

July 21, 1959

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2,895,439

CLOTH FEEDING MECHANISM FOR SEWING MACHINES

Filed July 29, 1955

5 Sheets-Sheet 1

FIG. 1

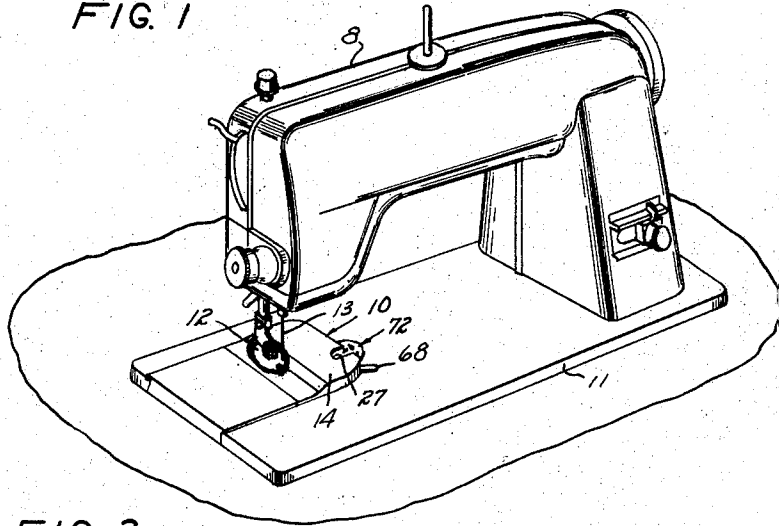
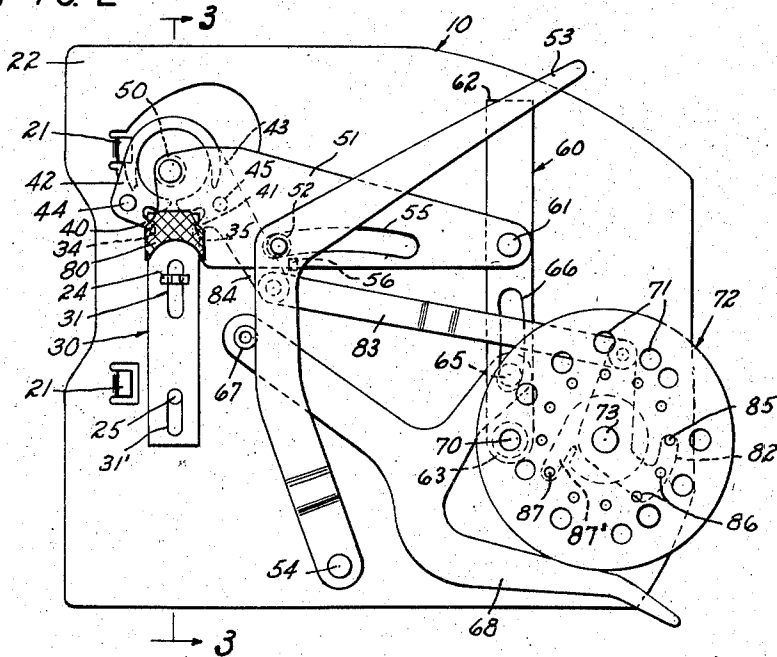


FIG. 2



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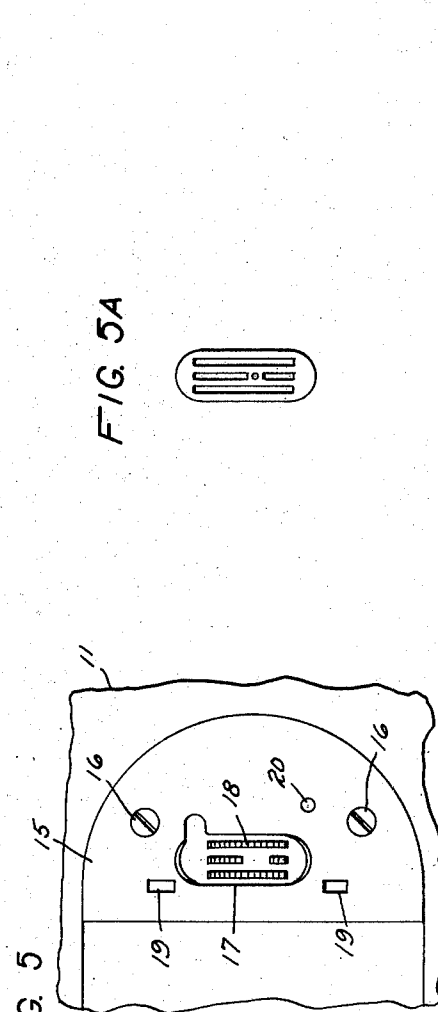
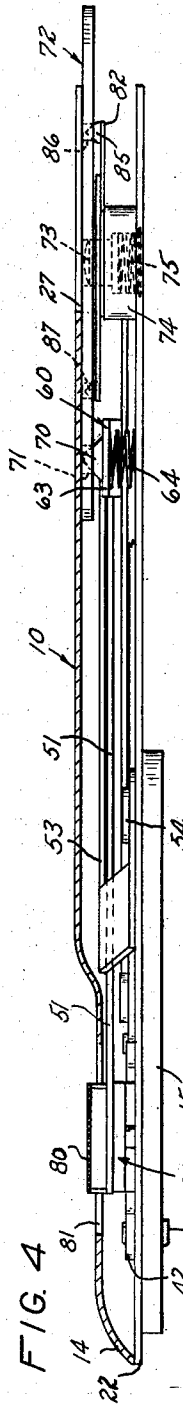
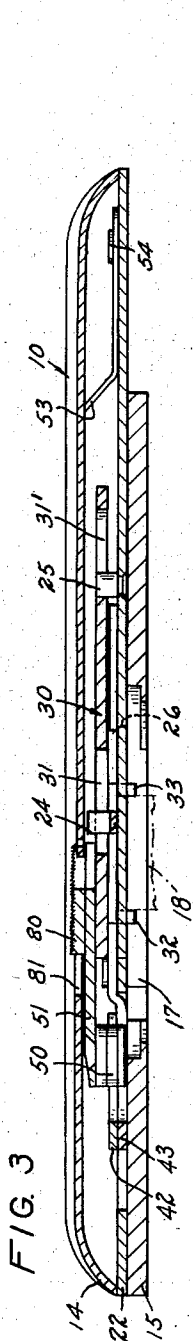
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FIG. 6

