

Dec. 5, 1967

YASUKATA EGUCHI

3,356,051

CAM SELECTING ARRANGEMENT

Filed Oct. 28, 1964

8 Sheets-Sheet 1

FIG. 1

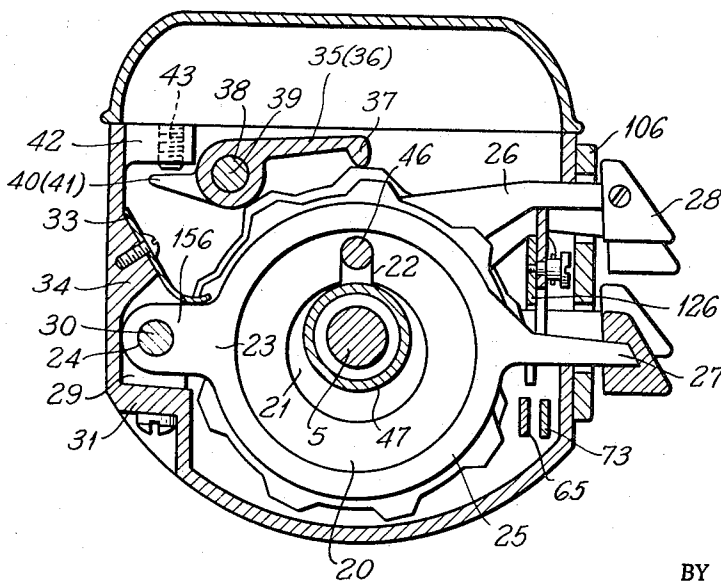
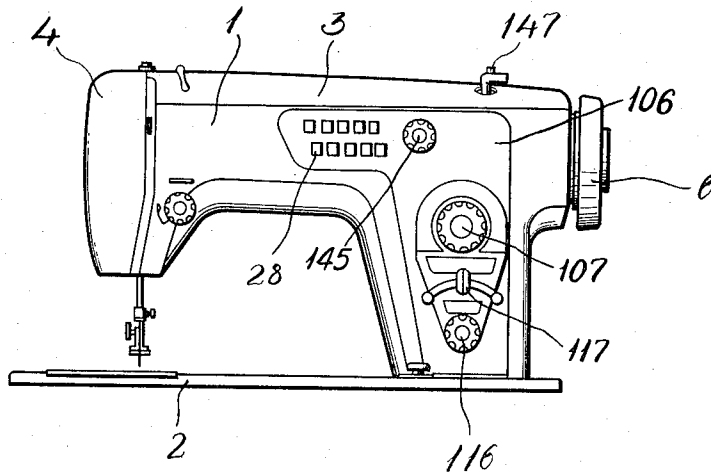


FIG. 5

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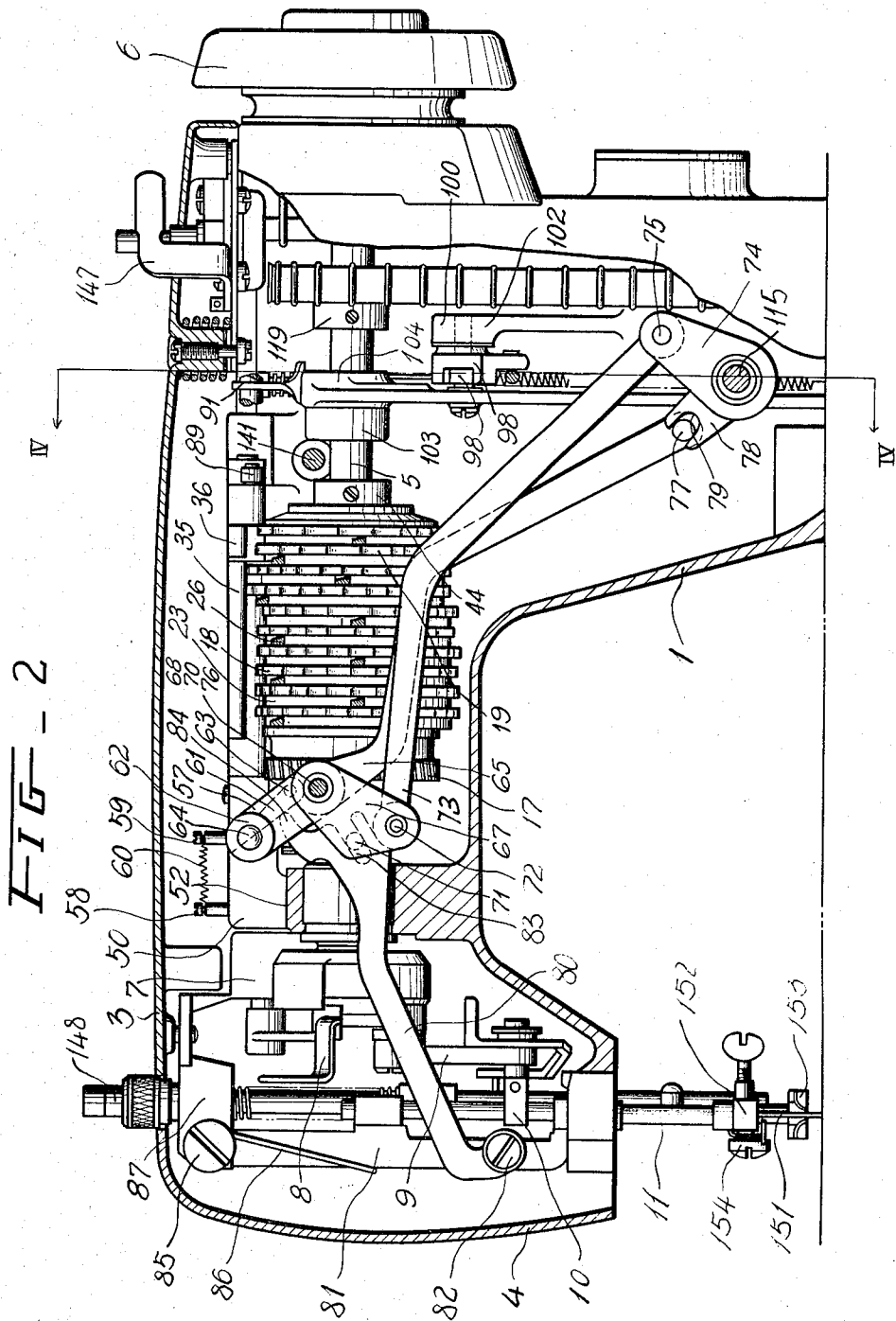


