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[54] **INTEGRATED SEWING MACHINE CONTROLS**

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[51] **Int. Cl.** **D05b 3/00**

[58] **Field of Search** ..... 112/158 R, 158 A, 158 D, 112/121.11, 121.12

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[57] **ABSTRACT**

A control arrangement for sewing machine is disclosed including information carriers dictating repetitive operational patterns for the sewing machine stitch-forming instrumentalities which may be rendered selectively effective, and means rendered effective simultaneously with the selection of each information carrier for shifting the control mechanisms of the sewing machine into discrete positions so coordinated with the selected pattern as to ready the sewing machine for stitching a predetermined form of each pattern of stitches.

12 Claims, 6 Drawing Figures

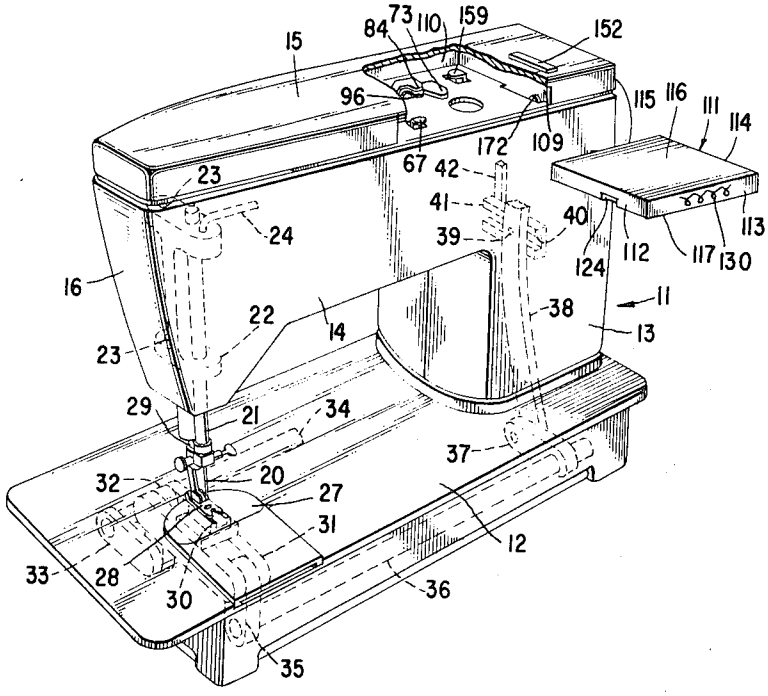


Fig. 1

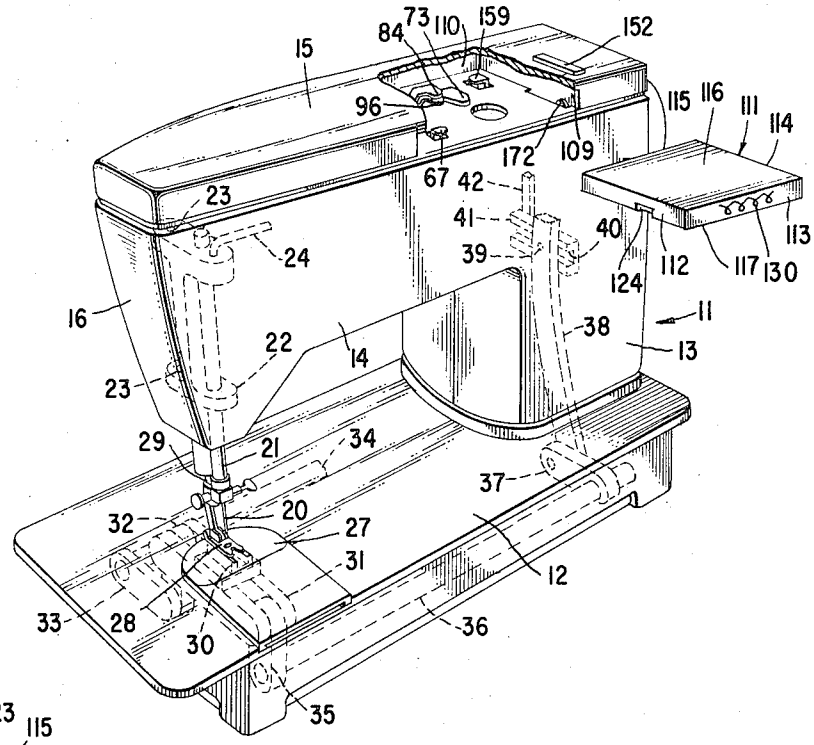


Fig. 2

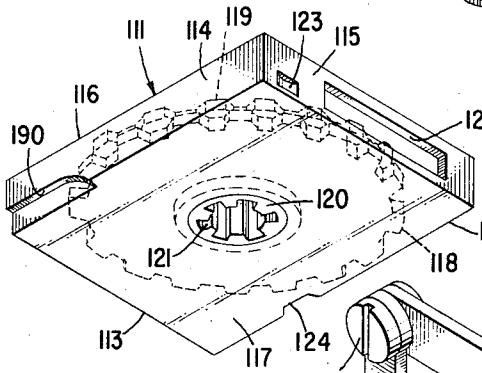
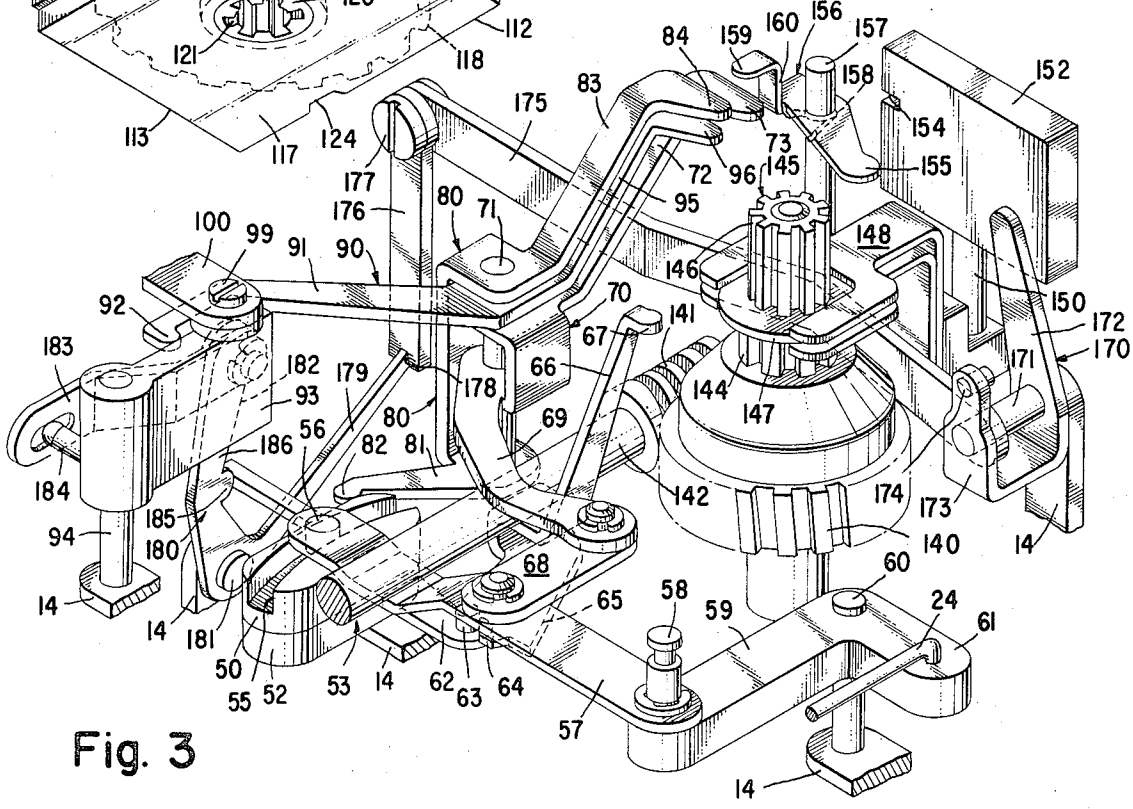


