Dec. 4, 1951 R. L. HOFFMEISTER 2,577,705

ADJUSTABLE FEED MECHANISM FOR SEWING MACHINES

Filed Sept. 28, 1949 3 Sheets-Sheet 1

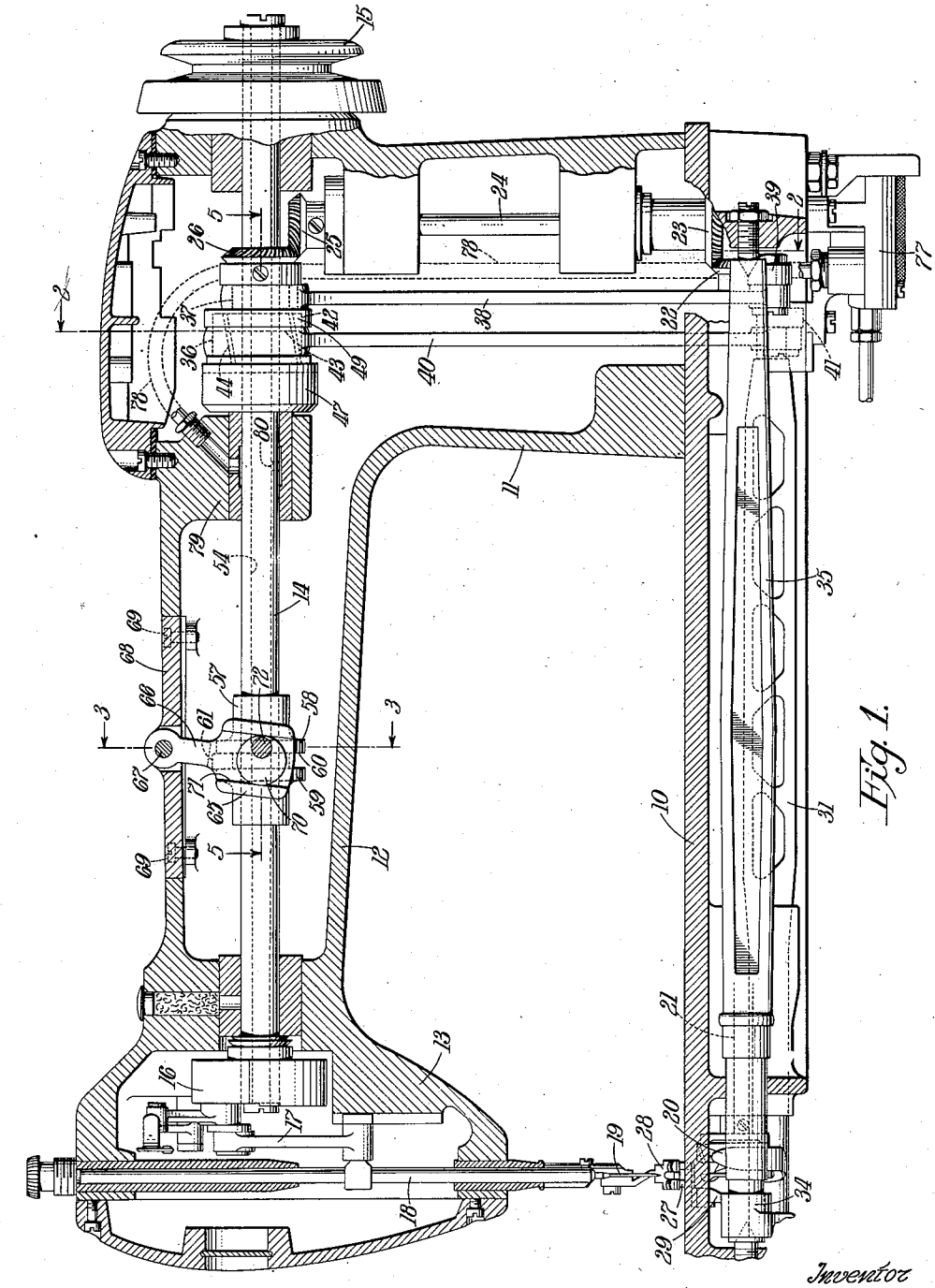


Fig. 1.