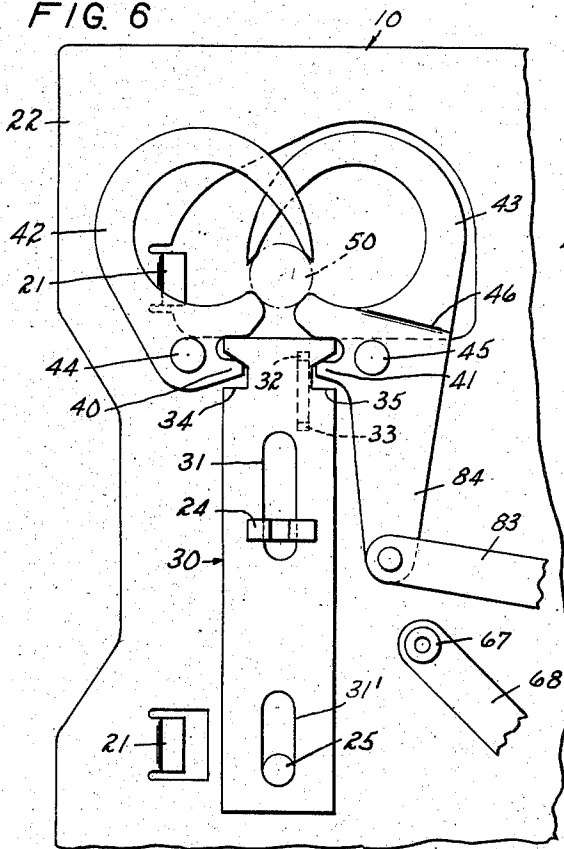


FIG. 6A

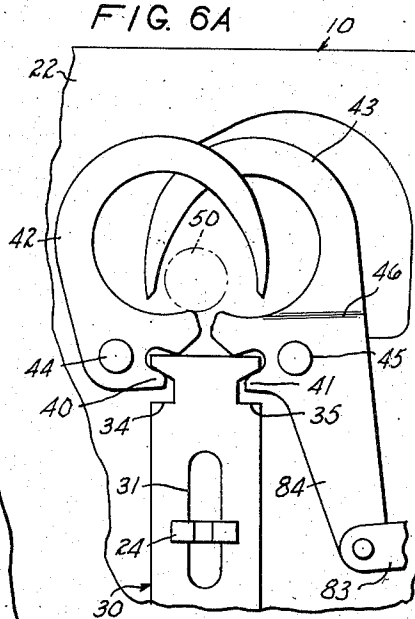


FIG. 7A

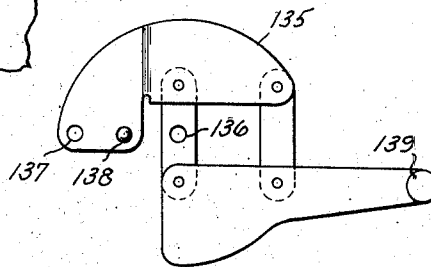
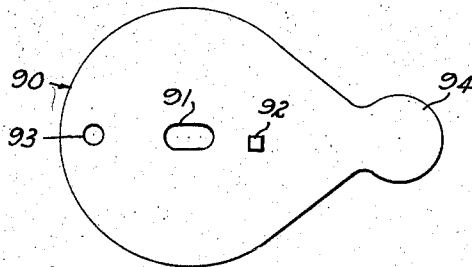


FIG. 7



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FIG. 8

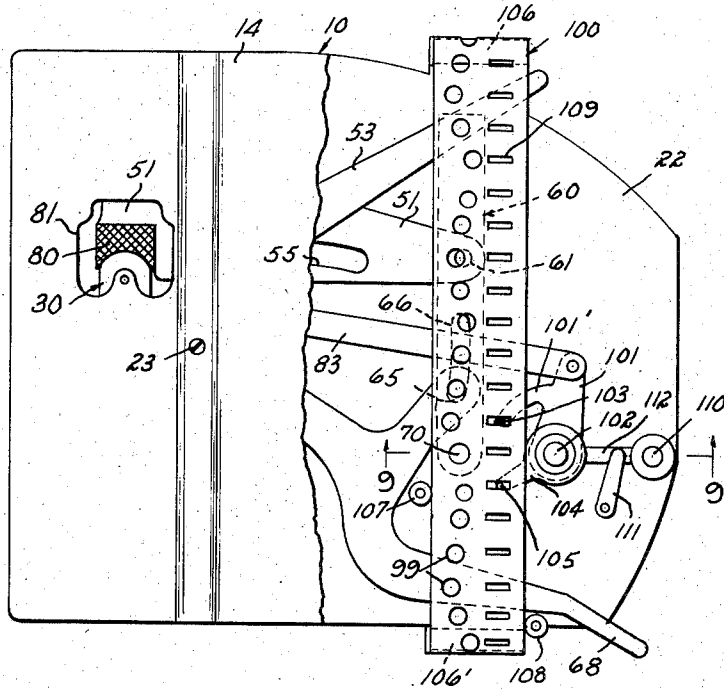


FIG. 9

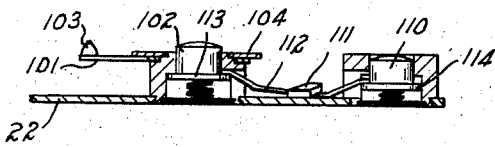
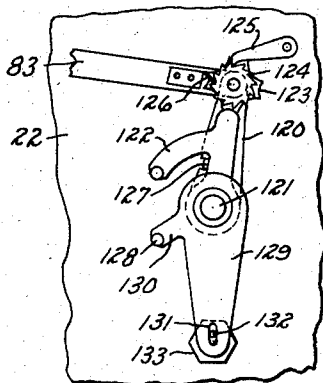


FIG. 10



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FIG. 12

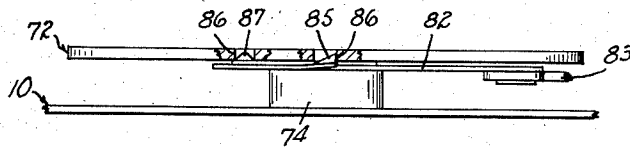


FIG. 13

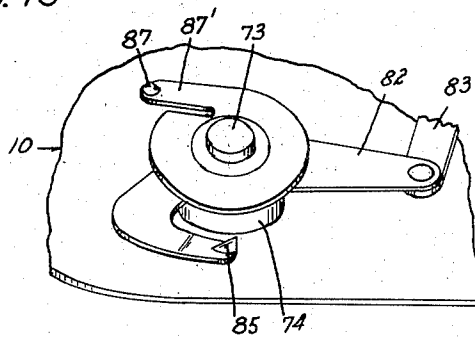
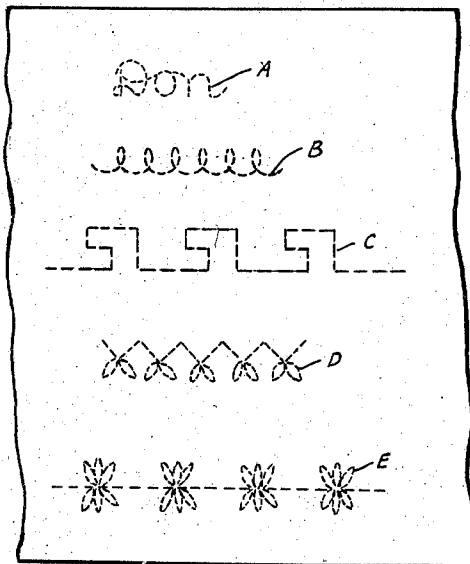


FIG. 11



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CLOTH FEEDING MECHANISM FOR SEWING MACHINES

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Application July 29, 1955, Serial No. 525,291

30 Claims. (Cl. 112—204)

The present invention relates generally to sewing machines and, more particularly, to an improved cloth feeding mechanism for use with sewing machines, either as a permanent part thereof or as a separate attachment.

It is an aim of the present invention to provide a cloth feeding mechanism for sewing machines having a novel principle of operation whereby a wide variety of decorative stitchings may be obtained with a simple and compact mechanism which is easy to adjust and use.

A more particular aim of the invention is to provide a cloth feeding mechanism which derives its motive power from the conventional feed dog operating mechanism of the sewing machine and which requires no connection to the needle bar, cloth hold down bar or the like whereby visibility of the work in process is greatly improved and whereby the movements of the cloth may be properly synchronized with the normal operating cycle of the sewing machine. Included in this aim is the provision of a low compact structure without superstructure whereby the cloth may be run across the top thereof in full view of the operator in substantially the same way as though the operator were using a conventional sewing machine without a mechanism for providing decorative stitching.