Fig. 3



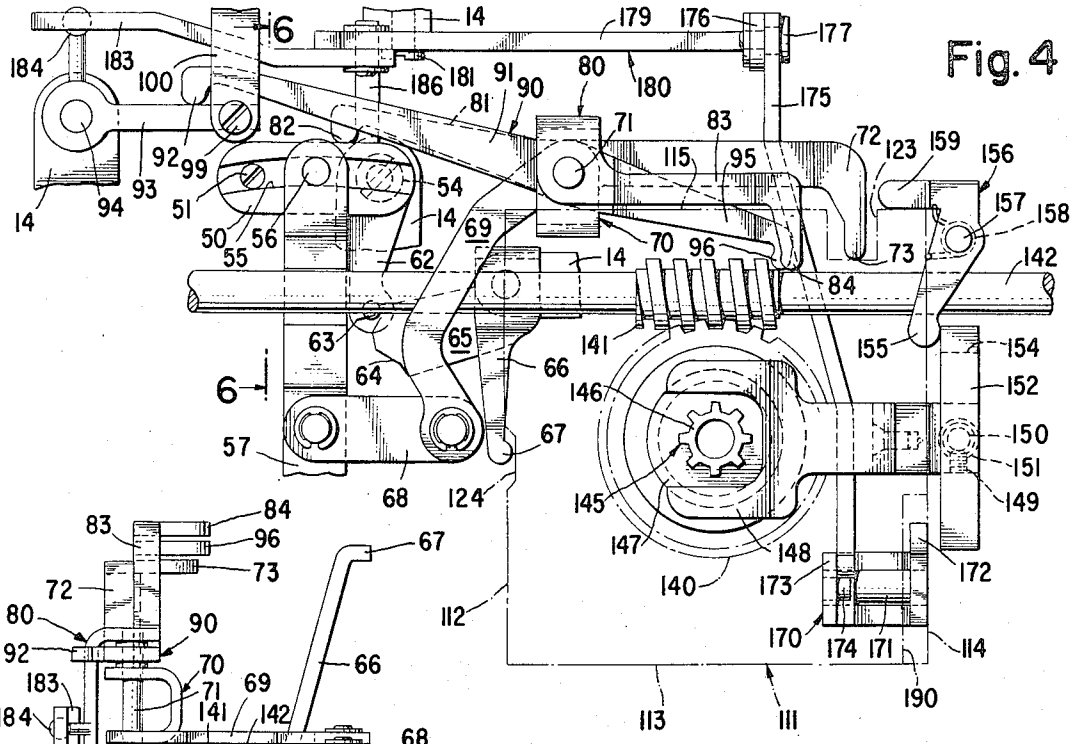


Fig. 4

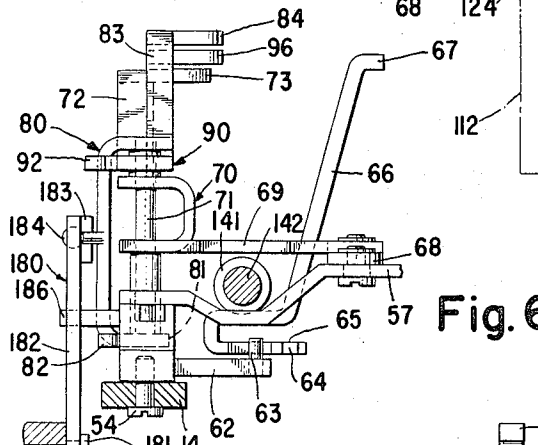


Fig. 6

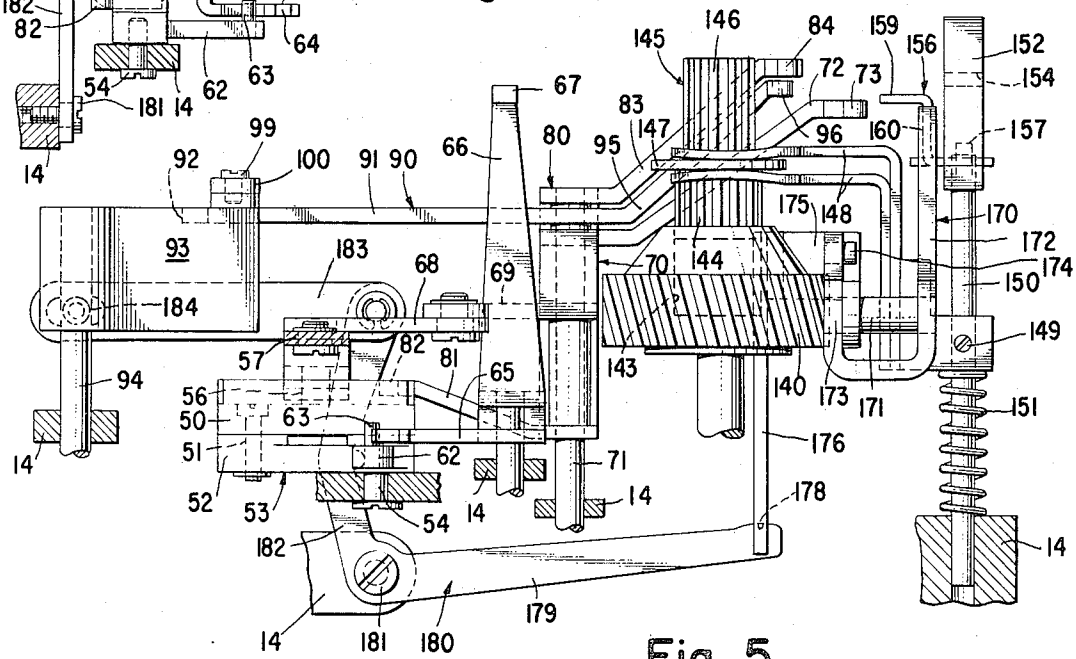


Fig. 5

INTEGRATED SEWING MACHINE CONTROLS

BACKGROUND OF THE INVENTION

Known information carriers for dictating repetitive stitch patterns for sewing machines produce stitching which can be varied radically in appearance depending upon the settings of a number of the sewing machine controls. Where the information carrier includes a representation of the appearance of the resulting stitch group, considerable confusion can arise because simply selecting that particular information carrier will seldom result in the production of the depicted stitch pattern. Usually the operator is required to adjust several of the sewing machine controls, such as stitch length, bight and field of zigzag stitching, etc. as a separate and subsequent adjustment in order to maintain the depicted stitch pattern. For this reason, later exact duplication of a particular stitch pattern has been difficult in prior art sewing machines.

BRIEF SUMMARY OF THE INVENTION

It is an object of this invention to provide a sewing machine which includes selectable patterning means each associated with setting devices for the sewing machine controls which become effective simultaneously with selection of the patterning means to provide for sewing of preselected forms of the different stitch patterns which are available. The object of the invention is attained by the provision of selectable programming units which include, in addition to pattern information carriers, associated control cam means arranged to shift the sewing machine control mechanisms into preselected positions of adjustment.