FIG. 2

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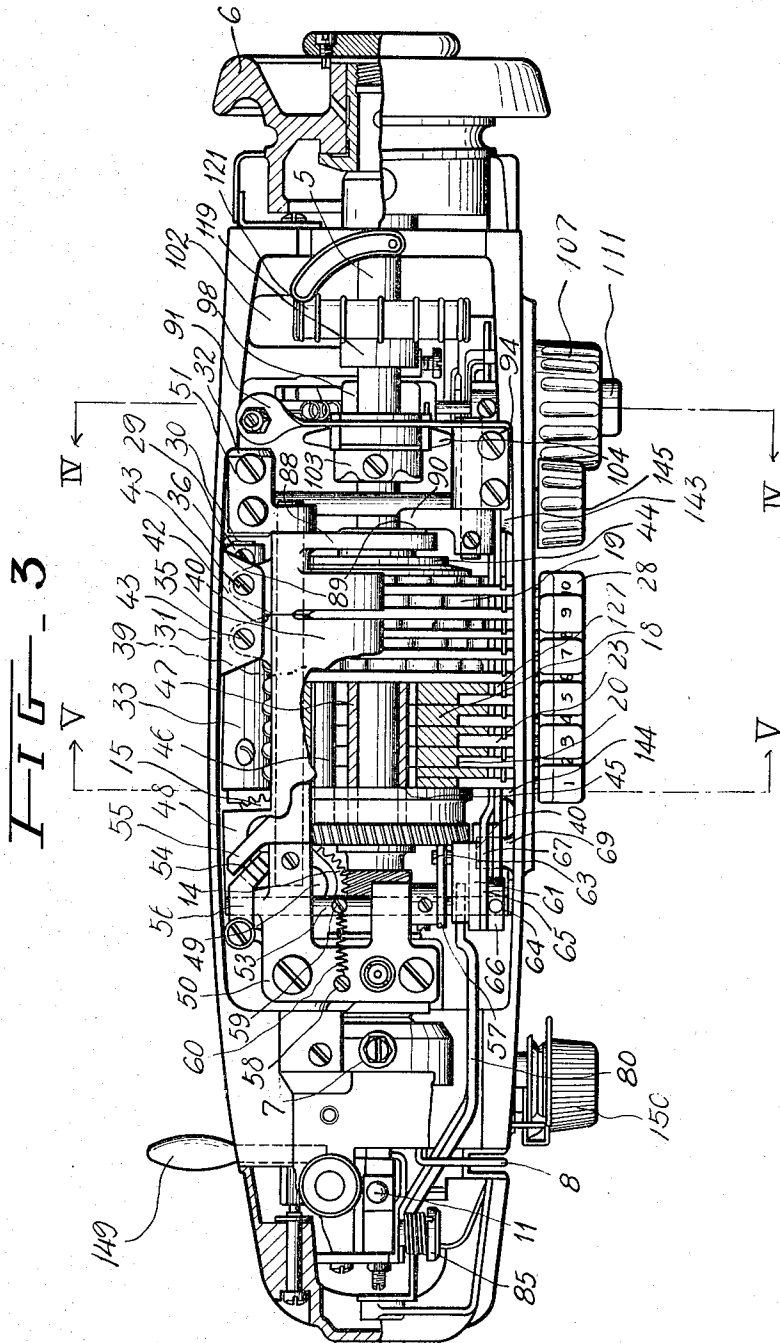
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CAM SELECTING ARRANGEMENT

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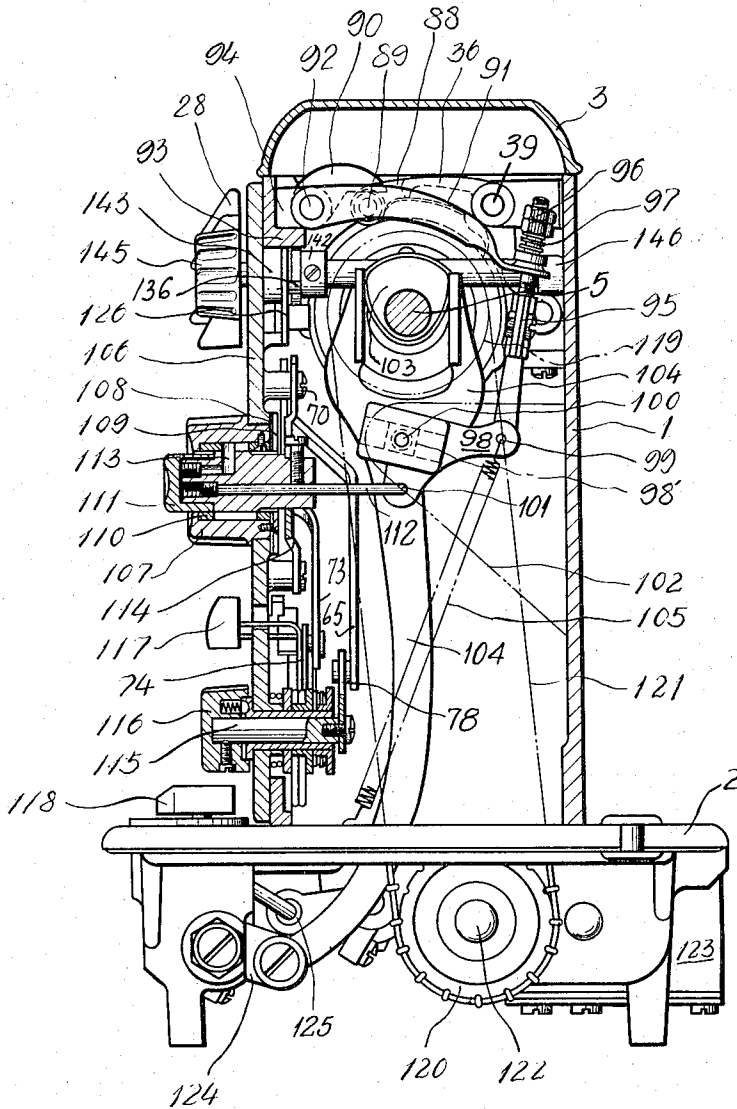
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FIG. 4



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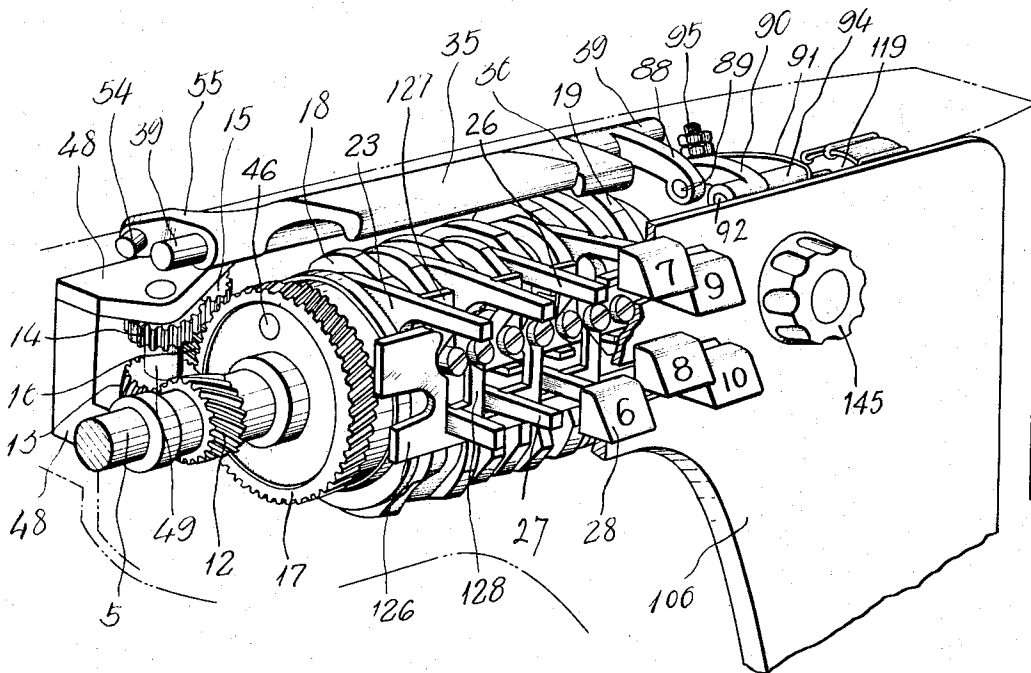
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FIG. 6



