Oct. 7, 1958 C. J. M. BENINK ET AL 2,854,935

AUTOMATIC SHIFTING MECHANISM FOR SEWING MACHINES ADAPTED FOR EMBROIDERY WORK

Filed Nov. 7, 1955 4 Sheets-Sheet 1

Fig. 1

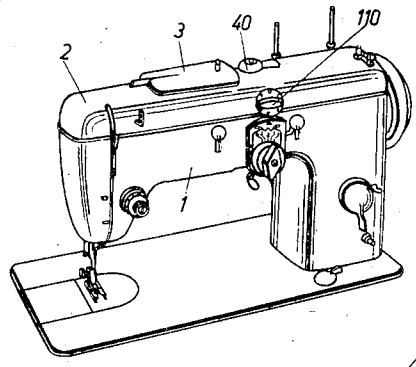

Fig. 10

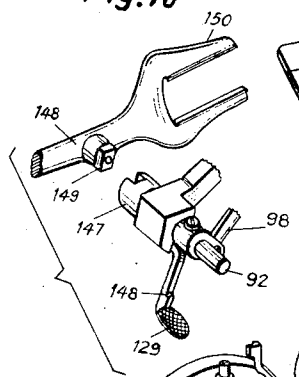

Fig. 11

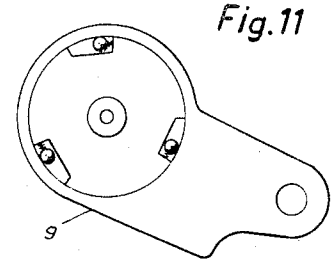

Fig. 2

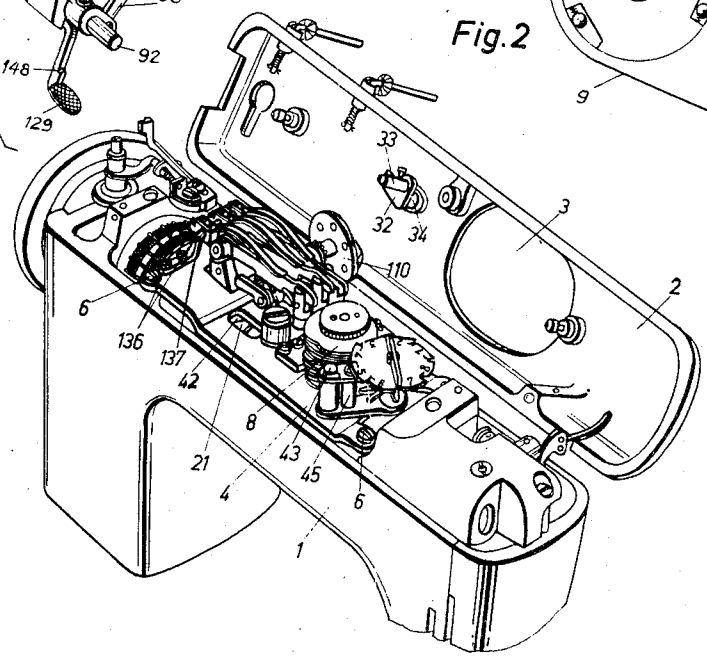