Another aim of the invention is to provide a new cloth feeding mechanism for sewing machines which is capable of forming an infinite variety of stitch patterns which are predetermined by relatively simple and inexpensive control elements which are simple and easy to insert or remove from the mechanism. Also included in this aim is the provision for varying the dimensions of a stitch pattern which is produced by any selected control element.

A further aim of the invention is to provide a cloth feeding mechanism which is of simple construction having a minimum of moving parts whereby the same may be fabricated and assembled in an economical manner and whereby wearing and possible breakage is reduced to a minimum so that the mechanism is susceptible to hard usage over long periods of time without breakdown and without requiring adjustment or replacement of parts.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereafter set forth and the scope of the application of which will be indicated in the appended claims.

In the drawings:

Figure 1 is a fragmentary perspective view of a conventional sewing machine with an embodiment of the cloth feeding mechanism attached to the bed plate thereof;

Figure 2 is a plan view of the attachment with the cover removed;

Figure 3 is a cross-sectional side view of the attachment taken along the lines 3—3 of Fig. 2 but with the cover in place;

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Figure 4 is a front elevation of the attachment with the cover in cross-section;

Figure 5 is a fragmentary plan view of the throat plate of the sewing machine of Figure 1 showing a modification thereof for facilitating securing the attachment to the machine;

Figure 5-A is a plan view of a filler plate for use with the throat plate of Figure 5;

Figure 6 is an enlarged fragmentary view of a portion of the elements of Figure 2 in a centered position;

Figure 6-A is an enlarged fragmentary view of a portion of the elements of Figure 2 in an intermediate position;

Figure 7 is a plan view of a modified form of programming disc;

Figure 7-A is a plan view of a pantograph type of programming disc;

Figure 8 is a modification of a portion of the elements shown in Figure 2 for use selectively with a programming belt or strip, or with a programming disc;

Figure 9 is an enlarged fragmentary cross-sectional view of the positioning means for the programming disc taken along the line 9—9 of Figure 8;

Figure 10 is a fragmentary plan view of a modification of the means for advancing the programming belt or disc;

Figure 11 is a fragmentary view illustrating a few of the embroidery patterns obtainable by the use of this invention;

Figure 12 is a view taken from the righthand end of Fig. 2 with the programming disc partially cut away to show the pawls of the indexing mechanism;

Figure 13 is a perspective view of the indexing mechanism.

For simplicity of presentation, the cloth feeding mechanism has been shown in the drawings as embodied in an attachment for sewing machines, but it will be apparent from the description that, if desired, the cloth feeding mechanism can be embodied as a permanent part of the sewing machine mechanism to render the same capable of performing a wide variety of sewing patterns. It is a particular advantage of the invention, however, that the cloth feeding mechanism may be incorporated in an inexpensive and compact attachment having substantially universal application to existing sewing machines and which may be installed or removed in a simple and easy manner.

Referring to Fig. 1 of the drawings, an embodiment of the mechanism of the present invention in the form of a sewing machine attachment is indicated at 10, the same being mounted on the bed plate 11 of an exemplary sewing machine 8 having a presser foot 12 and reciprocating needle 13. It will be observed that the attachment 10 is in no way connected to the presser foot or needle bar and the housing 14 is of low compact size so as not to interfere with the free passage of the cloth to be sewed over the top of the attachment and whereby the progress of the sewing operation can be clearly viewed by the operator.

The attachment housing 14 has an opening 81, which as will be later seen receives a feed dog to which is imparted cloth feeding movement in any direction backward, forward, or lateral. Because of this movement of the feed dog in any direction, the opening 81 is of necessity somewhat larger than the usual presser foot used with conventional sewing mediums, limited to straight line sewing. It is therefore preferable to employ a presser foot having a plan area greater than that of the usual presser foot. Also the unique ability of the attachment to move the cloth in any direction necessitates the use of a presser foot which will permit free engagement with the cloth from any direction. While a

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variety of presser foot designs might be utilized, the circular presser foot 12 shown in Figure 1 has the desired characteristics of providing an enlarged plan area, while its upwardly struck periphery provides free cloth engagement from any direction. It is further desirable to mount the presser foot for limited pivotal movement in any direction, in order that as the cloth engages any point on the periphery of the foot the foot will pivot slightly towards the cloth to maintain the cloth in proper proximity with the housing 14.

While the attachment 10 may be secured to the bed plate of the sewing machine in a variety of ways within the scope of the invention, a particularly effective fastening arrangement is indicated in Figs. 2, 5 and 8 of the drawings. As illustrated in Fig. 5 of the drawings, the conventional throat plate of the sewing machine is removed and replaced by a throat plate 15 of similar contour and secured in place by the same screws 16. The throat plate 15 has an enlarged opening 17 in place of the usual needle hole and slots for the sewing machine feed dog 18. The plate 15 in addition has two slots 19 and a threaded hole 20 for the reception, respectively, of two depending lugs 21 on the underside of the base plate or frame 22 of the attachment, as best shown in Fig. 2, and a fastening screw 23, as best shown in Fig. 8, whereby the attachment may be securely locked in place overlying the machine feed dog.

It is, of course, understood that the above method of securing the attachment to the bed plate of the sewing machine is merely an example, and that the actual method of securing the attachment to a specific sewing machine would vary with the make or model of the machine. However, for any machine only the addition of a new throat plate and filter plate would be required. It should be noted that when the conventional throat plate of the machine has been removed and replaced by a throat plate such as the throat plate 15, the new throat plate 15 need not be removed for conventional sewing. A filler plate shown in Figure 5A is provided for insertion in the opening 17 of the throat plate, to permit conventional sewing when the attachment has been removed from the machine. Thus, to perform conventional sewing it is only necessary to place the filler plate in position in the throat plate 15, while to perform decorative stitching it is only necessary to remove the filler plate and secure the attachment in place.

The motive power for the attachment is derived from a driving slide 30 which is mounted on the base plate 22 for limited vertical and reciprocal horizontal movement by posts 24, 25 extending through the slots 31 and 31'. As shown in Figs. 2 and 6, when the driving slide 30 is in its forward or rearward positions, the slot 31 extends forwardly of the post 24 to provide a needle hole for the needle of the sewing machine and to provide a passageway for the bobbin thread. The slide 30 overlies a slot 26 in the base plate 22 so as to rest on the feed dog 18 and is provided with depending shoulders 32, 33 engaging opposite ends of the feed dog 18. As a result of this arrangement, the driving slide 30 will be moved upwardly, forwardly, downwardly and then rearwardly in a rectilinear path in accordance with the movement of the machine feed dog 18.

The forward end of slide 30 is notched at 34, 35 as best shown in Fig. 6 to receive the ears 40, 41 of centering levers 42, 43 which are pivoted on the frame at 44 and 45 respectively. The centering levers 42, 43 are in the form of generally arcuate camming fingers which are adapted to be oscillated by the slide between the positions shown in Fig. 2 and Fig. 6, the lever 43 being offset as indicated at 46 to permit the levers to overlap. The function of the centering levers 42, 43 is to move a two-section centering roller or follower 50 from any position within the confines of the levers in the position of Fig. 2 to the centered position or locus shown in dotted lines in Fig. 6 of the drawings through such intermediate

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positions as shown in Fig. 6A. As will be seen from an inspection of Figs. 2, 6 and 6A, the curved claw-like camming fingers of the centering levers 42, 43 in the position of Fig. 2 define a circular enclosure for the centering roller 50 which is of greater diameter than the roller 50 allowing the roller 50 to be moved to a selected position or locus anywhere within the enclosure. As the levers 42, 43 are moved to the position shown in Fig. 6A, the roller 50, regardless of its original position within the enclosure, is cammed toward a center position by the curved claw-like camming fingers which progressively decrease the effective size of the enclosure and finally fix the roller in center position by engagement of the ends of the fingers as shown in Fig. 6.