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FIG. 7

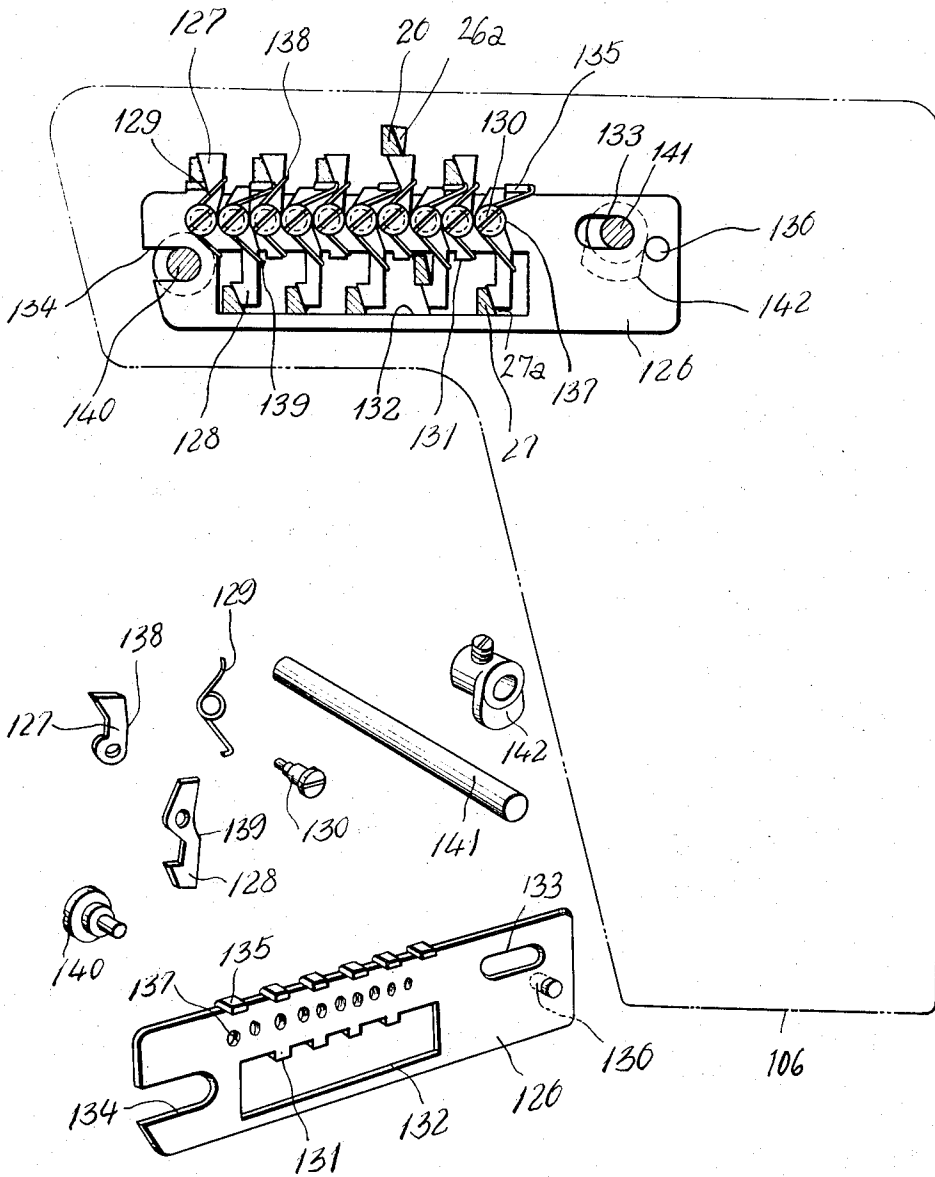


FIG. 7a

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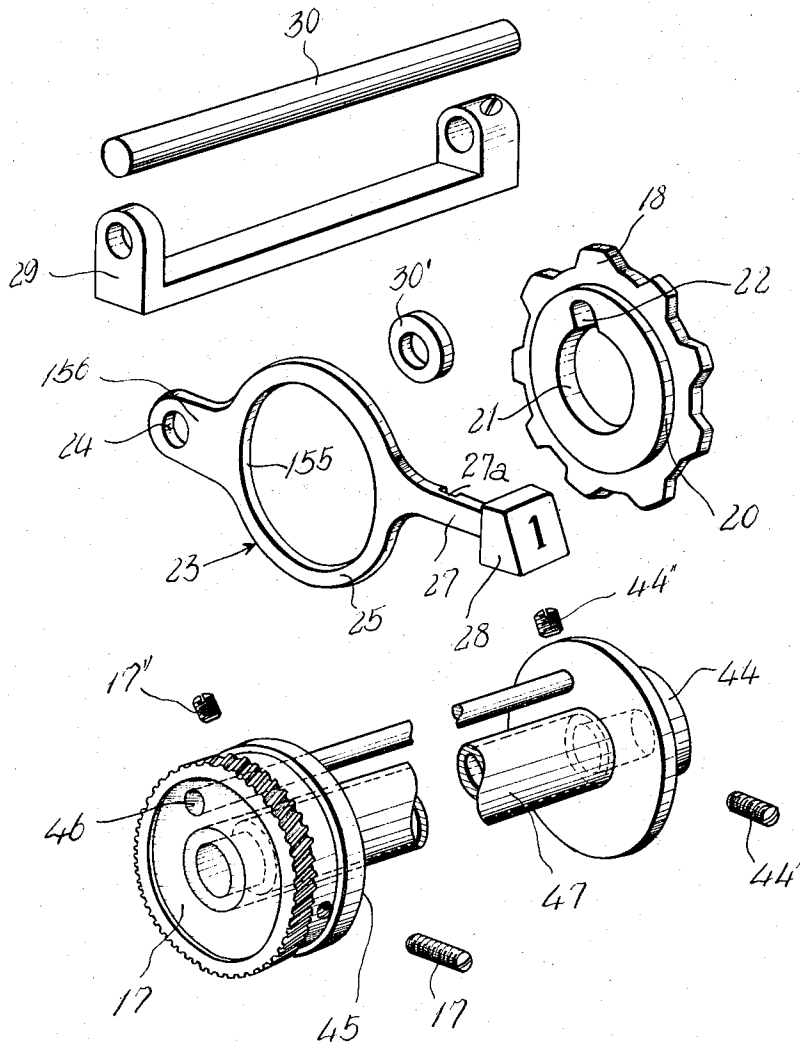
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FIG. 8



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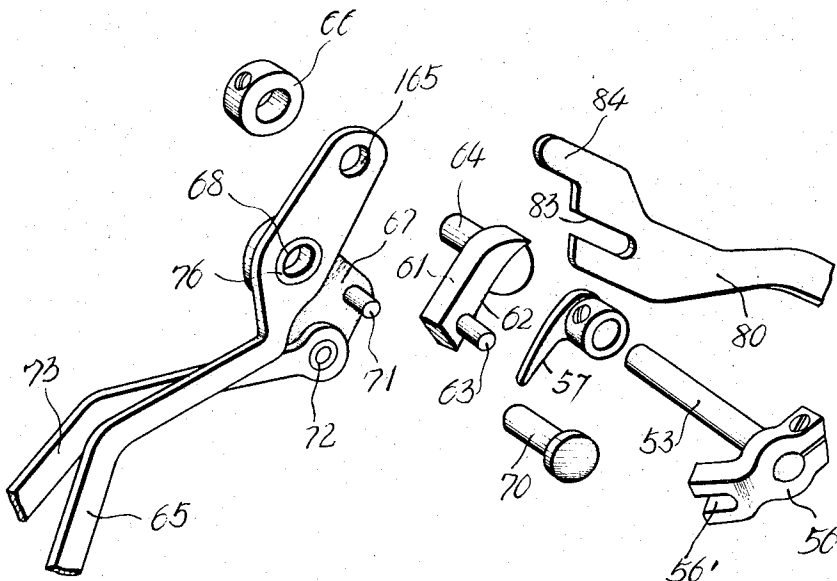
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FIG. 9



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3,356,051

CAM SELECTING ARRANGEMENT

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Claims priority, application Japan, Oct. 28, 1963, 38/57,272

21 Claims. (Cl. 112—158)

ABSTRACT OF THE DISCLOSURE

An ornamental zig-zag sewing machine having a single cam follower means and a plurality of pattern cams individually and selectively movable to and from an operative position cooperating with said cam follower means, whereby the needle bar assembly of the sewing machine may be oscillated to control ornamental stitching in accordance with the cam track pattern of a pattern cam moved to said operative position.

The present invention relates to a cam selecting arrangement, and more particularly to apparatus provided in an ornamental zig-zag sewing machine for selecting pattern cams in accordance with ornamental stitches to be carried out by the needle bar assembly.

Ornamental sewing machines are known in which the needle bar assembly is controlled by different pattern cams to make different ornamental and zig-zag stitches. In accordance with the prior art, selected cam followers are moved to an operative position cooperating with a selected pattern cam having desired cam track patterns.

It is one object of the invention to improve the cam selecting arrangement according to the prior art, and to provide a cam selecting arrangement of simple and efficient construction in which a single cam follower cooperates with all pattern cams.

Another object of the invention, is to carry out the selection of pattern cams by moving rotary pattern cams individually and selectively to and from a position cooperating with the cam follower.

Another object of the invention is to maintain selected cams in operative position by arresting a carrier on which the respective cam is mounted for rotary movement.

Another object of the invention is to mount cams on carriers in such a manner that the cams are rotatable, and also individually movable to and from an operative position cooperating with a common cam follower.