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Fig. 3

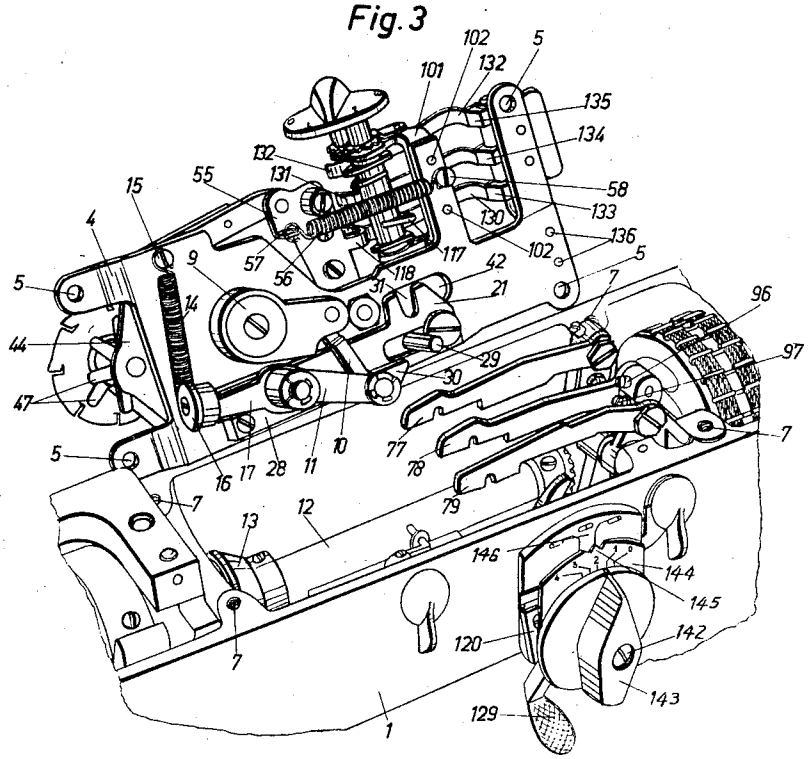

Fig. 4

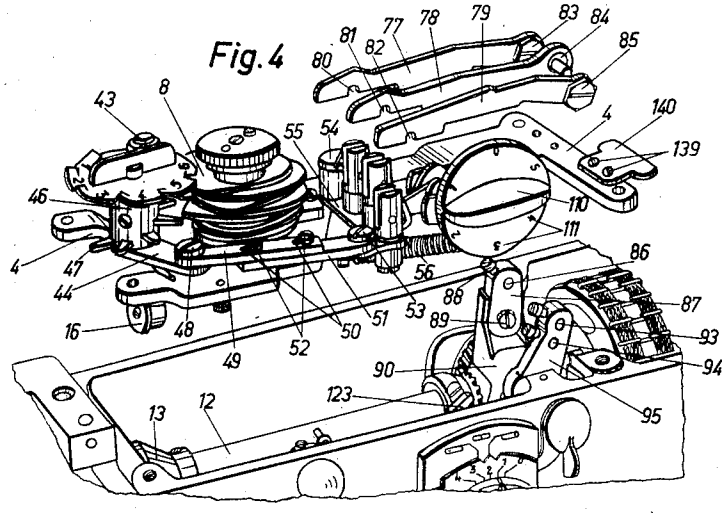

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Fig.5

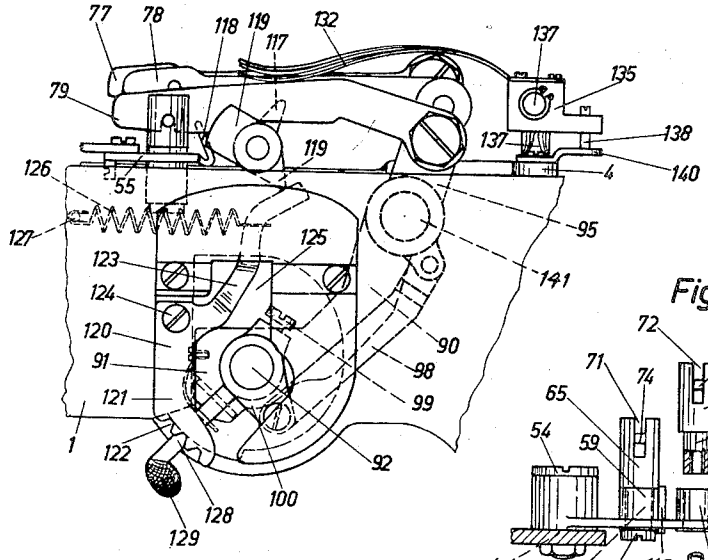


Fig.6

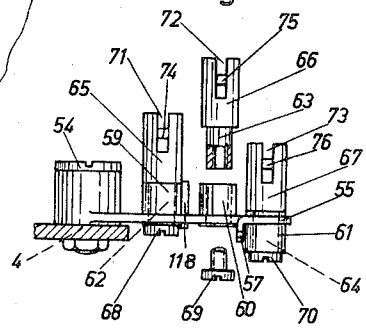


Fig.7

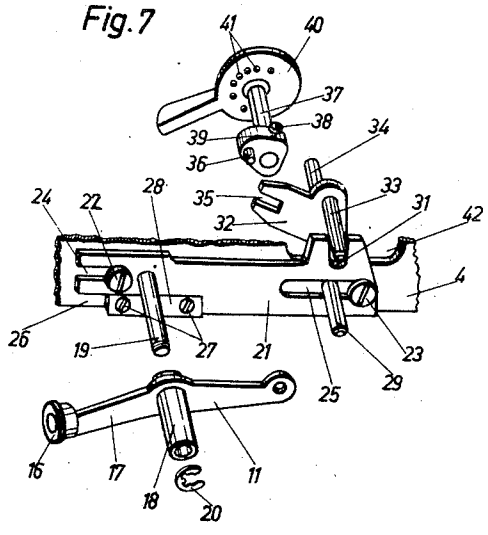
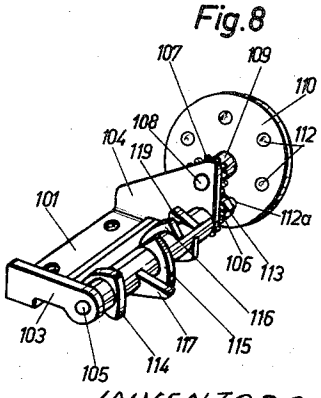