The centering roller 50 is mounted in a depending manner at one corner of a longitudinal feed lever 51 which is mounted for pivoting movement in a horizontal plane by a depending pivot 52 on a longitudinal stroke adjustment arm 53 which is pivoted at one end on the base plate at 54 and which projects outwardly from the housing at the other end to permit manual adjustment of the pivot for the purpose to be described hereinafter. The pivot 52 is received in an arcuate slot 55 in the feed lever 51 which not only permits adjustment of the pivot position but also permits limited longitudinal sliding movement of the feed lever 51.

The end of the feed lever 51 carrying the centering roller 50 rests on the top of the driving slide 30 so as to move vertically therewith but is free to move horizontally relative thereto. The up and down movement of the end of feed lever 51 in response to the rise and fall of drive slide 30 which in turn is caused by the machine feed dog results in a pivoting of the feed lever 51 in a vertical plane about a pivot provided by a turned-over lug 56 struck up from the base plate 22.

The opposite end of feed lever 51 is pivotally connected at 61 to an intermediate point of transverse feed lever 60 which bears at the end 62 on the base plate 22 and which is biased upwardly at its other end 63 by a spring 64. In addition to having vertical pivoting movement about the bearing point 62, the lever 60 is also mounted for pivoting movement in a horizontal plane by virtue of the pivot 65 which is received in the arcuate slot 66. The pivot 65 is supported on a transverse stroke adjustment arm 68 which is pivoted on the base plate at 67 and which projects outwardly from one corner of the housing to permit manual adjustment of the pivot position for the purpose to be described hereinafter. The arcuate slot 66 not only permits adjustment of the pivot 65 but also permits limited longitudinal sliding movement of the feed lever 60.

The end 63 of feed lever 60 has a centering cone or follower 70 which, in the embodiment shown in Figs. 1 to 4 of the drawings is adapted to cooperate sequentially with circular openings 71 in a programming disc 72. The programming disc 72 is rotatably mounted on a post 73 in the form of a depressable cap, as best shown in Fig. 4, slidably mounted in stud 74 and biased upwardly by spring 75. The housing 14 of the attachment is cut away at 27 to permit access to the disc 72 and post 73 when it is desired to change discs to provide a different pattern.

The function of the openings 71 in disc 72 is to cause longitudinal movement or horizontal pivoting or both of the transverse feed lever 60 in accordance with a preselected pattern. This is accomplished by disposing the openings 71 so that they are offset or partially out of registry with the centering cone 70 when the parts are in the position shown in Fig. 6 of the drawings. It will be understood that, when the parts are in the position shown in Fig. 6 of the drawings, the centering roller and hence the levers 51 and 60 have been moved to a predetermined or fixed position, hereinafter referred to as the centered position, and the slide 30 is in elevated posi-

tion thus pivoting the lever 51 in a clockwise direction as viewed in Fig. 4 and depressing the spring pressed end 63 of lever 60 to space the cone 70 from the programming disc. Upon the subsequent lowering and return of the slide 30 to the position shown in Fig. 2 of the drawings, the lever 51 is permitted to pivot in a counterclockwise direction thus allowing the end 63 of lever 60 to rise under the influence of spring 64 and seat the cone in the adjacent opening 71 of disc 72. Since the opening 71 is only partially in registry with the cone, a camming action is created which moves the lever 60 and hence effects lever 51 to move the centering roller 50 to an off-center position within the confines of centering levers 42, 43 as shown in Fig. 2. As will be appreciated, the off-centering of an opening 71 with respect to cone 70 can be in any direction with the result that the centering roller 50 likewise can be moved in any direction from the centered position shown in Fig. 6. It also will be appreciated that the amount of movement of the centering roller from centered position by reason of any given programming hole 71 can be varied in any horizontal dimension by varying the locus of pivots 52 and 65 by manual adjustment of adjustment arms 53 and 66. In summary, when the slide 30 is raised and moved forwardly by the machine dog, the centering roller 50 is brought to a predetermined centered position and then, when the slide 30 is lowered and returned to starting position, the centering cone 70 is moved upwardly by spring 64 and in being cammed to fully seated position in an offset opening 71 is given a horizontal movement which through levers 51 and 60 is imparted to centering roller 50 moving it to a preselected position or locus spaced from the centered position.

The movements thus imparted to centering roller 50 and the adjacent end of lever 51 are utilized to operate the cloth feeding dog 80 of the attachment. The cloth feeding dog 80 is in the form of a knurled raised platform secured to the corner of lever 51 adjacent the centering roller 50. The cloth feeding dog 80 registers with an opening 81 in the cover of the attachment so that it can engage with the underside of the cloth being sewed. As will be appreciated, the cloth feeding dog will be raised into engagement with the cloth and moved horizontally to the centered position by the raising of the machine feed dog and the drive provided through drive plate 30, centering levers 42, 43 and centering roller 50. Thereafter, the cloth feeding dog 80 will be permitted to drop out of engagement with the cloth and will be moved horizontally in any direction of a new location determined by the cone 70 and programming disc 72, whereupon the cycle will be repeated. Thus it will be apparent that the operation of the attachment is in the nature of a "surging" operation in that upon the completion of each stitch, the cloth feeding dog 80 on the feed lever 51 of the attachment while in lowered position and out of engagement with the cloth is moved from a central or first fixed position to a second position which is determined by the programming disc 72 and then while the dog 80 is in a raised position in engagement with the cloth it is repositioned or moved back to the first fixed position by the action of the centering levers 42, 43 on the roller 50 carried by the feed lever 51, as previously described.

It thus will be apparent that by indexing the programming disc 72 and providing the same with properly located programming or locating holes 71 any feeding direction can be imparted to the cloth feeding dog 80 resulting in a great variety of decorative stitchings. The indexing of disc 72 is accomplished by a ratchet arm 82 pivotally mounted on stud 74. One end of ratchet arm 82 is pivotally connected to a link 83 which in turn is pivotally connected to an extension 84 on the centering lever 43. Thus the ratchet arm 82 is oscillated in unison with the reciprocation of the driving slide 30 by the ma-

chine feed dog. The ratchet arm has a pawl 85 adapted to engage sequentially with the index openings 86 in disc 72 to advance the disc by one index opening during each forward movement of the driving slide. A holding pawl 87 carried by a flexible arm 87' which is fixed on stud 74 insures accurate indexing of the disc 72 and impedes movement thereof so that it will not turn except during an indexing movement. The drive pawl 85 is formed with a relatively flat forward end so that when the pawl is engaged in an index opening, there is provided a positive drive for the disc 72 during indexing movement; while the trailing edge of pawl 85 is inclined so that the pawl merely cams itself out of the index opening on the return stroke.

It is to be particularly observed that the movement of the cone 70 into engagement with a programming opening with the resulting positioning of the roller 50 in a new off-center position, takes place during the portion of the cycle when the cloth feeding dog 80 is out of engagement with the cloth. The re-positioning of the roller 50 is accomplished by the force of the spring 64, as very little power is required to shift the operative elements of the attachment when the dog 80 is disengaged from the cloth. The attachment has therefore a distinct advantage of requiring no power from the sewing machine motor to reposition the roller 50 other than that required to index the programming disc 72.