With these objects in view, the present invention relates to a cam selector arrangement, which is advantageously applied to an ornamental sewing machine. One embodiment of the invention comprises a plurality of cams, and means for selectively and individually moving each cam, while the same is being rotated, to and from an operative position cooperating with a cam follower which is common to all cams so that the same is oscillated in accordance with the cam track pattern of the respective selected and operative cam. Preferably, the cam follower is oscillatable about an axis and operatively connected with the needle bar assembly of an ornamental sewing machine.

In the preferred embodiment of the invention, each cam has a circular journal-like projection of comparatively great diameter and a central opening in the projection. The projection is received in a bearing opening of a carrier member so that each cam is supported for rotation on the respective carrier members. The carrier members of a set of cams are mounted for angular movement

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about a shaft and can be individually raised and lowered with the cams carried thereby.

Drive means including a coupling rod located in a radial cutout of the central opening of each cam, are provided for rotating all cams on the respective carrier members, and the radial cutouts remain in coupling connection with the coupling rod when the cams are individually raised and lowered together with the respective carrier members. Thus, although the cams perform a translatory movement to and from the operative position cooperating with the cam follower, the driving connection with the drive means is nevertheless maintained so that the cams are rotated, irrespective of whether they are in the inoperative or in the operative positions.

In the preferred embodiment of the invention, each carrier member has an arm projecting out of the housing of the sewing machine, and carrying at the outwardly located end a handle knob preferably provided with an indicia identifying the respective cam track pattern.

Arresting means are provided for individually locking each carrier member in the normal position and in the actuated position in which the respective cam cooperates with the cam follower. Clearing means are provided for releasing all arrested carrier member arms simultaneously.

The cam follower is preferably connected to the needle bar assembly by linkage means which permit manual adjustment of the stitch amplitude, and of the field position of the needle of the needle bar assembly so that stitches of different amplitude can be produced along a center line, or along laterally displaced lines.

In a sewing machine according to the preferred embodiment of the invention, one set of cams controls the needle bar assembly, while another set of cams, mounted and selected as explained above, cooperates with the cam follower which is operatively connected with the feeding means of the sewing machine, so that the shape of the ornamental stitch can be simultaneously influenced by the pattern of a cam controlling the needle bar assembly, and by the pattern of another cam controlling the feeding means.

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 connection with the accompanying drawings, in which:

FIG. 1 is a side elevation illustrating a sewing machine according to the present invention;

FIG. 2 is a longitudinal sectional view of a sewing machine provided with the cam selecting arrangement of the present invention;

FIG. 3 is a plan view of the sewing machine with the top cover removed, and partly in horizontal section;

FIG. 4 is a vertical cross-sectional view taken on lines IV—IV in FIGS. 2 and 3;

FIG. 5 is a cross-sectional view taken on line V—V in FIG. 3;

FIG. 6 is a fragmentary perspective view illustrating the cam selector arrangement, other parts being omitted for the sake of clarity;

FIG. 7 is a fragmentary side elevation, partially in vertical section, and illustrating arresting means for the carriers of the cams;

FIG. 7a is an exploded perspective view illustrating parts of the arresting arrangement illustrated in FIG. 7;

FIG. 8 is an exploded perspective view illustrating parts of the cam selector arrangement; and

FIG. 9 is an exploded perspective view illustrating part of an adjustable linkage for adjusting the field position and transverse amplitude of the needle bar assembly.

Referring now to FIG. 1, a sewing machine housing 1 is mounted on a bed plate 2 and has a top cover 3 and a lateral cover 4. A plate 106 is provided on the front of the machine and is penetrated by handle knobs 28. Manually operated turnable knobs 145, 107, 116, and a manually operated handle 117 are provided on the front of the machine, and control functions which will be explained hereinafter.

Referring now to FIG. 2, a needle bar assembly is mounted in the housing, and includes a needle bar 11, a needle 151 clamped in a member 152 by a screw 154, a pressure foot 153, and a member 81 in which the needle bar is guided for up and down movement, and which is mounted on a pivot screw 85 for angular oscillation together with the needle bar and needle on a support 87. A spring 86 urges the needle bar assembly to turn in counterclockwise direction as viewed in FIG. 2.

A main shaft 5 is mounted in the machine housing and carries at one end a fly wheel 6, and on the other hand a crank connected to a link 9 articulated by pivot 10 to the needle bar 11 so that the same is reciprocated in vertical direction for making stitches.

As best seen in FIG. 6, a worm gear 12 is fixed to main shaft 5 and meshes with a gear 13 secured to a vertical shaft 49 mounted in a frame portion 48 of the housing. Another gear 14 on shaft 49 meshes with a gear 15 driving a worm 16 in meshing engagement with a larger worm gear 17 which is mounted on shaft 5 for free rotation. The above-described transmission transmits the rotation of shaft 5 at a lower rotary speed to gear 17. The ratio of this reduction transmission may be 18 to 1.

As best seen in FIG. 8, gear 17 is secured to a circular disc 45 which is secured to a sleeve 47 surrounding shaft 5, but having a larger diameter than the same, as best seen in FIG. 5. The other end of sleeve 47 carries a fixed disc 44, and a coupling rod 46 extending parallel to the axis of shaft 5 is fixedly secured to discs 45 and 44 by screws 17" and 44". Coupling rod 46 will revolve about the axis of shaft 5 with sleeve 47 when gear 17 is rotated from drive shaft 5.

As best seen in FIGS. 2, 3 and 6, two sets of cams 18 and 19 are mounted between discs 45 and 44 and are held axially immovable by the same. Each cam 18, or 19 has a lateral circular projection 20, as best seen in FIG. 8, which has a central opening 21 with a radial cutout 22. The circular journal-like projection 20 is rotatably received in a circular bearing part 25 of a carrier 23 which has an inner circular bearing surface 155 permitting free rotation of a cam 18 or 19 supported on a carrier 23.

Each carrier 23 has a tail portion 156 formed with a bearing bore, and all carriers 23 are mounted for angular movement about a shaft 30 which is mounted on a bracket 29 secured to the housing of the machine. An arm 27 projects forwardly from each carrier 23 and carries a handle knob 28 located outside of the housing and provided with an indicia. The tail portions 156 of the carriers are spaced from each other by circular spacing members 30' located on shaft 30.

Arms 26, 27 of alternate carriers 23 are staggered in vertical direction, as best seen in FIG. 6 so that the handle knobs 28 are arranged in two rows whereby more space is available for each handle knob.

The arms 26, 27 project through openings in a cover plate 106 on which an arresting plate 126 is mounted, as will be explained hereinafter.

When anyone of the handle knobs 28 is raised, the respective carrier 23 will turn about shaft 30, and will raise the respective cam 18, or 19, mounted thereon. During such movement on any cam with a carrier 23, coupling rod 46 will remain in the cutout 22 of a raised cam, but will be located in an inner portion of the respective cutout 22 instead of in the outer portion where the cou-

pling rod 46 is located in the normal lower position of a cam 18 or 19 with its carrier 23.

Consequently, the driving connection between gear 17, disc 45 and coupling rod 46 will be maintained irrespective of whether a cam 18 or 19 is in the lower position while its carrier 23 is in its normal lower position or in a higher position when the carrier has been actuated to move upward.

Bracket 29 is secured by screws to the rear wall of the machine housing 31 as best seen in FIGS. 3 and 5. A spring 33 is secured by screws to a projection 34 on the rear wall of the housing and has a plurality of tongues forming a comb, each tongue abutting the tail portion 156 of a carrier 23, as best seen in FIG. 5 so that all carriers 23 are urged downward to a normal lower position.

As best seen in FIG. 3, two cam followers 35 and 36 are provided on top of the cam packets 18 and 19, respectively, cam follower 35 cooperating with cams 18, and cam follower 36 cooperating with cams 19. Cam followers 35 and 36 are mounted for turning movement about a shaft 39 which extends parallel to shaft 5 and shaft 30. As best seen in FIG. 5, each cam follower 35, or 36, has a downwardly projecting portion extending over all cams 18, or 19, respectively, and being engaged by the cam track of any cam whose carrier 23 are raised to an operative position.