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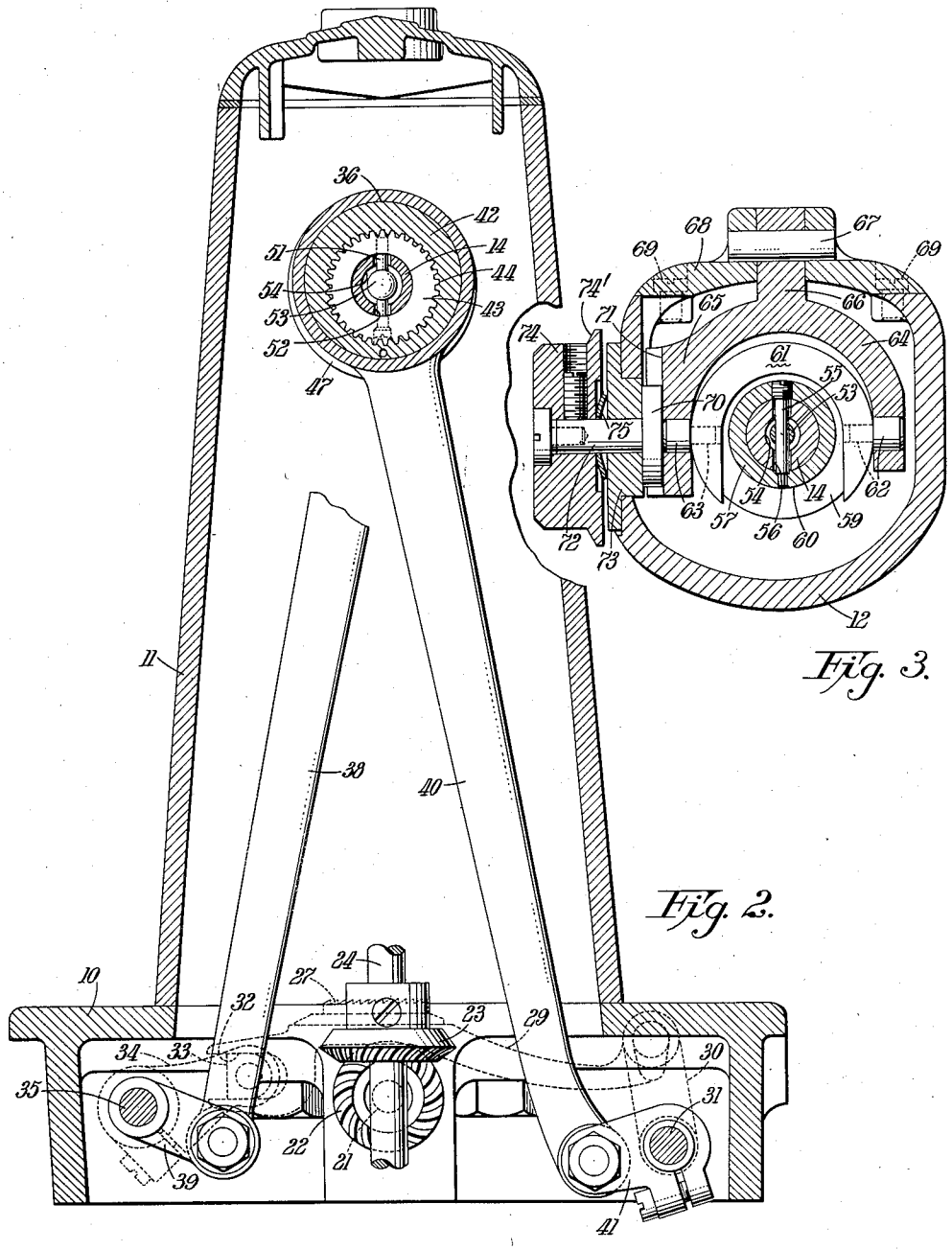


Fig. 3.

Fig. 2.