Fig.8



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4 Sheets-Sheet 4

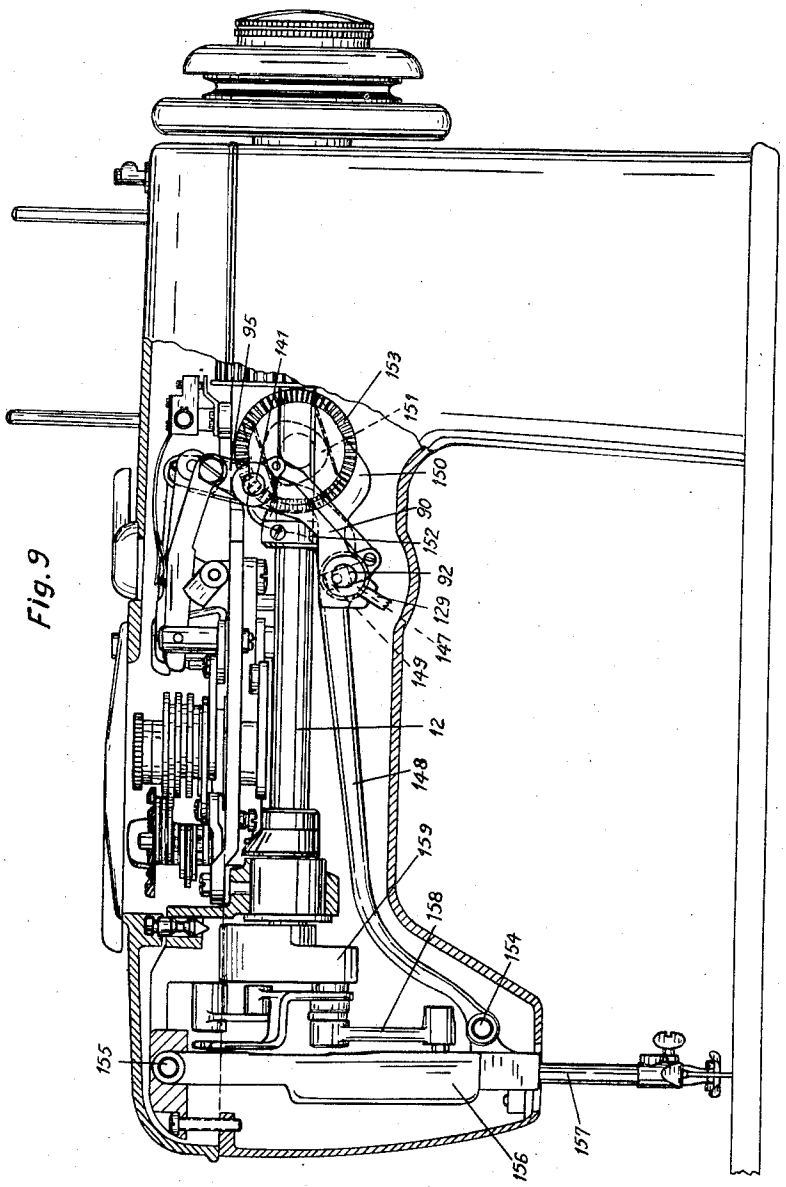

Fig. 9

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2,854,935

AUTOMATIC SHIFTING MECHANISM FOR SEWING MACHINES ADAPTED FOR EMBROIDERY WORK

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Application November 7, 1955, Serial No. 545,482

Claims priority, application Germany November 9, 1954

11 Claims. (Cl. 112—158)

This invention relates to a shifting and guiding mechanism for zig zag sewing machines having a control device which permits the adjustment of the stitch location and of the stitch width separately as well as simultaneously for the purpose of producing a plurality of different stitch designs from a design disk.

In a known arrangement this is achieved in that the guiding impulses derived from the design dial are transferred to swinging adjusting links. From these they are applied by means of guide bars to oscillating shafts which are in operative engagement with the bearing stud of the oscillating lever of the needle bar oscillator. The operation of the guiding device is effected from the crank shaft by way of an adjustable cam, the deflections or throws of which are applied to a stepping device which, in turn, drives the design dial.

It is possible with devices of that type to derive a large number of design variations from a design disk; but the proper operation of the numerous adjusting elements mounted externally of the machine arm requires the use of both hands and is cumbersome and time consuming. Furthermore, the known arrangement cannot be readily installed in a simple zig zag sewing machine of conventional construction.

In another known arrangement the design dial is driven by the motor by way of a step cone and a worm drive mounted in the standard of the machine. The guiding impulses derived from the dial disk are transferred to a suspended arm rotatably mounted in the machine arm by means of an oscillating lever and an adjustable transmission bar, and from there the impulses may be applied to the adjustment levers for the stitch location and the width by means of a manually operated lever connection which is likewise provided externally of the machine arm.

Also here the adjustment of the designs is relatively cumbersome, especially as far as the change over to different design lengths is concerned. For that purpose it is necessary for each change to change over the belt on the step cone pulley.

Furthermore, step switching mechanisms have been proposed in connection with fancy stitch sewing machines for producing star patterns where the length of the steps is made adjustable by following certain procedure.

The problem underlying the invention is to eliminate the shortcomings of the known arrangements and it is one object of the invention to provide a shifting and guiding mechanism which makes it possible with simple structural means to provide for continuous or stepless adjustment even during the running of the machine. The invention solves this problem by means of engageable and disengageable connections between the transfer lever for the guiding impulses and the adjusting levers for the stitch location and the stitch width and furthermore by means of a selector switch for engaging and disengaging the connections and by a means for the continuously adjustable variation of the advancing length of the drive for the control mechanism.

In the preferred embodiment it is possible to provide supports for yokes upon the transfer lever which cooperate with spring loaded coupling or shifts bars connected to the adjusting levers of the machine. It is furthermore appropriate to movably connect the shift bars with the adjusting levers for the stitch location and the stitch width by means of eccentric bolts. Furthermore, it is suitable to make the adjusting pressure of the springs for the coupling bars which are mounted on a carrier rack variable by means of set screws.

In accordance with a further object of the invention the engaging and disengaging of the shifting bars can be effected by a cam shaft operated by the selector switch, which carries additional cams besides the cams associated with the shifting bars, in particular one cam which, for a specific position of the selector switch, keeps the transmission system for the control impulses out of engagement with the control mechanism, and one cam which, in response to predetermined positions of the selector switch, operates the stitch location control. In this connection the particular shifting positions of the selector switch can be secured by a toothed rack.

A still further object of the invention provides for a possibility of influencing the stitch location adjustment by means of the selector switch by way of a double armed lever mounted rotatably under control of a spring on the outside of the machine arm, one arm of which lever extends into the interior of the machine arm and rests with its angular end against the cam of the cam shaft while the other arm extends downwardly on the outside of the machine arm and is provided with teeth forming a rack which, when the stitch location control is in operative position, are in engagement with the point of the adjusting lever for the stitch location.

A further object of the invention is to provide a cone shaped cam on the drive shaft which is operatively connected to a step by step advancing mechanism for operating the control mechanism by way of an adjustably mounted double armed lever and a push rod. The pivot of the double armed lever may be mounted on a slide member which is slidably mounted on a supporting plate secured to the machine arm and adjustable by means of a switch provided in the cover of the machine.