It is further to be observed that the needle 13 enters the cloth on the downward movement of the cloth feeding dog, and leaves the cloth after the machine feeding dog has been moved rearwardly, and while it is being moved upwardly. Inasmuch as the cloth feeding dog 80 is disengaged from the cloth during the time that it is being moved with the roller 50 to a new off-center position, there will be no movement of the cloth while the needle is in the cloth.

A modified form of the invention is shown in Fig. 7 wherein the indexable control disc 72 is replaced by a manually adjustable control plate 90 having an elongated mounting aperture 91, an upstanding stop lug 92 and a cone engaging opening 93. The control plate 90 is mounted on the post 73 in the same manner as the control disc 72 and the opening 93 cooperates with the cone 70 in the same manner as heretofore described in connection with the openings 71 of disc 72. The elongated aperture 91 enables the operator to manually move the plate 90 transversely of the center post 73 by means of the handle 94 or to rotate the plate about the center post, or both. The rotation of the disc 90 is limited by the engagement of the struck-up lug 92 with the sides of the aperture 27 in the housing 14. It will be obvious from the above description that the operator may by the use of control disc 90 manually vary the stitch pattern by moving the handle 94 and thus the cone engaging opening 93 either longitudinally to move the roller 50 to an off-center position coinciding with either forward or backward movement of the cloth, or laterally to move the roller to an off-center position, coinciding with sideways movement of the cloth, or any combination of longitudinal and lateral movements.

Another means of manually controlling the off-center location of the roller 50 and thus the movement of the cloth can be accomplished by means of a pantograph, such as is shown in Figure 7A. The pantograph 135 has a mounting aperture 136 by means of which the pantograph is mounted on the post 72, an opening 137 which cooperates with the cone 70 in the same manner as the opening 71 as heretofore described, a stop in the form of a pin 138 which is adapted to engage the sides of the aperture 27 in the housing of the attachment to limit the movement of the opening 137, and a handle 139 for manual movement of the pantograph and thus the programming opening 137. In operation the pantograph 135 has the same resulting function as the manually ad-

justable control plate 90 heretofore described. The use of a pantograph to control the movement of the cone 70 has one advantage over the use of the previously described control plate 90, in that the cloth will always be moved in the direction of the movement of the pantograph operating handle 139. In the case of the control plate 90, forward or rearward movement of the handle 94 would cause forward or rearward movement respectively of the cloth, while leftward movement of the handle would cause rightward movement of the cloth and vice versa, due to the arrangement of the linkage connecting the cone to the centering roller 50.

A further modification of the structure heretofore described is shown in Fig. 8 wherein the device has been adapted for use with either a large or a small control disc 72 or with an endless belt or strip 100. The structure is shown in Fig. 8 in connection with a perforated belt 100 which, in a manner similar to the program control disc 72 heretofore described, determines the movement of the cloth feeding dog. An advancing crank 101 is pivotally mounted on the center post 102 with its free end pivotally connected to the link 83. The crank 101 has an arm 101' of relatively thin cross-section on which is mounted the advancing pawl 103. A locating arm 104 of relatively thin cross-section is fixedly mounted to the center post 102 and has mounted on its end the detent 105. The endless belt 100 is mounted on rollers 106 and 106' and is maintained in lateral position by means of guide rollers 107 and 108. The belt 100 has index slots as at 109 which perform the same function as the index openings 86 heretofore described in the control disc 72 and has a series of program openings 99 which are successively engaged by the cone 70 in the same manner and for the same purposes as heretofore described in connection with the openings 71 of disc 72. As the belt is advanced by the crank 101, the cone 70 is successively engaged with the program openings 99 to determine the movements of the cloth feeding dog. In general, the use of the belt 100 rather than the disc 72 will permit a greater number of program openings in the one control element.

As shown in Fig. 8, a second center post 110 is provided to the right of the center post 102. The structure shown in Fig. 8 is adapted for use, if desired, with a small diameter disc 72 mounted on the center post 102 or a large diameter disc 72 mounted on the center post 110 in place of the belt 100. In order that one center post will not interfere with a disc mounted on the other post, there is provided a center post selection lever 111 which, as can be seen in Fig. 9, is pivotally mounted on the bottom plate 22 and engages a rocker lever 112. The rocker lever 112 is engaged at opposite ends with the shoulders 113 and 114 of the posts 102 and 110 respectively. When the lever 111 is in the righthand position, the center post 10 is held downwardly out of obstructing relationship with a disc mounted on the center post 102. Conversely, when the switching lever is moved to its lefthand position, the center post 102 will be held downwardly and the center post 110 permitted to be urged upwardly into disc supporting position.

A modification of the disc or belt advancing mechanism heretofore described is shown in Fig. 10. In this modification, the disc advancing link 83 is pivotally connected to a rocker arm 120 which is pivotally mounted at its other end on a center post 121. The advancing crank 122 is also pivotally mounted on the center post 121. Rotatably mounted on the rocker arm 120 is the advancing pawl lock 123 and the ratchet gear 124. The pawl lock 123 and gear 124 are interconnected for simultaneous rotation. The ratchet gear 124, as shown in Fig. 10, has three times as many teeth as the advancing pawl lock 123. This ratio is, of course, arbitrary and could be any ratio desired. As the disc advancing link 83 is moved to the right, the ratchet gear 124 is moved one notch counterclockwise by means of the multiplier pawl 125. As the disc advancing link 83 is moved to the left, the gear 124 is prevented

from rotating due to the ratchet gear detent 126. The ratchet gear 124, therefore, is rotated one notch for each cycle of the machine feed dog. The rocker arm 120 is pivoted counterclockwise as the disc advancing link 83 is moved to the left. If a tooth of the advancing pawl lock 123 is in alignment with the crank 122 at this time, as shown in Fig. 10, the crank will also be rotated counterclockwise to advance the disc or belt. On the rightward movement of the disc advancing link 83, the upstanding lug 127 on the rocker arm 120 will engage the crank 122, as shown in Fig. 10, to return the crank to its starting position. On the rightward movement of the disc advancing link, the ratchet gear and thus the pawl lock 123 will be rotated one notch counterclockwise so that on the next leftward movement of the disc advancing link, the crank 122 will not be engaged with a tooth of the advancing pawl lock 123 and no advance of the belt or disc will take place. Thus, it can be seen that there is provided by this mechanism a means for repeating the same movement of the material between each advancement of the disc or belt thus providing another variation in the character in the resulting stitch. If it is desired to operate the device in a normal fashion with a disc or belt being advanced one index opening for each cycle of the machine feed dog, a tooth of the advancing pawl lock 123 need only be engaged with the crank 122 and the multiplier pawl 125 moved out of operating position. The structure of Fig. 10 also shows a modification of the means of positioning the index opening detent. The index opening detent 128 is mounted on an arm 129 and performs the same function as the positioning detents heretofore described. The arm 129 is an integral part of the detent lever 130 which is pivotally mounted on the center post 121. A slot 131 in the end of the lever receives the pin 132 mounted off-center the nut 133. As can be seen, the position of the detent 128 may be adjusted for proper relationship with the advancing pawl 134 by the rotation of the nut 133 in either direction.