Each of the cam followers 35 and 36 has at its tail end a projection 40, or 41, respectively which cooperates with an adjustable screw 43 mounted in a threaded hole of a stationary bracket 42 so that turning of the cam followers in clockwise direction is limited before projection 37 can engage a cam 18 or 19 in its lower inoperative position. When a cam is raised to its operative position engaging projection 37, the respective cam follower 35 or 36 is turned to a position in which the stop portion 40, or 41, is spaced from the stop screw 43 so that the respective cam follower is free to perform an angular oscillating movement under the control of the cam track of the respective operative cam. Supporting shaft 39 of cam followers 35 and 36 is supported on bearings 50 and 51 secured by screws to bracket 52 on the machine frame.

A shaft 53 extending at right angles to shaft 39 is mounted on the frame of the machine for oscillatory movement and carries a fixed fork member 56 having a slot 56', best seen in FIG. 9 receiving a coupling pin: 54 carried by a rearwardly projecting portion 55 of cam follower 35. Consequently, oscillatory movement of cam follower 35 under control of a selected cam 18, will cause oscillation of shaft 53.

As best seen in FIGS. 2 and 3 a projecting screw 59 is fixed to shaft 53 and is connected by a spring to another screw 58 mounted on a stationary bearing member 50 having two bearing portions in which shaft 53 is mounted. Due to the force of spring 60, shaft 53 is angularly turned in counterclockwise direction as viewed in FIG. 2, and urges through members 55, 54, 56, cam follower 35 to turn in clockwise direction as viewed in FIG. 5 until stop portion 40' abuts stop screw 43. However, when cam follower 35 is oscillated by a selected cam 18, shaft 53 will perform an angular oscillatory movement.

As best seen in FIGS. 2 and 9, an arm 57 is fixed to shaft 53 and cooperates with a pin 63 on an arm 61 having a planar surface 62, and a projecting stud 64 received by a bore 165 in a link 65 and held in position by a collar 66 secured by a screw. Link 65 has a bushing 76 secured to a plate 67 and forming a bearing 68 for mounting link 65 on a journal 70 which is secured to a boss 69 on the stationary front wall of the machine as shown in FIGS. 3 and 4.

Plate 67 serves for the regulation of the stitch amplitude and has a projecting pin 71 which is located in a slot 83 of a motion transmitting link 80 which is pivotally connected by a screw 82 to member 81 of the needle bar assembly, as best seen in FIG. 2. Link 80 has a projection 84 cooperating with the planar face 62 of member 61.

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The amplitude regulation plate 67 is connected by a pivot 72 to a control link 73 whose other end is connected by a pivot pin 75 to an arm 74 mounted for turning movement about the axis of a shaft 115 and being operated by a handle lever 117, as shown in FIG. 4. The lower end of link 65 carries a projecting pin 77 received by a slot 79 of a fork-shaped arm 78 which is secured to shaft 115, as best seen in FIG. 4, and operated by a knob 116. When arm 78 is turned, the link 65 is shifted and the position of journal 64 of arm 61 is changed resulting in a changing of the field position of the needle bar assembly. When arm 74 of control link 73 is adjusted, the position of plate 67 is varied, and pin 71 acting on member 80 is influenced to vary the stitch amplitude by displacing projection 84 along surface 62 of member 61. Consequently, adjusted lateral oscillation will be transmitted to the needle bar assembly, and the stitch can be placed in left, central or right field positions, and its amplitude can be adjusted.

Referring now to FIGS. 3, 4 and 6, shaft 39 carries an arm 88 having a pin 89 with a roller engaging a face on an arm 90 mounted for angular movement on a shaft 92 mounted in bearing means 94 which is fixed by a screw to a stationary part 93 of the machine frame. Arm 90 oscillates under control or shaft 39 and pin and roller 89 and turns shaft 92 which projects from bearing 94 and carries on its projecting part a feed controlling arm 91 to which a feed controlling rod 95 is adjustably attached by means of a spring 97 and a nut 96.

Rod 95 is pivotally connected at 99 to a feed regulator 98, and a long coil spring 105 is connected to the same point and the frame of the machine. The oscillatory movement of cam follower 96 under the control of a cam 19 will be transmitted to the feed regulator 98 which is supported for angular movement on a shaft 100 which is mounted on a bracket 102 shown in chain lines in FIG. 4. The point 99 controls automatic feeding operations, whereas the point 101 of regulator 98 is connected by a link 112 to a manually operated knob 111 by which the feed can be manually controlled.

A main drive cam 103 on shaft 5 controls the feeding motions and oscillates a forked rod 104 supported by a slide 98' which is guided in a guideway of the feed regulator 98. Spring 105 urges feed regulator 98 to a position in which feeding takes place due to oscillation of member 104 by cam 103.

The cover plate 106 at the front wall of the machine housing has several graduation scales arranged as dials for the several manually operated knobs provided at the front wall of the machine. Knob 107 controls the feed and is held in an opening 108 of plate 106 for turning movement by the action of a spring 109. Knob 107 has a feed controlling cam 110 mounted therein, and a feed reversing button passing through the center thereof. The feed reversing rod 112 is secured to button 111 so that the regulator 98 can be shifted by operation of button 111. A follower pin 113 is inserted into the reverse button 111 and cooperates with cam 110 when knob 107 is turned so that link 112 can be gradually shifted by turning of knob 107. The shifting of the reverse button 109 in axial direction changes the position of regulator 98 and of the guideway therein so that the feed motion is reversed, irrespective of the feeding speed.

Shaft 115 is operated by knob 116 and controls arm 78 and link 65, as explained above, for changing the field position of the needle bar assembly.

The manually operated lever 117 controls link 73, described with reference to FIGS. 2 and 9 through arm 74 to vary the stitch amplitude.

FIG. 4 further shows a handle 118 mounted on the bed plate 2 and controlling a lever 125. Pulleys 119 and 120 are connected by a belt 121 transmitting the rotary motion from the main shaft 5 to the feed shaft 122. A gear case 123 is mounted on bed plate 2. A feed arm 124 is connected to the feed control rod 104. The arrangement of the feeding means is conventional, and

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not an object of the present invention so that a further detailed description is unnecessary. It will be understood that the oscillatory motion produced by cam follower 36 under control of each selected cam 19 is transmitted by the above-described linkage means to the feed dog of the sewing machine, while nevertheless the linkage permits the reversing of the feed, and adjustment of the feeding speed by manually controlled means 107 and 111.

When a cam 18, and a cam 19 are simultaneously placed in an operative position respectively cooperating with cam followers 35 and 36, the needle bar assembly will be transversely oscillated in accordance with a cam track pattern of cam 18, while the feed motions will be carried out under the control of the operative cam 19 so that the shape of the ornamental stitch will be influenced by both cams.

Referring now to FIG. 7 and FIG. 7a, an arresting plate 126, whose shape is best seen in FIG. 7a, is mounted on plate 106 for transverse translatory movement. For this purpose, it is provided with a cutout 134 and a slot 133. Cutout 134 receives a supporting stud 140 whose head holds plate 126 in position, and slot 133 is penetrated by a shaft 141 carrying a cam 142 fixed by a screw. Knob 145 is secured to shaft 141 so that turning of the knob will cause turning of cam 142 which engages a projecting pin 136 on arresting plate 126 and shifts the same while the edges of cutout 134 and slot 133 slide on members 140 and 141, respectively.

Arresting plate 126 has a window 132 whose upper edge has a plurality of projections 131, while the upper edge of the arresting plate 126 is provided with a series of outwardly bent projections 135. Threaded bores 137 in arresting plate 126 receive screws 130 which provide axles for catch members 127, 128 arranged to alternately project upward and downward, as best seen in FIG. 7. A spring 129 is mounted on each screw. Those springs 129 which cooperate with the upwardly projecting catch members 127 have an upper arm engaging the catch member, and a lower arm hooked to a projection 131. Springs 129 cooperating with the downwardly projecting catch members 128 have one arm engaging the catch member, and an upper arm engaging a bent projection 135. All springs urge the respective catch members 127 and 128 to move toward the left as viewed in FIG. 7. Each catch member has an oblique face engaging a corresponding oblique face 26a of an upper arm 26, or of a recess 27a of a lower arm 27 of the carriers 23, the upper arms 26 supporting the knobs 28 of the upper row, and the arms 27 supporting the knobs 28 of the lower row, as best seen in FIG. 6. Due to the inclined abutment faces of arms 26, 27 and catch members 127, 128, all arms are urged downward by catch members 127 and 128 which are also urged downward by spring 33 acting on the tail end 156 of the carriers 23, as described above with reference to FIG. 5.