Further features and objects of the invention and details of the advantages provided thereby will become apparent from the following description of one embodiment of the switching mechanism illustrated in the accompanying drawings in connection with a zig zag sewing machine in which

Fig. 1 is a perspective front view of a sewing machine equipped with the mechanism in accordance with the invention;

Fig. 2 is a further perspective view looking down on the machine with the cover removed;

Fig. 3 is a perspective view of a portion of the machine with the cover removed and of the raised mechanism from the bottom;

Fig. 4 is a partial perspective and exploded view of the machine with the cover removed and the mechanism raised with the dismounted coupling bars without the springs at the top;

Fig. 5 is a partial view of the machine arm from the front with the cover removed, with the shifting bars and springs, the transfer lever, the cam shaft without bearing means and selector switch, the stitch adjuster without adjusting knob or indicating dial;

Fig. 6 is the transfer lever with the carriers or supports where the center carrier has been removed and partly shown in cross section;

Fig. 7 is an exploded view of the transfer elements for the design length adjustment and the journalling of the slide upon the support;

Fig. 8 is the cam shaft with the bearing member and the selector switch;

Fig. 9 is a side view, partly in section, showing the switching device installed in a zig zag type sewing machine for cooperation with the conventional type of needle bar oscillator mechanism;

Fig. 10 is an exploded view of the stitch location lever and of the cam fork rod and their interengaging elements, and

Fig. 11 is a plan view of a unidirectionally operating cam nest advancing device in the form of a clutch.

The shifting or switching mechanism is mounted on the arm **1** of the machine beneath the cover **2** which is provided with a flap **3** and bores for the shifting shafts of the mechanism.

A supporting plate **4** is provided with bores **5** for screws **6** by means of which it is secured in the threaded bores **7** of the machine arm **1**. A cam disk assembly **8** rotatably mounted on the supporting plate **4** is moved by a continuously (stepless) adjustable advancing device **9** which is connected for operation by way of variable cam drive means including a pusher bar **10** and a double armed lever **11** to a conical cam **13** secured to the drive shaft **12** in the machine arm. The device **9** is preferably of a conventional ratchet and pawl, or wedge, or one way clutch type which, when rotated in one direction rotates the shaft of the cam assembly, while on the return movement it slides over its engagement with the cam assembly so that the cam assembly is only moved in one direction. Fig. 11 shows one such device by way of example. The double armed lever **11** is spring biased by means of a tension spring **14** which is hooked at one end to said lever and at the other end to the supporting plate **4** by means of a screw **15**, which holds it with its free arm **17** which is provided with a roller **16** in uninterrupted operative engagement with the cam **13**. The lever **11** is rotatably mounted by means of its hub **18** of tubular shape (Fig. 7) upon a shaft **19** and is retained by a fastening ring **20**. The shaft **19** is mounted upon a slide **21** which is movable parallel to the drive shaft **12** and which is held and guided on the supporting plate **4** by means of collar screws **22, 23** which extend through longitudinal slots **24, 25**. The movement of the slide **21** is limited in the direction toward the head of the machine by means of a guide member **28** mounted on the supporting plate **4** by means of screws **27** in a recess **26** of the slide **21**.

A pin **29** projects through longitudinal slot **25** in the slide **21** and serves as an abutment for a lug **30** on the pusher bar **10** in the inoperative position of the slide **21**. A pin **33** secured to an angular lever **32** engages a recess **31** in the slide **21**. The angular lever **32** is rotatable around a pivot shaft **34** and is provided with a slot **35** which is engaged by a pin **36** on a collar **39** mounted upon a shifting shaft **37** to which it is secured by means of a set screw **38**. The shifting shaft **37** projects through the cover **2** and carries a manipulating knob **40** at its upper free end which has curved recesses **41** for seating a spring biased ball (not shown) which is embedded in the top surface of cover **2** under knob **40**. The supporting plate **4** is provided with a correspondingly large longitudinal aperture **42** so that the pin **33** can readily reach through for operating the slide **21**.

An angular lever **44** pivoted on a bolt **43** (Figs. 2, 4) carries at its vertex a rotatably mounted shifting start **46** provided with a locking means **45** and having feeler fingers **47** for selecting a cam disk from the nest of cam disks. A lever **49** is linked to the free end of the angular lever **44** by means of a collar screw **48**, which lever is provided with slots **50** longitudinally thereof for the adjustable connection with a lever **51** by means of screws **52**. Lever **51** is pivotally connected at its other end by means of a collar screw **53** to a transfer lever **55** pivotally supported on a threaded bolt **54**.

Thus the lever mechanism **44, 49, 51, 55** for receiving and transferring the control movements, which is pivoted around bolts **43** and **54** and carries the shifting star **46**, constitutes a coupling system or impulse transfer means which is held in operative engagement with the cam disk nest **8** by means of a spring **56**. The spring **56** is hooked at one end to a lug **57** on the transfer lever **55** and secured at its other end to the supporting plate **4** by means of a screw **58**.

Three bearing bushings **59, 60, 61** are provided, on the transfer lever **55** which rotatably receive studs **62, 63, 64** of supports **65, 66, 67** and which are secured to said lever by screws **68, 69, 70**. The supports **65, 66, 67** are provided at their ends with slots **71, 72, 73** and yokes **74, 75, 76**. Coupling bars **77, 78, 79** which are guided in the slots **71, 72, 73** are provided at one end with recesses **80, 81, 82** for seating in the yokes **74, 75, 76**. At the other end the coupling bars **77, 78, 79** are movably connected to the shifting levers of the machine by means of eccentric collar bolts **83, 84, 85**. The collar bolt **83** carrying the coupling bar **77** is secured in a bore **86** in an extension lever **87** by means of a set screw **88**. The extension lever **87** is secured by means of a screw **89** to the stitch location adjusting lever **90** which at its lower end rotatably receives the shaft **92** of the stitch adjuster or locater in a bearing **91**.

The collar bolts **84, 85** of the coupling bars **78, 79** are secured in bores **93, 94** on both sides of an angular lever **95** by means of screws **96, 97**. The angular lever **95** (Fig. 5) is pivotally connected in a known manner by way of a pull bar **98** to a one armed lever **100** which is secured by means of a screw **99** to the shaft **92** of the stitch adjuster.