From the above, it can be readily understood that a great variety of complex embroidery patterns may be automatically stitched with the described attachment. A few examples of such embroidery or decorative stitching are shown in Fig. 11. In Fig. 11, A illustrates that with a predesigned programming disc or strip, a name may be easily stitched on a garment for decorative or identification purposes; B illustrates the ability of the machine to stitch a forward, backward, or lateral curvilinear pattern; C illustrates the ability of the machine to stitch a forward, backward, or lateral rectilinear pattern; D illustrates a pattern obtainable from a combination of curvilinear and rectilinear cloth movement, and E illustrates a particularly complex embroidery pattern obtainable automatically by use of the attachment with a predesigned disc or strip.

It thus will be seen that there has been provided, in accordance with the invention, a cloth feeding mechanism having a great deal of versatility and flexibility and particularly adapted for use as an attachment for conventional sewing machines. Inasmuch as the attachment has its own cloth feeding dog which is disengaged from the cloth during the portion of the cycle that it is being moved to a new off-center position and also while the needle is in the cloth, there is no tension placed on the cloth due to the relocation of the cloth feeding dog, nor is there any dragging or scuffing of the cloth over the feed dog. Further the timing of the cloth movement is such that movement of the cloth while the needle is inserted therein is effectively prevented.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in

the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

I claim:

1. A cloth feeding mechanism for sewing machines comprising a lever mounted for vertical and horizontal pivoting movement, an upwardly facing cloth feed dog carried by one end of the lever, a follower on said one end of the lever, means operated by the driving means of the sewing machine for raising and lowering the feed dog and engageable with said follower to move the said end of the lever while in raised position to a predetermined locus in a horizontal plane, and means for moving the feed dog while in lowered position to a variable selected locus spaced horizontally from said predetermined locus comprising a conical follower operatively connected to the other end of the lever and facing approximately at right angles to the plane of the lever, a control element having a positioning hole arranged to be brought into partial registry with the conical follower, and means for seating the conical follower in the positioning hole to impart a selected horizontal movement to the dog.

2. A cloth feeding mechanism as defined in claim 1 wherein the control element has a plurality of positioning holes arranged to be brought sequentially into partial registry with the conical follower and including means for indexing the control element.

3. A cloth feeding mechanism as defined in claim 2 wherein the control element is a rotatably mounted disc having a series of round holes at varying distances from the center of the disc and at varying distances from each other.

4. A cloth feeding mechanism as defined in claim 2 wherein the control element is a strip mounted for longitudinal movement and having a series of round holes of irregular spacing.

5. A cloth feeding attachment for sewing machines comprising a relatively flat housing adapted to be secured to the bed plate of a sewing machine over the machine feed dog actuating mechanism thereof, a cloth feeding dog registering with an opening in the upper surface of said housing and mounted for vertical and horizontal movement, means operable by the machine dog actuating mechanism of the sewing machine and operatively engageable with the cloth feeding dog for raising and lowering the cloth feeding dog and for moving the cloth feeding dog horizontally while in raised position to a fixed first locus, and means responsive to lowering of the cloth feeding dog for moving the cloth feeding dog horizontally to a second locus spaced from said first locus in any horizontal direction.

6. A cloth feeding attachment for sewing machines as defined in claim 5 wherein the means responsive to lowering of the cloth feeding dog for moving the cloth feed dog horizontally to a second locus is provided with means for varying the second locus.

7. A cloth feeding attachment for sewing machines comprising a housing adapted to be secured to the bed plate of a sewing machine over the feed dog thereof, a cloth feeding dog registering with an opening in the upper surface of the housing and mounted for vertical and horizontal movement, means disposed between and engageable with the feed dog of the machine and the cloth feeding dog for raising and lowering the cloth feeding dog and for moving it horizontally to a fixed first locus while in raised position in response to movement of the machine feed dog, and means in the housing connected to the cloth feeding dog for moving the cloth feeding dog horizontally to a selected locus spaced from said first locus while the cloth feeding dog is in lowered position.

8. A cloth feeding attachment for sewing machines

as defined in claim 7 wherein the means for moving the cloth feeding dog horizontally to a selected locus spaced from said first locus while the cloth feeding dog is in lowered position comprises biasing means operatively connected to the cloth feeding dog and variable positioning means for controlling movement of the cloth feeding dog responsive to the biasing means.

9. A cloth feeding attachment for sewing machines comprising a frame adapted to be mounted on the bed plate of a sewing machine overlying the feed dog thereof, an upwardly facing cloth feeding dog mounted on the frame for vertical and horizontal movement, means adapted to be engaged by the feed dog of the machine and operatively connected to the cloth feeding dog for raising and lowering the cloth feeding dog in synchronism with the feed dog of the machine, a first follower connected to the cloth feeding dog, centering means adapted to be driven by the feed dog of the machine and cooperating with the first follower for moving the cloth feeding dog while it is in raised position to a fixed first locus, a second follower connected to the cloth feeding dog, and positioning means cooperating with the second follower to move the cloth feeding dog to a second locus while in lowered position.

10. A cloth feeding attachment for sewing machines comprising a housing adapted to be mounted on the bed plate of a sewing machine overlying the feed dog thereof, a slide in the housing arranged for engagement with the machine feed dog and mounted for vertical and horizontal reciprocating motion therewith, a cloth feeding dog registering with an opening in the upper surface of the housing supported for vertical movement on the slide but movable independently thereof in a horizontal direction, a first follower connected to the cloth feeding dog, centering means operatively connected to the slide and cooperating with the first follower for returning the cloth feeding dog to a predetermined locus during movement of the slide in raised position, a second follower connected to the cloth feeding dog, and variable positioning means cooperating with the second follower for locating the cloth feeding dog while it is in lowered position in a selected second locus spaced from said predetermined locus.

11. In a cloth feeding mechanism for sewing machines, a slide mounted for reciprocating motion, means operatively connected to the feed dog driving mechanism of the sewing machine and engageable with the slide for reciprocating the slide in response to movement of the feed dog mechanism of the sewing machine, a pair of pivotal centering arms connected to the slide for movement in response to reciprocation of the slide, a cloth feeding dog mounted for movement relative to the slide, and a centering roller attached to the cloth feeding dog and embraceable by said centering arms to move the cloth feeding dog to a first fixed locus from a second locus spaced horizontally therefrom in response to reciprocation of the slide.

12. In a cloth feeding mechanism for sewing machines, a frame, a slide mounted for reciprocating movement on the frame, means operatively connected to the feed dog driving mechanism of the sewing machine and engageable with the slide for reciprocating the slide in response to movement of the feed dog mechanism of the sewing machine, a pair of arcuate overlapping centering arms pivotally mounted on the frame and having their ends engaged by the slide, a cloth feeding dog mounted for movement relative to the slide, and a centering roller attached to the cloth feeding dog and embraceable by said centering arms to move said cloth feed dog to a first fixed locus from a second locus spaced horizontally therefrom in response to reciprocation of the slide.

13. In a cloth feeding attachment for sewing machines, a frame adapted to be secured to the bed plate of a sewing machine overlying the feed dog thereof, a slide on the frame mounted for vertical movement and

for horizontal reciprocating movement, said slide being engageable with the feed dog of the sewing machine for movement therewith, a cloth feeding dog movably supported on the frame above the feed dog of the sewing machine, means connected to the slide and engageable with the cloth feeding dog for moving the cloth feeding dog to a first position upon movement of the slide in one direction, and means independent of said slide for moving the cloth feeding dog to a variable second position.