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Filed Sept. 28, 1949 3 Sheets-Sheet 3

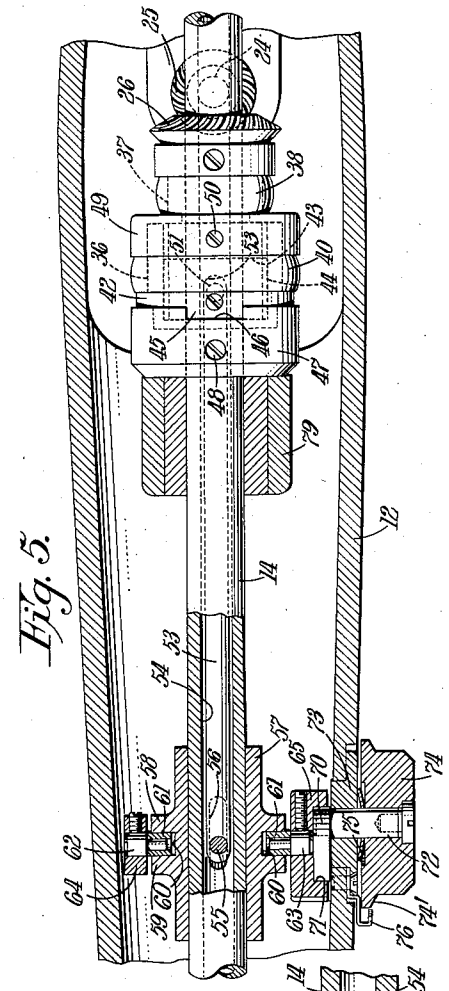


Fig. 5.

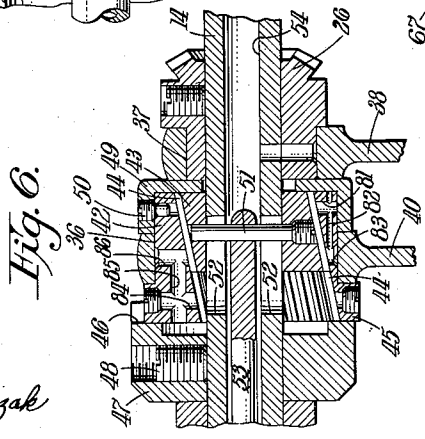


Fig. 6.

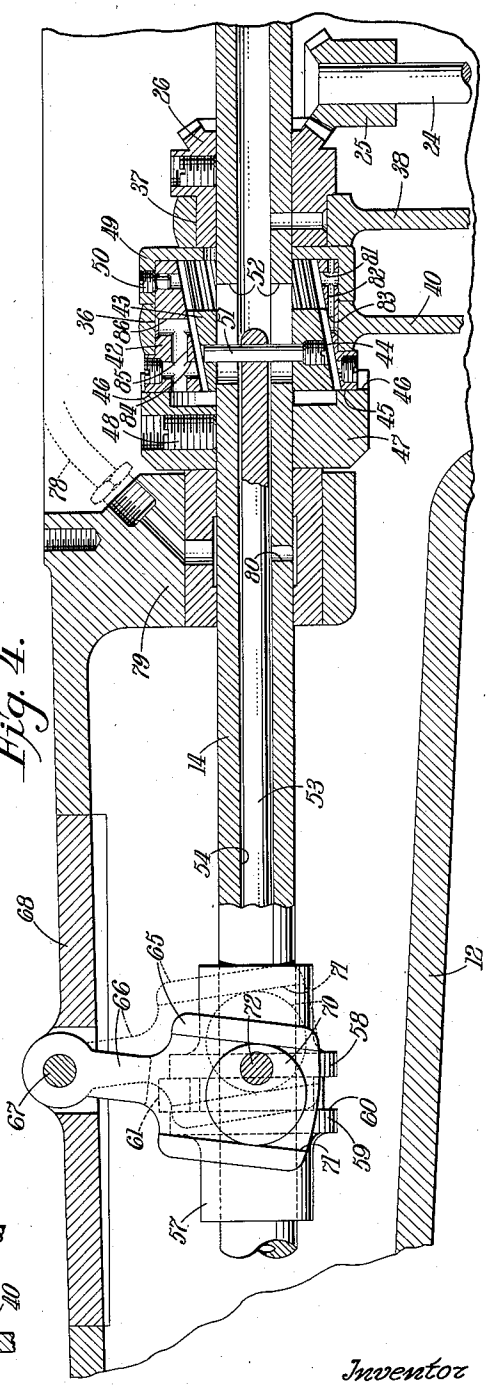


Fig. 4.