When handle knob 28 is gripped by the operator and moved upward, the respective catch member 127 or 128 is urged to the right as viewed in FIG. 7 by the abutting slanted faces, until the catch member can snap back under the action of spring 129 under the raised arm 26 or 27. As shown in the upper part of FIG. 7, an upper arm 26 will be held by the top face of the corresponding catch member 127 when raised by a manual operation, while a lower arm 27 will rest on a horizontal shoulder of the catch member 128 when raised by the operator. In both positions, the respective arm 26 or 27 will be locked in its higher position, so that the respective carrier 23 will be arrested in its higher position and hold the cam 18, or 19, mounted thereon in a higher operative position cooperating with cam follower 35 or cam follower 36.

In order to release an arm 26 or 27 of a carrier in actuated position, knob 145 is operated, and shaft 141 and cam 142 are turned so that cam 142 engages pin 136 and shifts arresting plate 26 to the right as viewed

in FIG. 7 whereby an arrested arm 26 slides off the top face of the respective arresting member and moves downward until the slanted faces of recess 26a and of the respective arresting member abut each other again, such downward movement being caused by the spring 33 acting at the tail ends 156 of the carrier members. Consequently, the actuated carriers can be cleared by operation of knob 145. It will be seen that raised arms 26 and 27 of carriers 23 are rigidly held and locked in the raised positions by horizontal faces of catch members 127 and 128, so that the respective cam 18 or 19 is rigidly held in the operative position while cooperating with cam follower 35 or 36 which are urged against the same by spring 60 described with reference to FIGS. 2 and 3. The raising of a carrier requires the operator to overcome not only spring 33, but also the force of springs 129 which act at points 138 and 139 of catch members 127 and 128. Shaft 141 is supported on a bearing 146 at the rear wall of the housing as shown in FIG. 4. Conventional parts of the sewing machine are a spool supporting device 147, shown in FIG. 1, a presser bar 148 with a presser foot 153, shown in FIG. 2, a thread tensioning device 150 and the needle holder 152, 154.

When it is intended to make ornamental stitches in accordance with a desired stitch pattern, the respective pattern which may be indicated by a number on one of the knobs 28, is selected by raising the respective knob 28 from its normal lower position to a higher position in which the corresponding carrier 23 is raised from its normal position to an actuated position. As soon as the arm 26 or 27 of the respective carrier 23 is located above the arresting surface on the top of an upper arresting member 127, or a corresponding face on a lower arresting member, the respective arresting member snaps under the raised arm 26 or 27 and locks the respective carrier member in the actuated position. While an arm 26 or 27 is raised, the respective carrier 23 turns about shaft 30 so that its bearing surface 155 is raised together with projection 20 and the respective cam 18 or 19 which is supported for turning movement in the bearing surface 155.

The raised cam is located in the region of the projection 37 of cam follower 35 or 36 which is urged by spring 60 to turn in clockwise direction as viewed in FIG. 5 until abutting stop 43, but a raised cam 18 or 19 will raise projection 37 and turn the respective cam follower to a position in which the same can freely oscillate under the control of the respective cam without engaging stop 43.

Shaft 5 drives through gears 13 to 17 the coupling rod 46 to revolve about shaft 5, and since coupling rod 46 passes through all radial cutouts 22 of cams 18 and 19, all cams are continuously rotated irrespective of whether they are in inoperative or operative positions.

When a carrier 23 is raised with its cam 18 or 19, the central opening 21 permits relative movement between the cam and sleeve 47, since the diameter of openings 21 is greater than the diameter of sleeve 47. The diameter of shaft 5 is smaller than the inner diameter of sleeve 47, so that the same are free to rotate at different speeds. When a carrier is raised or lowered, there is a relative translatory movement between coupling rod 46 and cams 20 with cutouts 22, but no relative movement between sleeve 47 and coupling rod 46.

While one or several selected cams are held in operative positions cooperating with cam followers 35, 36, the corresponding carrier is locked by the associated catch member, and when the arresting plate 126 is shifted, the arrested carriers are released and are urged by spring 33 downward to the normal position in which cams 18 and 19 are spaced from the corresponding cam followers 35 and 36 and inoperative.

The oscillatory movement of cam follower 35 about shaft 39 is transmitted through members 55, 54, 56 to shaft 53 which performs an oscillatory movement and

oscillates the arm 57 on which pin 63 of arm 61 slides so that link 80 whose projection 84 slides on face 62 of arm 61 is oscillated and causes the needle bar assembly to oscillate accordingly corresponding to the cam track pattern of a selected cam 18. The needle bar assembly is shifted to the left as viewed in FIG. 2 by the cam controlled motion of link 80, while spring 86 urges the needle to the right as viewed in FIG. 2. The amplitude of the stitch can be regulated by handle 117, as described with reference to FIG. 4, since handle 117 controls through arm 74 link 73 which displaces amplitude regulating plate 67 which turns about pin 70, and changes the position of pin 71 resulting in a variation of the stitch amplitude.

When knob 116 is operated, arm 78 is turned and moves link 65 whereby the journal 64 of member 61 is shifted resulting in a variation of the field position of the needle bar assembly so that the same can be operated along a central line, or in positions displaced to the left or right as viewed in FIG. 2.

If it is desired to influence the shape of the ornamental stitch by a variation of the feeding speed, a handle knob 28 of a carrier 23 supporting a cam 19 is raised so that a cam 19 is shifted to an operative higher position cooperating with cam follower 36 and oscillating the same. Arm 88 of cam follower 36 transmits the oscillatory movement through pin and roll 89 to arm 90, see FIG. 6 so that the feed regulation arm 91 is correspondingly oscillated by shaft 92 which is secured to arms 90 and 91. The oscillation of arm 91 causes an oscillation of feed regulator 98 through rod 95 against the action of spring 105. Such oscillation influences the reciprocating motion of feed member 104 under control of feed cam 103 since feed member 104 is supported by a slide 94' in a guideway of feed regulator 98.

Control knob 107 is first turned to its maximum feed position so that feed regulation cam 110 is in a position permitting the oscillation of regulator 98 which is connected by link 112 to reversing button 111 and through cam 110 and pin 113 to control knob 107.

If knob 107 is placed in a position for zero feed, pin 113 is in a position in which the reversing link 112 prevents oscillation of regulator 98. In such a position, the pattern cams 19 have no influence on the feeding motion, and even if a cam 19 is placed in an operative position cooperating with cam follower 36, the reciprocation of arm 91 will be ineffective, and be taken up by the spring 97 which permits oscillation of arm 91 without transfer of the motion to rod 95 and regulator 98. However, the spring force of spring 97 is strong enough to permit oscillation of regulator 98 if the same is freely turnable in the position of dial 107 corresponding to maximum amplitude.

When a desired number of ornamental stitches has been made under control of one or several selected cams 18 or 19, the arresting plate 126 is shifted by operation of clearing knob 145 so that all arrested arms 26 and 27 of the carrier 23 are released and assume the normal positions under the control of spring 33. When the carriers 23 are in the lower positions, the respective cams 18 or 19 supported thereon are in a lower inoperative position spaced from the cam followers 35 and 36. Cam followers 35 and 36 abut the stop screw 43 under the action of spring 60, when all carriers are in the lower normal position, and consequently cam followers 35 and 36 are stopped and inoperative, and the machine can be operated for making straight seams, or plain zig-zag stitches.

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 ornamental sewing machines differing from the types described above.

While the invention has been illustrated and described as embodied in a cam selecting arrangement in which selected cams are individually moved to a position cooperating with a cam follower, 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 cam selecting arrangement comprising, in combination, a cam follower means; a set of rotary integral cams having endless cam tracks located opposite said cam follower means; and means for selectively and individually moving each of said cams in its entirety in direction transverse to its axis between an inoperative position, and an operative position cooperating with said cam follower means during rotation whereby said cam follower means is moved in accordance with the cam track of any cam in said operative position.