In a preferred embodiment of this invention the programming unit takes the form of a cassette insertable into the sewing machine with one or more pattern cams journalled for rotation in the cassette. Either included as a rotatable cam in the cassette, or formed as stationary cam surfaces on the cassette body, are control cam means effective when the cassette is inserted into the sewing machine for setting the various sewing machine controls into discrete positions of adjustment. With this arrangement a representation of the resulting stitch configuration may be placed on the cassette, and simply by inserting the cassette into the sewing machine, a stitch pattern matching that shown in the representation will be produced by the sewing machine.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a sewing machine with a programming unit of this invention illustrated in readiness for insertion into the sewing machine,

FIG. 2 is an enlarged bottom perspective view of a programming unit of this invention,

FIG. 3 is an enlarged perspective view of the control linkages and associated cam followers of the sewing machine together with the pattern cam drive for a programming unit of this invention but with the programming unit removed,

FIG. 4 is a top plan view of the parts illustrated in FIG. 3, and includes in phantom lines a representation of the programming unit inserted in operative position,

FIG. 5 is a front elevational view of the parts illustrated in FIG. 4, and

FIG. 6 is a cross-sectional view taken substantially along line 6—6 of FIG. 4.

In FIG. 1 there is illustrated a sewing machine indicated generally at 11 and including a work supporting bed 12 from which rises a standard 13 supporting a bracket arm 14 which overhangs the bed and is surmounted by a top cover 15. The bracket arm terminates at the free extremity in a sewing head 16 in which is mounted portions of the stitch-forming instrumentalities of the sewing machine including a needle 20 which cooperates in the formation of stitches with a loop taker (not shown) in the bed. The needle is carried by a needle bar 21 endwise reciprocable in a needle gate 22 which is pivoted on trunnions 23 in the sewing head for lateral jogging movements which give rise to zigzag stitch formation. A link 24 pivotally connected to the needle bar gate serves to impart lateral jogging movement thereto.

Work fabrics are supported against the thrust of needle penetration by a throat plate 27 on the bed and the work is held on the throat plate by a presser foot 28 carried by a presser bar 29 slidable in the sewing head 16. Arranged beneath the throat plate and operating through slots therein is a feed dog 30 carried by a feed bar 31. By means of a pivoted link 32 the feed bar is connected to a feed lift rock arm 33 extending from a feed lift rock shaft 34 journaled in the bed. The other end of the feed bar is pivotally connected to a rock arm 35 carried by a feed advance rock shaft 36 journaled in the bed. The rock arm 37 on the feed advance rock shaft beneath the standard is pivotally connected to an oscillating pitman 38 which carries a guide pin 39 constrained within a guide slot 40 formed in a feed regulating block 41 which is pivoted to the machine frame. A link 42 connected to the feed regulating block 41 is used to transmit shifting movement to the feed regulating block to control the direction and magnitude of stitch length.

As thus far described, the needle jogging mechanism and the work feeding mechanism constitute conventional stitch forming instrumentalities in sewing machines which may be influenced by pattern mechanism for the production of recurring patterns of stitches. These machanisms may also be controlled in their entirety by settable regulators as in most usually the case with the work feeding mechanism. The patterning mechanism may also include settable regulators for influencing one or more parameters of a programmed pattern of stitches as is most usually the case with the needle jogging mechanism.

With reference to FIGS. 3 to 6, needle jogging movements are derived from an oscillating block 50 pivoted to swing about a pin 51 which is carried in one arm 52 of a carrier lever 53 pivoted on a fulcrum pin 54 carried in the machine frame. A radial slot 55 in the block 50 embraces a slide pin 56 carried by an arm 57 which is pivotally mounted on a pin 58 in one arm 59 of a bell crank lever pivoted on a fulcrum pin 60 in the machine frame and having a second arm 61 to which the link 24 from the needle bar gate is pivoted. The other arm 62 of the carrier lever 53 carries a pin 63 which tracks a cam surface 64 formed in one arm 65 of a regulating bell crank lever having a second arm 66 terminating in a follower finger 67 for influencing the feed or neutral position of needle vibration in zigzag stitching. It is this control which influences the position left, right, or cen-

ter to which the zigzag stitches of diminishing bight will gravitate.