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UNITED STATES PATENT OFFICE

2,577,705

ADJUSTABLE FEED MECHANISM FOR SEWING MACHINES

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This invention relates to sewing machines and more particularly to a work feeding mechanism therefor, in which a feed-actuating eccentric may be adjusted to vary its eccentricity and thereby to change the length of the stitches.

The invention has for an object to provide a mechanism for adjusting the stitch-length while the machine is in operation, the stitch-length adjustment being accomplished by means of a regulating lever disposed at the front of the sewing machine in a location particularly convenient to the operator.

Another object of the present invention is to provide an adjustable feed mechanism for a sewing machine in which the feed actuating eccentrics are located within a closed lubrication compartment and the devices for regulating the eccentricity of the feed-advance eccentric have substantially oil-tight connections with the wall of said lubrication compartment.

Still another object of the invention is to provide a feed regulating mechanism which is of a positive and preferably self-irreversible nature so that the eccentric for any position of adjustment is positively held at the desired eccentricity, from which it cannot move under centrifugal force or by the forces of reaction to which the eccentric may be subjected at high operative speeds.

With the above and more specific objects in view, the invention comprises the devices, combinations, and arrangements of parts hereinafter described in connection with the accompanying drawings from which the several features of the invention and the advantages attained thereby will be readily understood by those skilled in the art.

In the drawings:

Fig. 1 is a longitudinal vertical sectional view of a machine having my invention embodied therein.

Fig. 2 is a transverse vertical sectional view taken substantially along the line 2—2, Fig. 1.

Fig. 3 is a sectional view taken substantially along the line 3—3, Fig. 1, showing the details of construction of the hand-operated regulating means for adjusting the eccentricity of the feed-actuating eccentric.

Fig. 4 is a longitudinal vertical sectional view taken substantially along the axis of the arm-shaft with the feed eccentrics in section to show their details of construction and the lubrication conducting ports used to supply lubricant to the bearing surfaces.

Fig. 5 is a horizontal sectional view taken substantially along the line 5—5, Fig. 1.

Fig. 6 is a vertical sectional view taken through the axis of the arm-shaft, showing the feed-advance eccentric shifted to a position of substantially zero eccentricity.

Referring to the drawings, the present improvement has been embodied in a sewing machine including a frame comprising a bed 10, from one end of which rises the hollow standard 11 of a tubular bracket-arm 12 overhanging the bed and terminating at its free end in a hollow head 13. Journaled in the bracket-arm 12 for rotary movement is an arm-shaft 14 having a pulley 15 fixed to one of its ends. To the other end of the shaft 14 there is secured a crank 16 which actuates, through a link 17, a needle-bar 18 which is journaled in bearings in the head 13 and to which is attached a thread-carrying needle 19. Cooperating with the needle 19 in the formation of lock-stitches is a loop-taker 20, of the conventional rotary hook type. The rotary hook 20 is carried by one end of a rotary bed-shaft 21 (Fig. 1) connected at its other end by gearing 22 and 23 to a vertical shaft 24. The vertical shaft 24 is connected by gearing 25 and 26 to the arm-shaft 14.

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The work to be stitched is adapted to be fed past the stitch-forming devices by means of a feed-dog 27 against which the work is yieldingly held by the usual spring-biased presser-foot 28. As will be observed in Fig. 2, the feed-dog 27 is mounted on a feed-bar 29 pivotally connected at one end to the usual feed-advance rocker 30 carried by the outer end-portion of a feed-advance and -return rock-shaft 31. At its other end, the feed-bar 29 is forked as at 32 to embrace a slide-block 33 pivoted to one end of a feed-lift rocker 34 clamped upon the front end-portion of a feed-lift rock-shaft 35.