A bearing member **101** (Figs. 3 and 8) is mounted upon the supporting plate **4** by means of screws **102** and accommodates between its upwardly extending cheeks **103, 104** a cam shaft **105**, which is disposed transversely of and beneath the coupling bars **77, 78, 79**. A toothed gear **106** is disposed upon the end of the cam shaft **105** which extends through the cheek **104** which meshes with another toothed gear **107** mounted by means of a bolt **108** upon cheek **104**. The hub **109** of gear **107** supports a selector switch **110** which is provided on its front face with markings **111** and on the rear surface with corresponding indentations or cavities **112** for seating a spring biased ball **112*a*** mounted in the hub **113** of the gear **106**.

Cams **114, 115, 116** associated with coupling bars **77, 78, 79** are mounted on the cam shaft **105** which, in corresponding positions of the selector switch **110**, disengage the coupling bars **77, 78, 79** from the yokes **74, 75, 76** of the supports **65, 66, 67**. There is furthermore provided upon the cam shaft **105** a cam **117** which in the position of disengagement of the selector switch **110** engages a lug **118** of the transfer lever **55** and removes the transfer system for the control or shifting movements from engagement with the nest of cam disks **8**, and also a cam **119** which in predetermined positions of the selector switch **110** operates a double armed lever **120** (Fig. 5) and thus shifts the stitch location adjustment. One arm **121** of the double armed lever **120** is provided with recesses **122** while the other arm **123** bulges out and extends at an angle at the end in the direction of the balance wheel. On the outside of the arm **1** lever **120** is rotatably mounted by means of a collar screw **124** and extends with its curved arm **123** through an aperture **125** to the inside of housing arm **1** to cam **119** on the cam shaft **105** where it is held in continuous engagement by a tension spring **126**. Spring **126** is hooked onto arm **123** at one end and at the other end onto a pin **127** on the machine housing arm. The other arm **121** of the double armed lever **120** which extends downwardly is adapted to receive in one of its recesses **122** the edge **128** of the stitch location adjusting lever **129** which, in a

known manner, is rotatably and resiliently disposed in the bearing **91** of the stitch location adjusting lever **90** as shown in Fig. 5.

The coupling bars **77, 78, 79** are biased by springs **130, 131, 132** which are secured by means of screws to mountings **133, 134, 135.** These mountings **133, 134, 135** are movably supported upon a yoke **137** secured to the supporting plate **4** by means of screws **136** and are provided with lugs through which extend adjustment or set screws **138** which are supported on a plate **140** secured to the supporting plate **4** by means of screws **139.** The pressure of the springs **130, 131, 132** against the coupling bars 77, 78, 79 can be adjusted by means of set screws **138.**

The manner in which the mechanism operates is now described. However, before discussing the shifting mechanism proper, a brief explanation is given of a conventional zig zag stepping mechanism and of the manner in which the shifting mechanism in accordance with the invention cooperates therewith.

The stitch location adjusting lever **90** and the angular lever **95** are pivotally supported in the machine arm **1** upon a stud **141.** At the end of shaft **92** of the stitch locator which projects through the aperture **125** an operating knob **143** is secured by means of screw **142** (Fig. 3), which serves for manually setting the width of the stitch.

Between the knob **143** and arm **1** an indicator dial **144** is provided for indicating the adjusted stitch width. This dial moves together with knob **143** and the stitch location lever **129** as they are turned to change the position of shaft **92,** but retains its adjusted position relative to the machine. Furthermore, pointer **145** is formed on the dial **144** which cooperates with the markings **146** provided upon machine arm **1** to indicate the stitch location.

At the other end of the shaft **92** of the stitch adjusting means the stitch adjuster guide member **147** (Fig. 9) is mounted in which is guided the sliding member **149** which is rotatably mounted upon the cam fork rod **148.** The fork **150** of the cam fork rod **148** receives the stitch locating cam **151** which is driven by way of the bevel gears **152** and **153** from the drive shaft **12.** The cam **151** and the bevel gear wheel **153** are rotatably disposed on a stud (not shown) which is secured in the machine arm **1** at the rear of the machine housing. The cam fork rod **148** is connected by means of a movable joint **154** to the needle bar oscillator **156** which is pivotally supported at bearing stud **155.** The needle bar oscillator **156** receives the needle bar **157** for reciprocating movement, which in turn is in operative engagement with the bell crank lever **159** secured to the housing arm **12.** Cam **151** effects one half revolution in response to one up and down movement of needle bar **157,** and the strokes of the cam **151** cause cam fork rod **148** to oscillate about the bolt of the joint **154.**

Adjusting the stitch location setting lever **129** to the center stitch position for which the edge **128** of the stitch location lever **129** is seated in the center tooth of the three teeth formed at the end of lever **120** (Fig. 5) and setting the switch knob **143** to zero causes the cam fork rod **148** in response to the rotary movement of the cam **151** to move pivotally about the pivot bolt **154** of the vertically disposed needle bar oscillator **156,** because the guide member **147** is disposed in the direction of the rotary movement of the sliding member **149.** The needle bar oscillator **156** thus effects no oscillatory movement with this adjustment so that the machine is set to effect straight forward stitching.

Rotating the switch knob **143** from zero position to the left causes the stitch locator guide member **147** to turn in the counterclockwise direction so that the eccentric fork rod **148** is imparted a forward movement in addition to the oscillatory movement around bolt **154** which causes the needle bar oscillator **156** to pendulate about its center position.