The arm **57** is connected by a link **68** to a one arm **69** of a bell crank lever **70** fulcrummed on a pin **71** in the sewing machine frame. The other arm **72** of the bell crank lever **70** is formed with a cam follower finger **73.** Swinging of the lever arm **57** in response to movements of the bell crank lever **70** will shift the slid pin **56** along the radial slot **55** in the block **50** thereby changing the width or bight of the zigzag stitches.

For oscillating the block **50** a bell crank lever **80** fulcrummed on the pin **71** is provided. The bell crank lever **80** is formed with one arm **81** terminating in a driving tang **82** engaging the slide block **50** and another arm **83** terminating in a cam follower finger **84.**

A bell crank lever **90** for influencing the work feed motion is also fulcrummed on the pin **71** and is formed with one arm **91** terminating in a tang **92** abutting a swinging frame **93** pivoted on a fulcrum pin **94** in the sewing machine frame. The ohter arm **95** of the lever **90** is formed with a cam follower finger **96.** Pivotally connected by a pin **99** to the swinging frame **93** is a link **100** which may be operatively connected to the link **42** which influences the feed regulating block to determine the stitch length and direction of work feed.

It is conventional in present day sewing machines for the needle jogging motion and for feed regulation to be varied under influence of a pattern cam means to produce predetermined recurring stitch patterns. In the above described mechanisms the follower finger **84** for influencing needle jogging and the follower finger **96** for feed regulation are those which would conventionally be adapted to respond to a pattern cam means. It is also known in sewing machine technology to provide for setting means by which to regulate the bight and needle position of zigzag stitching as is provided by the follower fingers **73** and **67,** respectively, of the mechanism described hereinabove. These roles for the follower fingers may, however, be changed, as for instance, the feed follower finger **96** may be set in a fixed position of adjustment when sewing patterns of stitches in which only the needle jogging is varied by a pattern means.

By way of example in the following description, however, the follower fingers **84** and **96** will respond to pattern cam information and the follower fingers **67** and **73** will be set by regulating cam means which remain stationary during sewing machine operation.

Referring to FIG. **1,** the sewing machine top cover **15** is formed with a front aperture **109** opening onto a cavity **110** shaped to admit insertion of a cassette **111** which takes the form of a flat box with sidewalls **112, 113, 114,** and **115,** a top wall **116** and a bottom wall **117.** Journaled within the cassette are a pair of pattern cams **118** and **119** fast on a common hub **120** formed with a splined axial bore **121.** The pattern cams **118** and **119** are accessible to the follower fingers **84** and **96,** respectively, through an access opening **122** in the sidewall **115** of the cassette.

Also formed in the sidewall **115** of the cassette is a control cam surface **123** which cooperates with follower finger **73,** while a control cam notch **124** is formed in the cassette sidewall **112** for cooperation with the follower finger **67.**

When the cassette is in place in the sewing machine cavity **110** the pattern cams **118** and **119** will engage the follower fingers **84** and **96,** respectively, to impart pattern information thereto, and the control cam surfaces **123** and **124** will engage the followers **73** and **67,** respectively. The cassette may carry, for instance on the sidewall **113,** a representation **130** of a pattern of stitches that the user may expect to sew when the cassette is utilized. The pattern cams **118** and **119** and the control cam surfaces **123** and **124** are preferably so interrelated one to the other that the parameters necessary for the production of the depicted stitch pattern in the representation **130** will be provided without requiring any further adjustments to the control instrumentalities of the sewing machine.