The two rock-shafts 31 and 35 are actuated from the rotary arm-shaft 14 by means of separate eccentrics 36 and 37. The eccentric 36 is the feed-advance eccentric and is constructed so that its eccentricity can be adjusted to vary the stitch-length, while the eccentric 37 is the feed-lift eccentric and, preferably, it is designed to have a fixed eccentricity. The feed-lift eccentric 37 is preferably cut into the hub of the gear 26 and is embraced by the upper end of a pitman 38 which is pivoted at its lower end to the extremity of a rock-arm 39 preferably integral with the feed-lift rock-shaft 35. The adjustable eccentric 36 is embraced by the upper end of a pitman 40 having its lower end pivoted to the free end of a rocker 41 which is preferably clamped on the feed-advance rock-shaft 31. Actuation of the rotary arm-shaft 14 will impart to the feed-advance and feed-lift rock-shafts 31 and 35 oscillations which transmit a conventional four-motion travel to the feed-dog 27. The amount of lift imparted to the feed-dog 27 is fixed since the eccentricity of the feed-lift eccentric 37 is not adjustable. Change in the length of stitch is effected by changing the eccentricity of the feed-advance eccentric 36 and this invention pertains particularly to the details of the adjustable eccentric and the means employed for regulating the eccentricity of the eccentric.

Referring now to Figs. 4 and 6, it will be seen

that the feed-advance eccentric 36 is composed of two parts, the outer part 42 and the inner part 43. These two parts, of which one is disposed wholly within the other, have splined cylindrical engaging surfaces 44 on an axis inclined to the longitudinal axis of the arm-shaft 14. The outer part 42 of the eccentric is fixed for rotation with the arm-shaft 14, see Figs. 4 and 5, by engagement of a radial projection 45 on the outer part 42 of the eccentric with a slot 46 in a collar 47 fixed on the shaft 14 by a set screw 48. The outer part 42 of the eccentric 36 is constrained against movement longitudinally of the shaft 14 by the feed-lift eccentric 37 which is fixed on the shaft 14, the feed-lift eccentric abutting against the outer face of a thrust-cap 49 secured on the outer part 42 by a set screw 50. From the above, it will be understood that the outer part 42 of the eccentric is confined against movement longitudinally of the arm-shaft 14 by the collar 47 on one side and the gear 26 on the other side, and that it is free to shift radially of the arm-shaft 14 in a line determined by the slot 46 in the collar 47.

The outer part 42 of the eccentric 36 is adapted to be shifted radially of the arm-shaft 14 to effect a change in the eccentricity of the eccentric, by movement of the inner part 43 lengthwise of the arm-shaft. To move the inner part 43 lengthwise of the arm-shaft, the inner part has threaded into it a diameter pin 51 extending through alined slots 52 formed in the hollow arm-shaft 14. Connected at the midpoint of the diameter pin 51 is one end of a shift-rod 53 endwise slidable in the bore 54 of the hollow arm-shaft 14. At its other end, the shift-rod 53 is connected to a diameter pin 55 (Figs. 3 and 5) extending through alined slots 56 in the arm-shaft 14 and threaded into a sliding sleeve 57 journaled on the arm-shaft 14, which sliding sleeve is adapted to rotate with said arm-shaft. The sliding sleeve 57 is flanged, as at 58 and 59, to define between said flanges an annular groove 60 in which is disposed an inverted U-shaped shoe 61 (Figs. 3 and 5) pivotally supported on a pair of fulcrum-pins 62 and 63 secured in the depending limbs 64 and 65 of a yoke 66. The yoke 66 is pivotally hung on a supporting pin 67 pressed into a cover-plate 68 detachably secured to the bracket-arm 12 by the screws 69. The yoke 66 is forcibly swung about its supporting pin 67 into selected positions by manually controlled means including a cam or eccentric 70 (Figs. 3 and 5) which fits into a slot 71 formed in the limb 65 of the yoke 66. The eccentric 70 is carried by a shaft 72 which is journaled in a shouldered bushing 73 mounted in the front wall of the bracket-arm 12. Secured on the exposed end of the shaft 72 is a knob 74 which is adapted to be grasped by the operator and turned to effect a change in the stitch-length. To preclude accidental turning of the eccentric 70 a spring-washer 75 is interposed between the knob 74 and the face of the shouldered bushing 73, whereby the eccentric 70 is frictionally held in set position. To assist in obtaining the proper setting of the knob 74, there is scribed preferably on a flange 74' on the knob 74 indicia which co-operate with a fixed pointer 76 (Fig. 5) secured beneath the shoulder of the bushing 73.