The greater the rotation of the guide member **147,** the greater will be the lateral swinging movements of the needle bar oscillator **156** and thus also of needle bar **157.** The triangular shape of the cam **151** causes the fork rod **148** to swing laterally only at predetermined partial sections of its course of rotation while the cam **151** is positioned in such a manner that the lateral swinging movement of the fork rod **148** takes place only when the needle bar **157** is in the area of its highest position.

The stitch location setting or adjusting is effected by means of the stitch locating lever **129.** For example, if the setting is to be effected for shifting the stitch location to the left, then the stitch location lever **129** is brought to be seated in the upper groove or tooth of lever **120.** In this manner the guide member **147** is moved about bolt **141** which, in turn, causes the fork rod **148** and thus the needle bar **157** to be displaced to the extreme left position. By simultaneous raising of the guide member **147** during the shifting, however, the sliding member **149** on fork rod **148** arrives in the lower part of the guide member **147** so that rotation of the knob **143** from the zero position causes the zig zag movements of the needle bar **157** to start always from the extreme left location.

If the machine is intended to be operated as an ordinary zig zag sewing machine the selector switch **110** is turned until the digit "0" is at the top as shown in Figs. 1 and 4. For this setting the cam **117** on cam shaft **105** engages the lug **118** of the transfer lever **55** and restrains the shifting star **46** of the transfer system which is mounted on the shifting lever **44** of the transfer system from engaging the cam disk assembly or nest **8.** Simultaneously the cam **119** on cam shaft **105** depresses arm **123** of the double armed lever **120** against the pressure of spring **126** so that the teeth **122** on its arm **121** are moved into engagement with the edge **128** of the stitch location adjustment lever **129.** Thus the stitch location adjustment is set. The coupling bars 77, 78, 79 are raised by their respective cams **114, 115, 116** on cam shaft **105** and are, therefore, disengaged from the yokes 74, 75, 76 of the supports 65, 66, 67.

By turning the shifting knob **40** counterclockwise for the adjustment of the design length the slide **21** is moved in the direction of the hand wheel of the machine by way of the eccentrically journalled pin **36** on switching shaft **37** and by way of the angular lever **32** and the pin **33** until the roller **16** of the double armed lever **11** is out of engagement with the conical cam **13** on the arm shaft **12** and the nose **30** of the pusher rod **10** engages the stud **29.** Thus the driving mechanism for the cam disk nest **8** is also disengaged.

In order to condition the mechanism for operation the aforementioned switches must again be manipulated, the sequence of the setting operations being immaterial. It is suitable to effect the setting by means of a pattern hand book or the like, in which the adjustments for each pattern are indicated.

By rotating the shifting star **46** a suitable cam is selected from the cam disk assembly **8.** Then by turning the shifting knob **40** counterclockwise the desired pattern or design length is adjusted. Thus the roller **16** of the double armed lever **11** is again brought into operative engagement with the conical cam **13** under the effect of the tension of spring **14.** Oscillatory movements are therefore imparted to the double armed lever when the mechanism is in operative position which are transferred by the pusher bar **10** to the step switching mechanism **9** whereby the cam disk assembly **8** is operated in steps. Displacement of the axis **19** of the double armed lever **11** parallel to the arm shaft **12** when the shifting knob **40** is operated causes roller **16** to be guided along the side of the conical cam **13,** so that the step size of the advancement movement of the cam disk assembly **8** can be controlled in a continuous manner from

zero to a maximum corresponding to the eccentricity of the cam **13**.

For example, if it is desired for producing a predetermined design to set the selector switch **110** to "1" it must be turned clockwise until the digit "1" is at the top and the spring biased ball **112***a* provided in the hub **113** engages and seats in a recess or detent **112** corresponding to the position of the selector switch **110**. In this connection the cam **117** slides from the yoke **118** of the transfer lever **55** and releases it so that it may yield to the pull of the spring **56** and establishes operative engagement between the shifting star **46** and the cam disk assembly **8** by way of the lever train **44**, **49**, **51**.

Furthermore, the two coupling bars **77** and **79** are raised by the cams **114** and **116** on cam shaft **105**, respectively, associated therewith, while the coupling bar **78** is released from its associated cam **115**, so that it is enabled under the pressure of the overlying spring **131** to seat in the yoke **75** of the support **66** by means of its notch or recess **81**. Thus the connection of the transfer lever **55** with the adjusting levers for the stitch width is established. By means of this adjustment, therefore, only the stitch width is controlled. The distance of the support **66** mounted upon the transfer lever **55** from its axis of rotation is so chosen that only half of the stitch width is controlled. Furthermore, the stitch location adjustment remains in operative position as in the setting "0" of the selector switch **110** due to the conformation of the cam **119**, so that it is possible, in addition, to adjust also the stitch location by means of the stitch location adjustment lever **129**.

The further adjustment possibilities of the selector switch are briefly described hereinafter:

In the position "2" of the selector switch **110** also the coupling bar **77** engages the yoke **74** of the support **65** upon release by the cam **114** and establishes the connection with the stitch location adjusting lever **90**. Accordingly the stitch location is controlled in addition to one half of the stitch width. For that reason the cam **119** in this position releases the double armed lever **120** again which under the influence of spring **126** disconnects the stitch location adjustment while the notches **122** are withdrawn from the reach of the edge **128** of the stitch location adjustment lever **129**.

In the position "3" of the selector switch **110** the coupling bar **78** is raised by the cam **115** and only coupling bar **77** remains in operative connection with the transfer lever **55**. Thus only the stitch location is controlled while the stitch width can be adjusted by hand. Also in this position the stitch location adjustment is disconnected.

In the position "4" of the selector switch **110** the coupling bar **77** is again raised by cam **114** while the cam **116** now frees the coupling bar **79** which in a similar manner engages the yoke **76** of support **67**. The coupling bar **79** is also connected with the adjusting levers for the stitch width so that only the stitch width is controlled. The arrangement of the support **67** upon the transfer lever **55** is made in such a manner that now the stitch width is fully guided. By means of the cam **119** the stitch location adpjustment means is reconnected so that it is possible to effect the control of the stitch width from the stitch location left, right or center.