For removing and inserting of cassettes, a retractable drive is provided for the pattern cams **118** and **119.** To this end a worm wheel **140** is provided journaled vertically in the machine frame and meshing with a worm **141** on a drive shaft **142** in the bracket arm. The worm wheel is formed with an axial bore **143** which is splined and slidably accommodates a spline **144** formed on the lower end of a drive stud **145.** A smaller spline **146** is formed at the upper end of the drive stud and between the splines a flange **147** is formed. The flange is loosely embraced by a bifurcate holder **148** secured by a set screw **149** to a push rod **150** which is slidable vertically in the machine frame and urged upwardly by a coil spring **151.** A pushbutton **152** affixed to the top of the push rod protrudes through the top cover **15.**

The pushbuttom **152** is formed with a latch notch **154** in one side cooperable with a latch finger **155** carried by a two-armed lever **156** journaled on a pivot stud **157** in the machine frame. A coil spring **158** biases the latch finger **155** into the notch **154** to retain the pushbutton depressed and with it the splined drive stud **145.** In this latch depressed position, the small spline **146** will be held beneath the level of the pattern cam bushing **120** of a cassette **111** inserted into the sewing machine cavity **110.**

A finger **159** formed on the upper arm **160** of the two-armed lever **156** is disposed in the path of the cassette sidewall **115** such that the pushbutton **152** and with it the drive stud **145** will be released when the cassette reaches fully inserted position in the sewing machine cavity **110.** The coil spring **151** will then cause the small spline **146** to be shifted into engagement with the splined axial bore **121** in the pattern cam hub.

To facilitate insertion of the cassette into the cavity **110** of the sewing machine frame without interference by the various followers, a follower throw-out mechanism is provided. As shown in FIG. **3,** a two-armed throw-out actuating lever **170** is pivoted on a pin **171** carried in the machine frame. One arm **172** of the lever **170** extends upwardly into the path of cassette movement into the cavity **110** and will be engaged by the cassette and held depressed thereby during insertion of the cassette. The second arm **173** of the lever **170** carries a lateral pin **174** adapted to overly and depress an elongate lever **175** which is also fulcrummed on the pin **171.** A depending link **176** pivoted as at **177** to the elongated lever **175** is slotted as at **178** and embraces one arm **179** of a bell crank **180** fulcrummed on a pin **181** in the machine frame. The other arm **182** of the bell crank **180** is pivotally connected to a connecting link **183** which embraces a spherically headed pin **184** projecting from the swinging frame **93** of the feed regulating linkage. The bell crank lever arm **182** also includes a finger **185** extending into engagement with an arm **186** projecting from the block **50** of the needle jog-

ging mechanism. When cassette insertion is initiated, therefore, the mechanisms influenced by the cam followers **84** and **96** will be shifted into retracted positions so that any resistance which these followers might offer to cassette insertion will be removed.

The cassette sidewall **114** is formed near the trailing edge with a recess **190** which accommodates the throw-out lever arm **172** when the cassette reaches fully inserted position in the sewing machine to release the follower throw-out mechanism and reestablish effectiveness of the pattern cam followers. When the cassette is removed, the throw-out actuating lever **170** is free to turn in the reverse direction without restraint by the throw-out mechanism.

It will be understood that a wide variety of instrumentalities other than those discussed in the above described preferred embodiment may be influenced by the pattern cams and control cams of a programming unit in accordance with this invention. It is also pointed out that the principles of this invention may be applied as well to a wide variety of forms of selectable programming units other than the cassette discussed in the preferred embodiment described herein.

Having set forth the nature of this invention, what is claimed herein is:

1. In a sewing machine having a plurality of controllable devices operating in concert to produce stitches, means for regulating the pattern of stitches produced by operation of the sewing machine comprising selectable programming units, each programming unit including a pattern cam adapted to be driven during operation of said sewing machine, and a control cam individual to the pattern cam of said unit adapted to shift only incident to the selection of programming units and to remain stationary during operation of said sewing machine, control linkages operatively associated one with each of said controllable devices and each including a cam follower element arranged to track one of said cams of a selected programming unit.