2. A cam selecting arrangement comprising, in combination, an elongated cam follower means; a set of integral cams mounted for rotation about an axis extending parallel to said elongated cam follower means and having endless cam tracks located opposite said cam follower means; drive means for rotating said cams; and means for selectively and individually moving each of said cams in its entirety in direction transverse to said axis between an inoperative position, and an operative position cooperating with said cam follower means during rotation whereby said cam follower means is moved in accordance with the cam track of any cam in said operative position.

3. A cam selecting arrangement comprising, in combination, a cam follower means; a set of integral cams having endless cam tracks located opposite said cam follower means; a set of carrier members respectively supporting said integral cams for movement; drive means for moving said cams on the respective carrier members; and supporting means supporting each of said carrier members for independent movement with the respective cam between a normal position in which the respective cam is spaced from said cam follower means and an actuated position in which the respective cam cooperates with said cam follower means for moving the same.

4. A cam selecting arrangement comprising, in combination, a cam follower means; a set of cams located opposite said cam follower means; a set of carrier members respectively supporting said cams for movement; drive means for moving said cams on the respective carrier members; supporting means supporting each of said carrier members for independent movement with the respective cam between a normal position in which the respective cam is spaced from said cam follower means and an actuated position in which the respective cam cooperates with said cam follower means for moving the same; and means for moving any selected carrier member to said actuated position whereby the cam supported on a selected carrier member in said actuated position moves said cam follower means.

5. A cam selecting arrangement comprising, in combination, a cam follower means; a set of cams located opposite said cam follower means; a set of carrier members respectively supporting said cams for rotary movement; drive means for rotating said cams on the respective carrier members; supporting means supporting each of said carrier members for independent movement with the respective cam between a normal position in which the respective cam is spaced from said cam follower means and an actuated position in which the respective cam cooperates with said cam follower means for oscillating the same; and means for moving any selected carrier member to said actuated position whereby the cam supported on a selected carrier member in said actuated position oscillates said cam follower means.

6. A cam selecting arrangement comprising, in combination, a cam follower means; a set of cams located opposite said cam follower means; a set of carrier members respectively supporting said cams for rotary movement; drive means for rotating said cams on the respective carrier members; supporting means supporting each of said carrier members for independent movement with the respective cam between a normal position in which the respective cam is spaced from said cam follower means and an actuated position in which the respective cam cooperates with said cam follower means for oscillating the same; means for moving any selected carrier member to said actuated position whereby the cam supported on a selected carrier member in said actuated position oscillates said cam follower means; arresting means for arresting each carrier member in said normal and actuated positions; biasing means urging said carrier members to said normal positions; and means for releasing said arresting means.

7. In an ornamental sewing machine, in combination, an assembly mounted for oscillatory movement; an elongated cam follower means mounted for oscillatory movement and operatively connected with said assembly for oscillating the same; a set of cams located opposite said cam follower means, said cams having different cam track patterns; a set of carrier members respectively supporting said cams for rotary movement about an axis extending parallel with said cam follower means; drive means for rotating said cams on the respective carrier members; and supporting means supporting each of said carrier members for independent movement with the respective cam between a normal position in which the respective cam is spaced from said cam follower means and an actuated position in which the respective cam cooperates with said cam follower means for oscillating the same and thereby said assembly; and manually operated means for moving any selected carrier member to said actuated position whereby said assembly is adapted to control ornamental stitches in accordance with the cam track pattern of a cam supported on a selected carrier member in said actuated position.

8. In an ornamental sewing machine, in combination, an assembly mounted for oscillatory movement; an elongated cam follower means mounted for oscillatory movement and operatively connected with said assembly for oscillating the same; a set of cams located opposite said cam follower means, each cam having a circular projection with a central opening, said cams having different cam track patterns; a set of carrier members respectively supporting said cams for rotary movement about an axis extending parallel with said cam follower means, each carrier member having a circular bearing opening receiving said circular projection; drive means for rotating said cams on the respective carrier members and including a coupling member passing through said central openings of said cams and being coupled with the same; supporting means supporting each of said carrier members for independent movement with the respective cam between a normal position in which the respective cam is spaced from said cam follower means and an actuated position in which the respective cam cooperates with said cam follower means for oscillating the same and thereby said assembly; and manually operated means for moving any selected carrier member to said actuated position whereby said assembly is adapted to control ornamental stitches in accordance with the cam track pattern of a cam supported on a selected carrier member in said actuated position.

9. In an ornamental sewing machine, in combination, a needle bar assembly mounted for oscillatory movement;

10. In an ornamental sewing machine, in combination, a needle bar assembly mounted for oscillatory movement;

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an elongated cam follower means mounted for oscillatory movement and operatively connected with said needle bar assembly for oscillating the same; a set of cams located opposite said cam follower means, each cam having a circular lateral projection with a central opening, said cams having different cam track patterns; a supporting shaft; a set of carrier members, each carrier member being supported on said supporting shaft for independent angular movement between a normal position and an actuated position, each carrier member having a circular bearing opening receiving said circular projection of one of said cams so that said cams are supported on said carrier members, respectively, for rotary movement about an axis extending parallel with said cam follower means, and so that each cam moves with the respective carrier member and is in an inoperative position when said carrier member is in said normal position, and is in an operative position cooperating with said cam follower means when said carrier member thereof is in said actuated position whereby said cam follower means and thereby said needle bar assembly are oscillated when a cam in said operative position is rotated; drive means including a coupling member passing through said central openings of said cams and being coupled with the same for rotation in such a manner as to permit movement of each cam between said inoperative and operative positions while said coupling member rotates said cams on the respective carrier members; and manually operated means for moving any selected carrier member to said actuated position whereby said needle bar assembly is adapted to control ornamental stitches in accordance with the cam track pattern of a cam supported on a selected carrier member in said actuated position.

10. In an ornamental sewing machine, in combination, a needle bar assembly mounted for oscillatory movement; an elongated cam follower means mounted for oscillatory movement and operatively connected with said needle bar assembly for oscillating the same; a set of cams located opposite said cam follower means, each cam having a circular lateral projection with a central opening, each central opening having a radial cutout, said cams having different cam track patterns; a supporting shaft; a set of carrier members, each carrier member being supported on said supporting shaft for independent angular movement between a normal position and an actuated position, each carrier member having a circular bearing opening receiving said circular projection of one of said cams so that said cams are supported on said carrier members, respectively, for rotary movement about an axis extending parallel with said cam follower means, and so that each cam moves with the respective carrier member and is in an inoperative position when said carrier member is in said normal position, and is in an operative position cooperating with said cam follower means when said carrier member thereof is in said actuated position whereby said cam follower means and thereby said needle bar assembly are oscillated when a cam in said operative position is rotated; drive means including a coupling rod passing through said radial cutouts and being coupled with said cams for rotation while sliding in said cutout during movement of each cam between said inoperative and operative positions while said coupling rod rotates said cams on the respective carrier members; and manually operated means for moving any selected carrier member to said actuated position whereby said needle bar assembly is adapted to control ornamental stitches in accordance with the cam track pattern of a cam supported on a selected carrier member in said actuated position.

11. A cam selecting arrangement as set forth in claim 10, wherein said drive means include a main shaft passing through said central openings and having a diameter smaller than the same, a sleeve surrounding said main shaft and passing through said central opening, a gear fixed to one end of said sleeve, a disk fixed to the other

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end of said sleeve, said gear and disk being located at opposite ends of said set of cams, and transmission means connecting said gear with said main shaft, said coupling rod being supported on said gear and said disk and extending parallel with said main shaft and sleeve.