From the above description, it will be understood that when it is desired to regulate the length of the stitch, the knob 74 may be turned, either while the machine is in operation or when the machine is stopped. Turning of the knob 74 turns the eccentric 70 which swings the yoke 66 about its supporting fulcrum 67. The movement of the yoke 66, through the shoe 61, transmits to the sleeve 57 sliding movement endwise of the arm-shaft 14. The sleeve 57, through the shift-rod 53, moves the inner part 43 of the eccentric 36 relative to the outer part 42. Because of the inclination of the splined cylindrical engaging surfaces 44 of the inner and outer parts of the eccentric 36, movement of the inner part 43 relative to the outer part 42, results in the outer part moving radially of the arm-shaft 14 along a line determined by the groove 46 in the collar 47. Thus, the eccentricity of the eccentric 36 is changed. In the present case, the parts in the position shown in Fig. 4 illustrate the eccentric 36 in maximum eccentricity, while in Fig. 6, the parts are shown in substantially zero eccentricity. It will be appreciated that the inner and outer parts of the eccentric 36 can be proportioned so that in moving from one extreme position to the other extreme position the eccentricity of the eccentric shifts from a maximum on one side of the axis of the arm-shaft to a maximum on the other side of said axis, and in which case the feed shifts from maximum forward feed to maximum reverse feed. It will be further understood that a suitably shaped cam can be substituted for the eccentric 70 and when this is done the scale on the flange 74' of the knob 74 can be linear.

The present adjustable feed mechanism is shown as applied to a high speed sewing machine of the type having a lubricating system similar to that disclosed in the U. S. patent of R. Kaier, No. 2,206,285, issued July 2, 1940. In the present drawings, oil under pressure is elevated from a sump beneath the bed 10 by a centrifugal pump 77 (Fig. 1) through a conduit 78 which is connected to a bearing-lug 79 for the arm-shaft 14. The oil delivered to the bearing lug 79 is conducted through the radial duct 80 (Fig. 1) into the bore 54 of the arm-shaft 14. Some of the oil in the bore flows outwardly through the alined slots 52 (Figs. 4 and 6) and into the cavity defined by the splined bore of the outer part 42 of the eccentric 36. Centrifugal force causes some of the oil in the cavity of the outer part 42 to travel through the ducts 81, 82 and 83 to the eccentric face 36 when the eccentric parts 42 and 43 are in the position shown in Fig. 4. When the eccentric parts 42 and 43 are in the position shown in Fig. 6, some of the oil in the cavity of the outer part 42 flows outwardly through the ducts 84, 85 and 86 to the eccentric face 36. Since one end of the duct 85 is opened, oil is also led into the groove 46 in the collar 47 to lubricate the engaging surfaces of the projection 45. It will be understood that the eccentrics 36 and 37 are located within a substantially closed lubrication compartment and that the excess oil from the eccentrics is returned to the sump at the bottom of the compartment. The shaft engaging bore of the sliding sleeve 57 is lubricated by oil from the bore 54 of the arm-shaft 14 which is transmitted through the slots 56 in the arm-shaft.

It will be understood that the design of the eccentric adjusting connections is such that no positive locking means is required to maintain the inner element 43 of the eccentric 36 in set position. The connections are self-irreversible to the extent that centrifugal force or the forces of reaction set up by high speed operation of the eccentric do not effect an accidental shift of the inner element 43 of the eccentric. The ad-

vantage of this construction is that the stitch-length can be changed without first having to release any locking device.

Having thus set forth the nature of the invention, what I claim herein is:

1. A work-feeding mechanism for sewing machines having a rotary shaft, comprising a movable feed-dog, a feed-lift eccentric operatively connected to said feed-dog, an adjustable feed-advance eccentric mounted on said rotary shaft and operatively connected to said feed-dog and including relatively movable inner and outer elements having interengaging surfaces inclined to the longitudinal axis of said rotary shaft, a sleeve slidable on said rotary shaft, a connection between said sleeve and one of the elements of said feed-advance eccentric, an eccentric operatively associated with said sleeve, and means providing for turning said eccentric and thereby shifting said sleeve lengthwise of said rotary shaft.