14. In a cloth feeding attachment for sewing machines, a frame adapted to be secured to the bed plate of a sewing machine overlying the feed dog thereof, a slide mounted on the frame for vertical movement and limited horizontal reciprocating movement, said slide being engageable with the feed dog of the machine for movement therewith, an upwardly facing cloth feeding dog mounted on the slide for vertical movement therewith but movable relative thereto in a horizontal direction, a first follower connected to the cloth feeding dog, positioning means operatively connected to the slide and cooperating with the first follower for moving the cloth feeding dog to a first position when the slide is moved in one direction, a second follower connected to the cloth feeding dog, and means cooperating with the second follower to change the location of the cloth feeding dog upon return movement of the slide.

15. In a cloth feeding attachment for sewing machines, a frame adapted to be secured to the bed plate of a sewing machine overlying the feed dog thereof, a slide mounted on the frame for vertical movement and limited horizontal reciprocating movement, said slide being engageable with the feed dog of the machine for movement therewith, an upwardly facing cloth feeding dog supported on the slide for vertical movement therewith but movable relative thereto in a horizontal direction, means connected to the slide and engageable with the cloth feeding dog to move the same to a predetermined locus during movement of the slide while in the raised position, second positioning means comprising a follower and a control element having a series of variously spaced cam surfaces adapted to be brought sequentially into registry with the follower, lever means connecting the follower and the cloth feeding dog, and means effective for moving the follower into contact with one of said cam surfaces when the slide is in lowered position.

16. In a cloth feeding attachment for sewing machines, a frame adapted to be secured to the bed plate of a sewing machine overlying the feed dog thereof, a slide mounted on the frame for vertical movement and limited horizontal reciprocating movement, said slide being engageable with the feed dog of the machine for movement therewith, an upwardly facing cloth feeding dog supported on the slide for vertical movement therewith but movable relative thereto in a horizontal direction, means connected to the slide and engageable with the cloth feeding dog to move the same to a predetermined locus during movement of the slide in one direction while in the raised position, second positioning means comprising a follower and a variable guide for the follower connecting lever means operatively connecting the follower and the cloth feeding dog, and means effective for moving the follower into engagement with the guide while the slide is in lowered position.

17. In a cloth feeding attachment for sewing machines, a frame adapted to be secured to the bed plate of a sewing machine overlying the feed dog thereof, a slide mounted on the frame for vertical movement and limited horizontal reciprocating movement, said slide being engageable with the feed dog of the machine for movement therewith, an upwardly facing cloth feeding dog supported on the slide for vertical movement therewith but movable relative thereto in a horizontal direction, means connected to the slide and engageable with the cloth feeding dog

to move the same to a predetermined locus during movement of the slide in one direction, second positioning means comprising a conical follower and a control element having a series of variously spaced circular control openings adapted to be brought sequentially into partial registry with the conical follower, adjustable lever means between the conical follower and the cloth feeding dog, and means effective for moving the conical follower into an adjacent control opening during movement of the slide in a direction opposite to said one direction.

18. In a cloth feeding attachment for sewing machines, a frame adapted to be mounted on the bed plate of a sewing machine overlying the feed dog thereof, an upwardly facing cloth feeding dog mounted for vertical and horizontal movement, means engageable with the feed dog of the sewing machine for raising and lowering the cloth feeding dog therewith and for moving the cloth feeding dog to a predetermined locus while in raised position, a first lever arm secured to the cloth feeding dog at approximately right angles thereto having a vertical pivot and a horizontal pivot intermediate its ends, a second lever arm extending approximately at right angles to the first lever arm and pivotally connected thereto intermediate its ends, a horizontal bearing surface for one end of the second lever arm, an upwardly facing conical point on the other end of the second lever arm, spring means upwardly biasing said other end of the second lever arm, a vertically extending pivot for the second lever arm between the conical point and the first lever arm, and a control element having a circular hole in partial registry with said conical point.

19. A cloth feeding attachment for sewing machines comprising a frame adapted to be mounted on the bed of a sewing machine to overlie the feed dog thereof, a slide on the machine engageable with the feed dog of the sewing machine, said slide being mounted for longitudinal reciprocal movement and vertical movement responsive to movement of the sewing machine feed dog, a pair of pivotally mounted overlapping arcuate centering levers connected to the slide for movement to a centering position on the feed stroke of the feed dog and for movement to an open position on the return stroke of the feed dog, a cloth feeding dog slidably supported on the slide for vertical movement therewith, a follower connected to the slide and extending between the centering levers, a first positioning lever fixed to the slide and extending approximately at right angles to the path of longitudinal movement thereof, a second positioning lever pivotally attached to the first positioning lever and extending approximately at right angles thereto, pivot means for the first lever comprising a pivot received in a slot extending longitudinally of the first lever, pivot means for the second lever comprising a pivot extending into a slot extending longitudinally of the second lever, a conically shaped follower on the end of the second lever, positioning means for the conical follower comprising an indexable member having a plurality of holes for registry individually with the conical follower, and ratchet means connected to the slide for indexing the indexable member.

20. In a cloth feeding attachment for sewing machines, a housing adapted to be secured to the bed plate of a sewing machine overlying the feed dog thereof, a slide in the housing adapted to rest on the feed dog and mounted for vertical and horizontal reciprocating movement therewith, an upwardly facing cloth feeding dog resting on the slide for vertical movement therewith but movable independently thereof in a horizontal direction, centering means connected to the slide for actuation thereby, a centering roller depending from the cloth feeding dog for engagement by the centering means, a first pivoted lever arm connected to the cloth feeding dog, a second pivoted lever arm pivotally connected to the first lever arm and extending at an angle thereto, a conically shaped follower on the second lever arm, a control element having a series of variously spaced holes adapted to be brought into reg-

istry sequentially with the follower, means biasing the follower toward the control element, and ratchet means connected to the slide for indexing the control element during movement of the slide in a centering direction.

21. In a cloth feeding attachment for sewing machines, a housing adapted to be secured to the bed plate of a sewing machine overlying the feed dog thereof, a slide in the housing adapted to rest on the feed dog and mounted for vertical and horizontal reciprocating movement therewith, an upwardly facing cloth feeding dog resting on the slide for vertical movement therewith but movable independently thereof in a horizontal direction, a centering means connected to the slide for actuation thereby, a centering roller depending from the cloth feeding dog for engagement by the centering means, a first lever arm connected to the cloth feeding dog and mounted for vertical and horizontal pivoting movement, a second lever arm pivotally connected to the first lever arm at approximately right angles thereto and mounted for vertical and horizontal pivoting movement, a vertically projecting conical point on the second lever arm, a control element having a series of variously spaced holes adapted to be brought into partial registry sequentially with the conical point, means biasing the conical point into an adjacent one of said holes when the cloth feeding dog is in lowered position and ratchet means connected to the slide for indexing the control element during movement of the slide in a centering direction.

22. In a cloth feeding attachment for sewing machines, a housing adapted to be secured to the bed plate of a sewing machine overlying the feed dog thereof, a slide in the housing adapted to rest on the feed dog and mounted for vertical and horizontal reciprocating movement therewith, an upwardly facing cloth feeding dog resting on the slide for vertical movement therewith but movable independently thereof in a horizontal direction, a centering means connected to the slide for actuation thereby, a centering roller depending from the cloth feeding dog for engagement by the centering means, a first lever arm connected to the cloth feeding dog, pivot means for the first lever arm comprising a stationary pivot and a longitudinal slot in the first lever arm, a second lever arm pivotally connected to the first lever arm and extending approximately at right angles thereto, pivot means for the second lever arm comprising a stationary pivot and a longitudinal slot in the second lever arm, an upwardly projecting conical point on the second lever arm, means biasing the conical point in an upward direction, a control element having a series of variously spaced holes adapted to be brought into partial registry sequentially with the conical point, and ratchet means connected to the slide for indexing the control element during movement of the slide in a centering direction.