12. In an ornamental sewing machine, in combination, an assembly mounted for oscillatory movement; an elongated cam follower means mounted for oscillatory movement and operatively connected with said assembly for oscillating the same; a set of cams located opposite said cam follower means, said cams having different cam track patterns; a set of carrier members respectively supporting said cams for rotary movement about an axis extending parallel with said cam follower means; drive means for rotating said cams on the respective carrier members; and supporting means supporting each of said carrier members for independent movement with the respective cam between a normal position in which the respective cam is spaced from said cam follower means and an actuated position in which the respective cam cooperates with said cam follower means for oscillating the same and thereby said assembly; and manually operated means including a handle knob secured to each carrier member for moving any selected carrier member to said actuated position whereby said assembly is adapted to control ornamental stitches in accordance with the cam track pattern of a cam supported on a selected carrier member in said actuated position.

13. In an ornamental sewing machine, in combination, an assembly mounted for oscillatory movement; an elongated cam follower means mounted for oscillatory movement and operatively connected with said assembly for oscillating the same; a set of cams located opposite said cam follower means, said cams having different cam track patterns; a set of carrier members respectively supporting said cams for rotary movement about an axis extending parallel with said cam follower means; drive means for rotating said cams on the respective carrier members; and supporting means supporting each of said carrier members for independent movement with the respective cam between a normal position in which the respective cam is spaced from said cam follower means and an actuated position in which the respective cam cooperates with said cam follower means for oscillating the same and thereby said assembly; manually operated means for moving any selected carrier member to said actuated position whereby said assembly is adapted to control ornamental stitches in accordance with the cam track pattern of a cam supported on a selected carrier member in said actuated position; arresting means for arresting each carrier member in said normal and actuated positions; clearing means for releasing carrier members arrested in said actuated position; and biasing means urging said carrier members to said normal position.

14. A cam selecting arrangement as set forth in claim 13 wherein each of said carrier members has a projecting arm with a handle knob; and wherein said arresting means includes an arresting plate, a plurality of spring loaded catch members mounted on said plate and respectively cooperating with said arms for arresting the same; and wherein said clearing means include a manually operated member for shifting said arresting plate whereby said catch members are moved to a position releasing arrested arms of said carrier members.

15. A cam selecting arrangement as set forth in claim 14, wherein said arms are staggered and the arms of alternating carrier members are located in two parallel rows.

16. In an ornamental sewing machine, in combination, an assembly mounted for oscillatory movement; an elongated cam follower means mounted for oscillatory movement about an axis and operatively connected with said assembly for oscillating the same; a set of cams located opposite said cam follower means, said cams having different cam track patterns; a set of carrier members re-

spectively supporting said cams for rotary movement about an axis extending parallel with said axis of said cam follower means; drive means for rotating said cams on the respective carrier members; supporting means supporting each of said carrier members for independent movement with the respective cam about an axis parallel to said axis of said cam follower means between a normal position in which the respective cam is spaced from said cam follower means and an actuated position in which the respective cam cooperating with said cam follower means for oscillating the same and thereby said assembly; and manually operated means for moving any selected carrier member to said actuated position whereby said assembly is adapted to control ornamental stitches in accordance with the cam track pattern of a cam supported on a selected carrier member in said actuated position.

17. In an ornamental sewing machine, in combination, a needle bar assembly mounted for oscillatory movement; an elongated cam follower means mounted for oscillatory movement about an axis and operatively connected with said needle bar assembly for oscillating the same; a set of cams located opposite said cam follower means, each cam having a circular lateral projection with a central opening, said cams having different cam track patterns; a supporting shaft having an axis parallel with said axis of said cam follower means; a set of carrier members, each carrier member being supported on said supporting shaft for independent angular movement between a normal position and an actuated position, each carrier member having a circular bearing opening receiving said circular projection of one of said cams so that said cams are supported on said carrier members, respectively, for rotary movement about an axis extending parallel with said axis of said cam follower means, and so that each cam moves with the respective carrier member and is in an inoperative position when said carrier member is in said normal position, and is in an operative position cooperating with said cam follower means when said carrier member thereof is in said actuated position whereby said cam follower means and thereby said needle bar assembly are oscillated when a cam in said operative position is rotated; drive means including a coupling member passing through said central openings of said cams and being coupled with the same for rotation in such a manner as to permit movement of each cam between said inoperative and operative positions while said coupling member rotates said cams on the respective carrier members; and manually operated means for moving any selected carrier member to said actuated position whereby said needle bar assembly is adapted to control ornamental stitches in accordance with the cam track pattern of a cam supported on a selected carrier member in said actuated position.

18. In an ornamental sewing machine, in combination, a needle bar assembly mounted for oscillatory movement; an elongated cam follower means mounted for oscillatory movement about an axis and operatively connected with said needle bar assembly for oscillating the same; a set of cams located opposite said cam follower means, each cam having a circular lateral projection with a central opening, said cams having different cam track patterns, a supporting shaft having an axis parallel with said axis of said cam follower means; a set of carrier members, each carrier member being supported on said supporting shaft for independent angular movement between a normal position and an actuated position, each carrier member having a circular bearing opening receiving said circular projection of one of said cams so that said cams are supported on said carrier members, respectively, for rotary movement about an axis extending parallel with said axis of said cam follower means, and so that each cam moves with the respective carrier member and is in an inoperative position when said carrier member is in said normal position, and is in an operative position cooperating with said cam follower means when said carrier member thereof is in said actuated position whereby

said cam follower means and thereby said needle bar assembly are oscillated when a cam in said operative position is rotated; drive means including a coupling member passing through said central openings of said cams and being coupled with the same for rotation in such a manner as to permit movement of each between said inoperative and operative positions while said coupling member rotates said cams on the respective carrier members; manually operated means including a handle knob secured to each carrier member for moving any selected carrier member to said actuated position whereby said needle bar assembly is adapted to control ornamental stitches in accordance with the cam track pattern of a cam supported on a selected carrier member in said actuated position; arresting means for arresting each carrier member in said normal and actuated positions; clearing means for releasing carrier members arrested in said actuated position; and biasing means urging said carrier members to said normal position.

19. In an ornamental sewing machine, in combination, a needle bar assembly mounted for oscillatory movement; a feeding assembly mounted for oscillatory movement; a first cam follower means mounted for oscillatory movement and operatively connected with said needle bar assembly for oscillating the same; a second elongated cam follower means mounted for oscillatory movement and operatively connected with said feeding assembly for oscillating the same; first and second sets of cams respectively located opposite said first and second cam follower means, said cams having different cam track patterns; a set of carrier members, each carrier member supporting one of said cams for rotary movement about an axis extending parallel with said cam follower means; drive means for rotating said cams on the respective carrier members; and supporting means supporting each of said carrier members for independent movement with the respective cam between a normal position in which the respective cam is spaced from the associated cam follower means and inoperative, and an actuated position in which the respective cam cooperates with the associated cam follower means for oscillating the same whereby an operative first cam causes oscillation of said needle bar assembly, and a selected second cam causes oscillation of said feed assembly; and manually operated means for moving selected carrier members to said actuated positions so that a selected first cam and a selected second cam are moved to operative positions cooperating with said first and second cam follower means, respectively whereby said needle bar assembly and said feeding assembly are oscillated to control the shape of ornamental stitches in accordance with the cam track patterns of first and second cams supported on selected carrier members in said actuated position.

20. An ornamental sewing machine as set forth in claim 19 and including a linkage means for connecting said needle bar assembly with said first cam follower means, and control means for adjusting said linkage means in such a manner that the oscillation amplitude and the field position of said needle bar assembly can be adjusted, and including another linkage means connecting said second cam follower means with said feeding assembly, and including manually operated means controlling said other linkage means for adjusting the same in such a manner that the feeding speed is varied, and the direction of the feeding movement can be reversed.

21. In an ornamental sewing machine, in combination, a needle bar assembly mounted for oscillating movement; a main shaft operatively connected to said needle bar assembly for reciprocating the needle bar thereof; an elongated cam follower means mounted for oscillating movement about an axis substantially parallel to said main shaft and operatively connected to said assembly for oscillating the same; a set of cams located with clearance about said main shaft, said cams having different cam track patterns; means connected said cams to said

main shaft for rotation therewith; and means for selectively and individually moving each of said cams in its entirety in direction transverse to the axis of said main shaft between an inoperative position, and an operative position cooperating with said cam follower means whereby said assembly is adapted to control ornamental stitches in accordance with the cam track pattern of a cam moved into said operative position.

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