2. A work-feeding mechanism for sewing machines having a rotary shaft, comprising a movable feed-dog, a feed-lift eccentric operatively connected to said feed-dog, an adjustable feed-advance eccentric mounted on said rotary shaft and operatively connected to said feed-dog and including relatively movable inner and outer elements having interengaging surfaces inclined to the longitudinal axis of said rotary shaft, a sleeve slidable on said rotary shaft, a connection between said sleeve and one of the elements of said feed-advance eccentric, a pivotally mounted yoke straddling said sleeve and connected thereto to permit rotation of said sleeve relative to said yoke, and manually turnable means connected to said yoke providing for swinging said yoke about its pivot.

3. A work-feeding mechanism for sewing machines having a rotary shaft formed with an axial bore, comprising a movable feed-dog, a feed-lift eccentric operatively connected to said feed-dog, an adjustable feed-advance eccentric mounted on said rotary shaft and operatively connected to said feed-dog and including relatively movable inner and outer elements having interengaging surfaces inclined to the longitudinal axis of said rotary shaft, a sleeve slidable on said rotary shaft, a shift-rod endwise slidable in the axial bore of said rotary shaft and connected at one end to said sleeve and at its other end to one of the elements of said feed-advance eccentric, a pivotally mounted yoke straddling said sleeve and connected thereto to permit rotation of said sleeve relative to said yoke, and manually turnable means connected to said yoke providing for swinging said yoke about its pivot.

4. A work-feeding mechanism for sewing machines having a rotary shaft formed with an axial bore, comprising a movable feed-dog, a feed-lift eccentric operatively connected to said feed-dog, an adjustable feed-advance eccentric mounted on said rotary shaft and operatively connected to said feed-dog and including relatively movable inner and outer elements having interengaging surfaces inclined to the longitudinal axis of said rotary shaft, a sleeve slidable on said rotary shaft, a shift-rod endwise slidable in the axial bore of said rotary shaft and connected at one end to said sleeve and at its other end to one of the elements of said feed-advance eccentric, a pivotally mounted yoke straddling said sleeve and connected thereto to permit rotation of said sleeve relative to said yoke, an eccentric operatively connected to said yoke, and means for turning said eccentric to effect a swinging of said yoke about its pivot.

5. A work-feeding mechanism for sewing machines having a rotary shaft formed with an axial bore and alined slots, comprising a movable feed-dog, a feed-lift eccentric operatively connected to said feed-dog, an adjustable feed-advance eccentric mounted on said rotary shaft and operatively connected to said feed-dog and including relatively movable inner and outer elements having interengaging surfaces inclined to the longitudinal axis of said rotary shaft, a sleeve slidable on said rotary shaft, a shift-rod endwise slidable in the axial bore of said rotary shaft, a diameter pin penetrating one end of said shift-rod and extending through said alined slots into the inner element of said feed-advance eccentric, a second diameter pin penetrating the other end of said shift-rod and extending through said alined slots into said sleeve, and connections for shifting said sleeve lengthwise of said shaft.

6. A work-feeding mechanism for sewing machines having a rotary shaft, comprising a movable feed-dog, a feed-lift eccentric operatively connected to said feed-dog, an adjustable feed-advance eccentric mounted on said rotary shaft and operatively connected to said feed-dog and including relatively movable inner and outer elements having interengaging surfaces inclined to the longitudinal axis of said rotary shaft, a sleeve slidable on said rotary shaft and formed with an annular groove, a connection between said sleeve and one of the elements of said feed-advance eccentric, a pivotally supported yoke straddling said sleeve, a shoe disposed in said annular groove and fulcrumed on said yoke, an eccentric operatively connected to said yoke, and means for turning said eccentric to effect a swinging of said yoke about its pivot.

7. A work-feeding mechanism for sewing machines having a rotary shaft, comprising a movable feed-dog, feed-lift means operatively connected to said feed-dog, an adjustable feed-advance eccentric mounted on said rotary shaft and operatively connected to said feed-dog and including inner and outer elements having interengaging surfaces inclined to the longitudinal axis of said rotary shaft, and connections operative at will for positively shifting one of said elements relative to the other of said elements in a direction to vary the eccentricity of said feed-advance eccentric, said connections including a member shiftable along a line parallel to the longitudinal axis of said rotary shaft, a cam operatively associated with said member, and manually operable means connected to said cam providing for turning the same and effecting a shift of said member lengthwise of said rotary shaft.

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