23. In a cloth feeding attachment for sewing machines, a housing adapted to be secured to the bed plate of a sewing machine overlying the feed dog thereof, a slide in the housing adapted to rest on the feed dog and mounted for vertical and horizontal reciprocating movement therewith, an upwardly facing cloth feeding dog resting on the slide for vertical movement therewith but movable independently thereof in a horizontal direction, a pair of pivoted centering arms connected to the slide for oscillation therewith, a centering roller depending from the cloth feeding dog for engagement by the centering arms, a first lever arm connected to the cloth feeding dog and mounted for vertical and horizontal pivoting movement, a second lever arm pivotally connected to the first lever arm at approximately right angles thereto and mounted for vertical and horizontal pivoting movement, an upwardly projecting conical point on the second lever arm, a spring urging the conical point in an upward direction, a control element having a series of variously spaced holes adapted to be brought into partial registry sequentially with the conical point, and ratchet means connected to

the slide for indexing the control element during movement of the slide in a centering direction.

24. In a cloth feeding attachment for sewing machines, a housing adapted to be secured to the bed plate of a sewing machine overlying the feed dog thereof, a slide in the housing adapted to rest on the feed dog and mounted for vertical and horizontal reciprocating movement therewith, an upwardly facing cloth feeding dog resting on the slide for vertical movement therewith but movable independently thereof in a horizontal direction, a pair of pivoted centering arms connected to the slide for oscillation therewith, a centering roller depending from the cloth feeding dog for engagement by the centering arms, a first lever arm connected to the cloth feeding dog, variable pivot means for the first lever arm comprising an adjustable pivot and a longitudinal slot in the first lever arm, a second lever arm pivotally connected to the first lever arm and extending approximately at right angles thereto, variable pivot means for the second lever arm comprising an adjustable pivot and a longitudinal slot in the second lever arm, an upwardly projecting conical point on the second lever arm, a spring urging the conical point in an upward direction, a control element having a series of variously spaced holes adapted to be brought into partial registry sequentially with the conical point, and ratchet means connected to the slide for indexing the control element during movement of the slide in a centering direction.

25. In a cloth feeding attachment for sewing machines, a housing adapted to be secured to the bed plate of a sewing machine overlying the feed dog thereof, a slide in the housing adapted to rest on the feed dog and mounted for vertical and horizontal reciprocating movement therewith, an upwardly facing cloth feeding dog resting on the slide for vertical movement therewith but movable independently thereof in a horizontal direction, a pair of pivoted centering arms connected to the slide for oscillation therewith, a centering roller depending from the cloth feeding dog for engagement by the centering arms, a first lever arm connected to the cloth feeding dog, variable pivot means for the first lever arm to permit pivoting thereof in a horizontal direction comprising an adjustable pivot and a longitudinal slot in the first lever arm, pivot means to permit pivoting movement of the first lever arm in a vertical direction, a second lever arm pivotally connected to the first lever arm and extending approximately at right angles thereto, variable pivot means for the second lever arm to permit pivoting movement thereof in a horizontal direction, comprising an adjustable pivot and a longitudinal slot in the second lever arm, pivot means spaced from the first lever arm to permit pivoting movement of the second lever arm in a vertical direction, an upwardly projecting conical point on the second lever arm, a spring urging the conical point in an upward direction, a disc having a series of variously spaced holes adapted to be brought into partial registry sequentially with the conical point, and ratchet means connected to the slide for indexing the disc during movement of the slide in a centering direction.

26. A cloth feeding mechanism for sewing machines comprising an upwardly facing feed dog, a housing having an aperture for reception of the feed dog which aperture is of greater dimensions than the feed dog to permit limited horizontal movement of the feed dog in any direction, a lever arm supporting the feed dog in said aperture, said lever arm being mounted for pivoting movement in a vertical plane and for pivoting and sliding movement in a horizontal plane, means actuated by the driving means of the sewing machine for pivoting the lever in a vertical plane to raise and lower the feed dog, a first follower on the lever, means actuated by the driving means of the sewing machine and engageable with said first follower to position the lever with the feed dog centered in said aperture, a second follower on the lever, and pattern control means engageable with the

second follower to move the lever to position the feed dog in an off-center position in said aperture.

27. A cloth feeding mechanism for sewing machines comprising an upwardly facing feed dog, a housing having an aperture for reception of the feed dog which aperture is of greater dimensions than the feed dog to permit limited horizontal movement of the feed dog in any direction, a lever arm supporting the feed dog in said aperture, said lever arm being mounted for pivoting movement in a vertical plane and for pivoting and sliding movement in a horizontal plane, means actuated by the driving means of the sewing machine for pivoting the lever in a vertical plane to raise and lower the feed dog, a first follower on the lever, means actuated by the driving means of the sewing machine and engageable with said first follower to position the lever with the feed dog centered in said aperture, a second follower on the lever, pattern control means engageable with the second follower to move the lever to position the feed dog in an off-center position in said aperture, and means for varying the moment arm of said lever.

28. A sewing machine having stitch-forming means including a needle, an upwardly facing cloth feed dog, a housing having an aperture for reception of the feed dog which aperture is of greater dimensions than the feed dog to permit limited horizontal movement of the feed dog in any direction, mounting means supporting the feed dog in said aperture for vertical movement and for radial horizontal movement relative to the needle in varied directions, means actuated by the driving means of the sewing machine for raising and lowering the feed dog, pattern control means for moving the feed dog horizontally in varied directions to an off-center position in said aperture relative to the needle while the feed dog is in lowered position so as to position the feed dog in said off-center position for engagement with a preselected portion of the work, and means actuated by the drive means of the sewing machine for centering the feed dog in said aperture relative to the needle while the feed dog is in raised position to move the cloth into stitching position and forming a stitch while the dog is in said center position.

29. A cloth-feeding attachment for a sewing machine of a type having a feed dog mounted in an aperture of

the bed plate thereof and having driving means for the feed dog, said attachment comprising a housing, means for mounting the housing on the bed plate of a sewing machine overlying the feed dog thereof and rendering the feed dog inoperative to engage the work, an auxiliary feed dog disposed in an aperture of the housing, programming means for moving the auxiliary feed dog horizontally in varied direction from an initial position independently of movement of the machine feed dog, and means for driving the auxiliary feed dog horizontally to said initial position including means for attachment to the feed dog of the sewing machine.

30. A cloth-feeding attachment for a sewing machine of the type having a feed dog mounted in an aperture of the bed plate thereof and having driving means for sequentially raising the feed dog and moving it in a first horizontal direction and then lowering a feed dog and moving it in a reverse direction, said attachment comprising a housing, means for mounting the housing on the bed plate of the sewing machine with the housing overlying the feed dog and rendering the feed dog inoperative to engage the work, an auxiliary feed dog disposed in an aperture of the housing, a support for the auxiliary feed dog movable vertically and also movable horizontally in varied directions, means for raising and lowering the support responsive to raising and lowering of the feed dog of the sewing machine including a driving element and means for connecting the driving element to the feed dog of the sewing machine for movement therewith, programming means for moving the auxiliary feed dog in varied horizontal directions independently of movement of the feed dog of the sewing machine while the feed dog of the sewing machine is in lowered position, and means for returning the auxiliary feed dog in a horizontal direction to original position while the feed dog is in raised position including actuating means connected to said driving element.

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