2. In a sewing machine as set forth in claim **1** in which said selectable programming units each includes a cassette, said pattern cam adapted to be driven during operation of said sewing machine comprising a cam disk journaled in said cassette, and said control cam adapted to remain stationary during operation of said sewing machine comprising stationary cam surfaces formed on said cassette.

3. In a sewing machine as set forth in claim **2** in which a separable drive is provided between said sewing machine and said pattern cam, and in which an operator influenced control member is provided accessible exteriorly of said sewing machine for selectively separating said drive.

4. In a sewing machine as set forth in claim **3** in which said programming units are selectable by insertion of a selected cassette into a cavity formed in said sewing machine, in which said separable drive comprises a splined drive shaft shiftable axially into and out of said cassette accommodating cavity for establishing said drive between said sewing machine and said pattern cam in said cassette.

5. In a sewing machine as set forth in claim **4** including means for retracting said follower elements of said sewing machine during insertion of a cassette into said cassette accommodating cavity in said sewing machine.

6. In a sewing machine having stitch-forming instrumentalities, and regulators for influencing said stitch-forming instrumentalities, a plurality of stitch patterning means, operator influenced pattern selecting mechanism effective to render a selected one of said stitch patterning means effective, and setting devices for said sewing machine regulators operated by said pattern selecting mechanism for establishing a predetermined individual setting of said regulators corresponding to each one of said stitch patterning means.

7. In a sewing machine having stitch-forming instrumentalities, and regulators for influencing and stitch-forming instrumentalities, a plurality of stitch patterning means, operator influenced pattern selecting mechanism effective to render a selected one of said stitch patterning means effective, means associated with said pattern selecting mechanism for displaying a representation of the appearance of said selected stitch pattern, and setting devices for said sewing machine regulators operated by said pattern selecting mechanism for establishing that setting of said regulators corresponding to each of said stitch patterning means which will result in the formation of a pattern of stitches having the appearance displayed by said representation upon operation of said sewing machine.

8. In a sewing machine as set forth in claim **7** in which said pattern selecting mechanism comprises a cassette having a body portion, in which said stitch patterning means comprises a pattern cam journaled in said cassette body, in which said representation of the apearance of each selected stitch pattern comprises indicia displayed exteriorly on said cassette body.

9. An exchangeable stitch programming unit for a sewing machine of the type including a plurality of individual settable stitch influencing regulators, said stitch programming unit including a body portion formed with guide means facilitating insertion thereof into a predetermined position in a sewing machine, first control means carried on said programming unit and effective to establish a recurring pattern of control setting for at least one of the sewing machine stitch influencing regulators when said programming unit occupies said predetermined position in a sewing machine, and second control means carried on said programming unit effective to establish a fixed control setting for at least one of the sewing machine stitch influencing regulators when said programming unit occupies said predetermined position in said sewing machine.

10. An exchangeable stitch programming unit as set forth in claim **9** in which said body portion includes a hollow cassette, in which said first control means effective to establish a recurring pattern of control settings comprises a cam disk journaled in said hollow cassette and accessible through an access opening therein and in which said second control means comprises cam surfaces formed on said cassette.

11. An exchangeable stitch programming unit as set forth in claim **9** in which a representation of the appearance of the selected stitch pattern influenced by each stitch programming unit is carried exteriorly on said body portion of said stitch programming unit.

12. In a sewing machine having a plurality of controllable devices operating in concert to produce stitches, means for regulating the pattern of stitches produced by operation of the sewing machine comprising selectable programming units, each programming unit including a pattern cam adapted to be driven during

operation of said sewing machine, and an associated control cam adapted to remain stationary during operation of said sewing machine, control linkages operatively associated one with each of said controllable devices and each including a cam follower element arranged to track one of said cams of a selected programming unit, and means for selecting programming units in said sewing machine simultaneously to orient the pattern and control cams of said selected programming unit into position to be tracked by said cam follower elements.

* * * * *