and 12.

During this time, the drum **18** has rotated and brought opposite the levers such as e_1 (Fig. 2) a fresh bar **20** carrying a fresh distribution of studs **21**. Certain keys r are lifted by said studs. Immediately, the bar **28**, and consequently all the slides **31**, **33** and **32** secured to said bar, move

for example in the opposite direction to the arrow F (Fig. 4).

The rollers o_1, o_2, o_3, o_4 encounter as they pass, respectively in the rows A, B, C, D, the end of the lifted keys r; the springs k_1, k_2, k_3, k_4 actuate as they pass, as explained above, the heels f of the levers e corresponding to the lifted keys r and the corresponding fingers d come into the position d_1 (Figs. 1 and 10) or retain the position d_2 (Figs. 1 and 14).

The translation of the bar **28** stops when the rollers o have gone slightly beyond the last key r. The arrangement of the fingers d, at each needle bed, then reproduces the pattern which had been prepared by means of the studs **21** on the bar of the drum.

While these operations are taking place, the pickers have moved downwards, have engaged the loops on the needles of the needle bed and have moved slightly upwards again (as in the usual machines). By means of the appropriate displacement of the rod **44** and of the rotation of the cams **48** that ensues therefrom, the picker boards **1** and **2** take up the position selected for the loop transfer, move downwards again, transfer the loops, then move upwards again while the rod **44** moves again and brings the cams **48** into the angular position which will be suitable for engaging the loops during the next picking operation (narrowing, widening, forming clocks, etc.).

When the picker boards **1** and **2** start moving upwards again, the blade L has taken up the position L_2 owing to the rotation of the rod **17** (Fig. 15). The ends such as **52** of the rockers b encounter the lower edge of the blade L_2 which brings them back to the position b_2 (inoperative position of the pickers), and immediately, owing to a rotation of the rod **17**, the blade L_2 comes into the position L and ceases to act on the ends **52** of the rockers (Fig. 14).

The boards **1** and **2** continue their upward movement; the ends of the fingers d which occupy the position d_1 engage in the notches of the corresponding rockers b_2. Said rockers rock about the pin **8** and rock the levers a which place the pickers in the operative position.

The picker boards are then ready for the next picking operation.

In said next operation, the slides will move in the direction indicated by the arrow F. Between the two successive motions of the bar **28**, the drum **18** will have turned or will not have turned according to a certain angle α.

Should it have turned according to the angle α, the same will lift other keys r than those which have been lifted during the previous displacement of the bar **28** and the translation of the bar **28** in the direction F will bring into working position other pickers p.

If the drum **18** has not changed its position, it will lift the same keys r and the translation of the bar **28** in the direction F will set again into working position the same pickers p as in its previous motion.

The only difference resulting from the change in the direction of translation of the bar **28** consists in that pickers p will be set into working position by the keys r of same index which are lifted, from the one to the next one, in the direction F (from the left to the right in Fig. 4) in starting from the left edge of every section of the frame, whilst, in the preceding displacement, the pickers p, acted upon by the lifted keys r, were set into working position, the one next to the other, from the right and from the left.

In the construction described above, it has been assumed that the arrangement of the studs **21** on the same drum bar was shifted on each picker board by means of four rows of keys r. It is quite obvious that this number has only been selected by way of example and may be changed as desired.

The advantage which is offered by the multiplicity of rows of keys has been explained above and consists in reducing the stresses to which are subjected the steel wires h and the elements of the connecting mechanism of which they form a part, and in avoiding, as a consequence, a reduction of the speed of translation of said mechanism, and therefore of the speed of rotation of the machine.

These advantages may be further increased by the use of a modification shown in Figs. 7, 8, 9 and 9a according to which the keys r which are again assumed for example to be arranged in four rows A, B, C, D, are divided into two groups E_1 (on the right) and E_2 (on the left). The slide **53** (which in this case replaces the slide **31** of the previous description) carries two groups F and G of four levers n, having rollers. The group F operates on the four rows of the part E_1, the group G on the four rows of the part E_2. The travel of the slides is thus reduced by one half relatively to the previously described case. At each needle bed, instead of the single slide **33** previously described, are located two slides **54** and **55** carrying the springs H and J one of which, H, acts on the members f, e, d, corresponding to the picker board **2** (Fig. 5) and is actuated by the group of levers F; the spring J acts on the board **1** (Fig. 5) and is actuated by the group of levers G.

The levers m of the group G (Fig. 8) and the levers g of the group J (Fig. 7) have their upper grooves out of centre and, in the spaces which separate two adjacent levers—m or g—pass the steel wires h which connect the groups F and H to each other. The levers m of the group F and g of the group H are symmetrical with the former as regards the out of centre position of their upper groove.

In the above description, only an embodiment of the device has been considered, applied to all the picking operations in flat knitting frames for looped hosiery, but the invention obviously applies to other machines as was stated in the introduction and, in particular, to flat knitting frames for embroidered hosiery.

I claim:

1. In a flat knitting frame for looped hosiery having a plurality of needle beds, the combination of two picker boards per needle bed, a picker for each needle of the needle bed on said picker boards, a single Jacquard device for all the needle beds of the frame, a connecting mechanism between said Jacquard device and said picker boards of all the needle beds, a spring adapted constantly to separate the two picker boards from each other, a cam at each end of each needle bed, said two cams being actuated by the driving mechanism of the frame, said picker boards being adapted to be pressed against said cams by the action of said spring, and the contour of said cams being selected in such a manner that the position of each of said picker boards is determined respectively for the engagement and the transfer of the loops for all the picking opera-

tions by simultaneous and symmetrical movements in opposite directions.

2. A flat knitting frame for looped hosiery as claimed in claim 1, wherein the picking device of each needle bed is decomposed into the picker board which is divided into two elements and swings about an axis, and a fixed part provided, on the one hand with a blade which, when the picker board moves upwards, brings back all the pickers into the inoperative position, then swings and only acts on the pickers after the next picking operation, on the other hand with fingers and levers which are respectively equal in number to that of the pickers and each of which corresponds to one of the pickers of the picker board, said blade having an extension adapted to act on each of said fingers and said levers and to bring same, at the beginning of each downward movement of the picker board, into a position corresponding to the inoperative position of the pickers.

3. A flat knitting frame for looped hosiery as claimed in claim 1, wherein the connecting mechanism between the picking device of each needle bed and said Jacquard device comprises keys which are of equal number to that of the needles of a needle bed, and each of which corresponds to a picker of each needle bed and is actuated by a stud of the same row of the Jacquard device in such a manner as to be lifted by said stud as it passes and to project on the path of a movable system, the length of which is equal to that of the machine and to which is imparted, at the instant of each downward movement of said picker boards, a translatory movement parallel with said needle bed and having an amplitude equal to the width of a needle bed, said movable system comprising, on the one hand a group of feelers, and on the other hand, opposite each picker board, a group of releasing devices, each of the elements of the groups of feelers and releasing devices corresponding respectively to a layer of said keys which are arranged in a plurality of parallel layers.

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