In the position "5" of the selector switch **110** the coupling bar **77** for the stitch location and the coupling bar **79** for the full-stitch width is released for seating in the yokes **74** and **76**, while the coupling bar **78** for one half of the stitch is raised. Also in this position the stitch location adjustment means is disconnected.

The adjustable lever connection **49**, **51** affords the possibility of determining the swinging range of the transfer lever **55**. It is furthermore possible upon releasing screws **88**, **96**, **97** by correspondingly rotating the eccentric bolts **83**, **84**, **85** to effect an accurate adjustment of the coupling bars **77**, **78**, **79**.

Having now described our invention with reference to one operative embodiment thereof, we do not wish to be limited thereto but what we desire to protect by Letters Patent of the United States is set forth in the appended claims.

We claim:

1. Shifting and guiding mechanism for a sewing machine of the zig-zag type having a drive shaft and a needle bar oscillator operatively connected to said drive shaft; said mechanism including a conically shaped cam mounted on said drive shaft a guiding device having a motion input portion, and a variable cam and follower means, variable cam drive means in operative engagement with said conically shaped cam, and impulse transfer means connected to said follower means, a stitch width adjusting means and a stitch location adjusting means operatively connected to said impulse transfer means, said cam follower means being movable in steps to transmit control impulses by way of said impulse transfer means and said stitch location adjusting means to the needle bar oscillator for producing embroidered designs, and said mechanism including selectively operable coupling bars disposed between said impulse transfer means and said stitch width and stitch location adjusting means, a selector switch having actuating members operative to shift selected ones of said coupling bars into and out of engagement with said impulse transfer means, and variable means operatively associated with said guiding device including a manipulating member operative to change the position of said drive means relative to said cam on said shaft for continuous variation of the size of the control impulses for said guiding mechanism.

2. Shifting and guiding mechanism for a sewing machine of the zig-zag type having a drive shaft and a needle bar oscillator operatively connected to said drive shaft; said mechanism including a conically shaped cam mounted on said drive shaft a guiding device having a motion input portion, and a variable cam and follower means, variable cam drive means in operative engagement with said conically shaped cam, and impulse transfer means connected to said follower means, a stitch width adjusting means and a stitch location adjusting means operatively connected to said impulse transfer means, said cam and follower means being movable in steps to transmit control impulses by way of said impulse transfer means and said stitch location adjusting means to the needle bar oscillator for producing embroidered designs, and said mechanism including selectively operable coupling bars disposed between said impulse transfer means and said stitch width and stitch location adjusting means, a selector switch having actuating members operative to shift selected ones of said coupling bars into and out of engagement with said impulse transfer means, and variable means operatively associated with said guiding device including a manipulating member operative to change the position of said drive means relative to said cam on said shaft for continuous variation of the size of the control impulses for said guiding mechanism, said coupling bars being spring biased toward said lever and said lever carrying a plurality of supports presenting yokes for selective engagement by the free ends of said coupling bars and said coupling bars being connected at their other ends to the stitch location adjusting means and to the stitch width adjusting means.

3. Shifting and guiding mechanism for a sewing machine of the zig-zag type having a drive shaft and a needle bar oscillator operatively connected to said drive shaft; said mechanism including a conically shaped cam mounted on said drive shaft a guiding device having a motion input portion, and a variable cam and follower means, variable cam drive means in operative engagement with said conically shaped cam, and impulse transfer means connected to said follower means, a stitch width adjusting means and a stitch location adjusting means operatively connected to said impulse transfer

means, said cam and follower means being movable in steps to transmit control impulses by way of said impulse transfer means and said stitch location adjusting means to the needle bar oscillator for producing embroidered designs, and said mechanism including selectively operable coupling bars disposed between said impulse transfer means and said stitch width and stitch location adjusting means, a selector switch having actuating members operative to shift selected ones of said coupling bars into and out of engagement with said impulse transfer means, and variable means operatively associated with said guiding device including a manipulating member operative to change the position of said drive means relative to said cam on said shaft for continuous variation of the size of the control impulses for said guiding mechanism, said coupling bars being spring biased toward said lever and said lever carrying a plurality of supports presenting yokes for selective engagement by the free ends of said coupling bars and said coupling bars being connected at their other ends by means of eccentric bolts to the stitch location adjusting means and to the stitch width adjusting means.

4. Shifting and guiding mechanism for a sewing machine of the zig-zag type having a drive shaft and a needle bar oscillator operatively connected to said drive shaft; said mechanism including a conically shaped cam mounted on said drive shaft a guiding device having a motion input portion, and a variable cam and follower means, variable cam drive means in operative engagement with said conically shaped cam, and impulse transfer means connected to said follower means, a stitch width adjusting means and a stitch location adjusting means operatively connected to said impulse transfer means, said cam and follower means being movable in steps to transmit control impulses by way of said impulse transfer means and said stitch location adjusting means to the needle bar oscillator for producing embroidered designs, and said mechanism including selectively operable coupling bars disposed between said impulse transfer means and said stitch width and stitch location adjusting means, a selector switch having actuating members operative to shift selected ones of said coupling bars into and out of engagement with said impulse transfer means, and variable means operatively associated with said guiding device including a manipulating member operative to change the position of said drive means relative to said cam on said shaft for continuous variation of the size of the control impulses for said guiding mechanism, each said coupling bar being provided with a biasing spring and each biasing spring being provided with a set screw or the like for biasing said bars toward said lever, said lever supporting a plurality of supports presenting yokes to receive the free ends of said coupling bars, said coupling bars being pivotally connected at their other ends to said stitch location adjusting means and said stitch width adjusting means.

5. Shifting and guiding mechanism for a sewing machine of the zig-zag type having a drive shaft and a needle bar oscillator operatively connected to said drive shaft; said mechanism including a conically shaped cam mounted on said drive shaft a guiding device having a motion input portion, and a variable cam and follower means, variable cam drive means in operative engagement with said conically shaped cam, and impulse transfer means connected to said follower means, a stitch width adjusting means and a stitch location adjusting means operatively connected to said impulse transfer means, said cam and follower means being movable in steps to transmit control impulses by way of said impulse transfer means and said stitch location adjusting means to the needle bar oscillator for producing embroidered designs, and said mechanism including selectively operable coupling bars disposed between said impulse transfer means and said stitch width and stitch location adjusting means, a selector switch having actuating members operative to shift selected ones of said coupling bars into and out of engagement with said impulse transfer means, and variable means operatively associated with said guiding device including a manipulating member operative to change the position of said drive means relative to said cam on said shaft for continuous variation of the size of the control impulses for said guiding mechanism, said selector switch including a cam shaft and said actuating members being cams mounted on said cam shaft, said cam shaft being also provided with a cam operative in a predetermined position of said cam shaft to disengage said stitch location and said stitch width adjusting means from said guiding device, and a further cam operative to render effective holding means associated with said stitch location adjustment lever.

6. Shifting and guiding mechanism for a sewing machine of the zig-zag type having a drive shaft and a needle bar oscillator operatively connected to said drive shaft; said mechanism including a conically shaped cam mounted on said drive shaft a guiding device having a motion input portion, and a variable cam and follower means, variable cam drive means in operative engagement with said conically shaped cam, and impulse transfer means connected to said follower means, a stitch width adjusting means and a stitch location adjusting means operatively connected to said impulse transfer means, said cam and follower means being movable in steps to transmit control impulses by way of said impulse transfer means and said stitch location adjusting means to the needle bar oscillator for producing embroidered designs, and said mechanism including selectively operable coupling bars disposed between said impulse transfer means and said stitch width and stitch location adjusting means, a selector switch having actuating members operative to shift selected ones of said coupling bars into and out of engagement with said impulse transfer means, and variable means operatively associated with said guiding device including a manipulating member operative to change the position of said drive means relative to said cam on said shaft for continuous variation of the size of the control impulses for said guiding mechanism, and locking means associated with said selector switch operative to retain said switch in the selected positions.

7. Shifting and guiding mechanism for a sewing machine of the zig-zag type having a drive shaft and a needle bar oscillator operatively connected to said drive shaft; said mechanism including a conically shaped cam mounted on said drive shaft a guiding device having a motion input portion, and a variable cam and follower means, variable cam drive means in operative engagement with said conically shaped cam, and impulse transfer means connected to said follower means, a stitch width adjusting means and a stitch location adjusting means operatively connected to said impulse transfer means, said cam and follower means being movable in steps to transmit control impulses by way of said impulse transfer means and said stitch location adjusting means to the needle bar oscillator for producing embroidered designs, and said mechanism including selectively operable coupling bars disposed between said impulse transfer means and said stitch width and stitch location adjusting means, a selector switch having actuating members operative to shift selected ones of said coupling bars into and out of engagement with said impulse transfer means, and variable means operatively associated with said guiding device including a manipulating member operative to change the position of said drive means relative to said cam on said shaft for continuous variation of the size of the control impulses for said guiding mechanism, said selector switch including a cam shaft and said actuating members being cams mounted on said cam shaft, said cam shaft being also provided with a

cam operative in a predetermined position of said cam shaft to disengage said stitch location and said stitch width adjusting means from said guiding device, and a further cam operative to render effective holding means associated with said stitch location adjustment lever, said holding means comprising a double armed lever mounted externally of the machine housing, including one arm resting against said last mentioned cam and another arm extending downwardly externally of the machine having recesses endwise thereof for engagement by said stitch location adjusting means.

8. Shifting and guiding mechanism for a sewing machine of the zig-zag type having a drive shaft and a needle bar oscillator operatively connected to said drive shaft, said mechanism including a conically shaped cam mounted on said drive shaft a guiding device having a motion input portion, and a variable cam and follower means, variable cam drive means in operative engagement with said conically shaped cam, and impulse transfer means connected to said follower means, a stitch width adjusting means and a stitch location adjusting means operatively connected to said impulse transfer means, said cam and follower means being movable in steps to transmit control impulses by way of said impulse transfer means and said stitch location adjusting means to the needle bar oscillator for producing embroidered designs, and said mechanism including selectively operable coupling bars disposed between said impulse transfer means and said stitch width and stitch location adjusting means, a selector switch having actuating members operative to shift selected ones of said coupling bars into and out of engagement with said impulse transfer means, and variable means operatively associated with said guiding device including a manipulating member operative to

change the position of said drive means relative to said cam on said shaft for continuous variation of the size of the control impulses for said guiding mechanism, said variable means including said cam provided upon the drive shaft of the machine, a double armed lever pivoted on a stud, a pusher bar and a unidirectional stepping mechanism for rotating said guiding device, said double armed lever supporting a roller at one end for following said conically shaped cam and being pivotally connected to said pusher bar at the other end.

9. Shifting mechanism in accordance with claim 8, wherein a slide is mounted upon a supporting plate secured to the machine housing arm and supporting said stud and a switch is mounted upon the cover of the machine including a manipulating device for moving said slide.

10. Shifting mechanism in accordance with claim 9, wherein said manipulating device comprises a shaft and a bell crank lever having a member in operative engagement with said slide.

11. Shifting mechanism in accordance with claim 8, including a pin on said supporting bar and a lug on said pusher bar for engagement by said pin in the position of said slide where said roller is disengaged from said conically shaped cam.

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