United States Patent

[11] 3,527,183

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[21] Appl. No. **801,951**
[22] Filed **Feb. 25, 1969**
[45] Patented **Sept. 8, 1970**

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[54] WORK FEEDING MECHANISMS FOR SEWING MACHINES

5 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **112/215**
[51] **Int. Cl.** **D05b 27/02**
[50] **Field of Search** ..... 112/215, 203 (Secondary)

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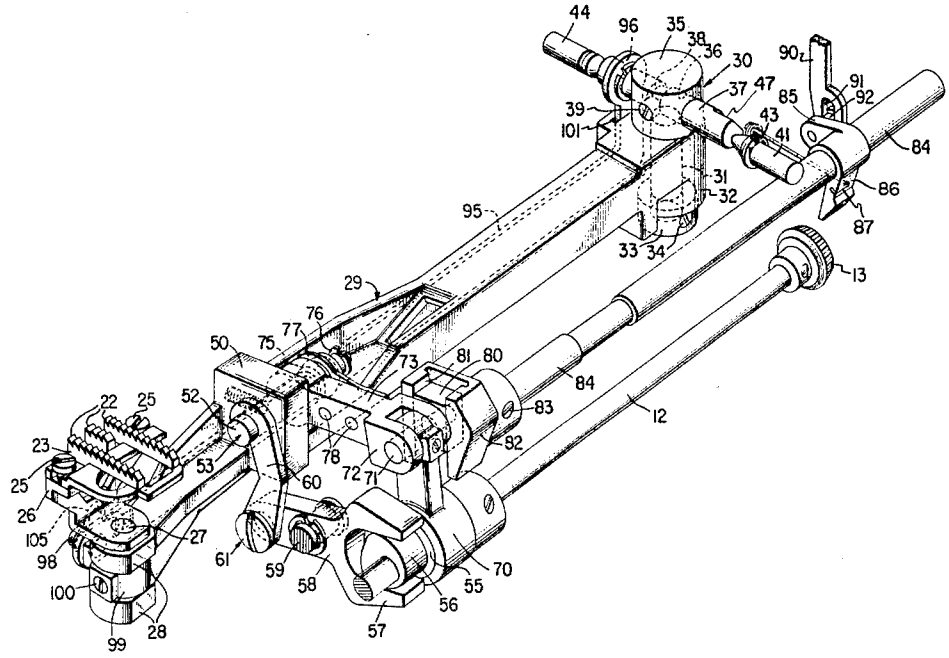
ABSTRACT: A sewing machine work feeding mechanism of the drop feed variety is disclosed in which an elongate feed bar is carried at one extremity in gimbals in the sewing machine frame and at the other extremity has a work engaging feed dog pivoted thereto. Connected to the feed dog is an anchor link extending substantially parallel to the elongated feed bar so that during work feed advance oscillation of the feed bar, the feed dog will be constrained substantially parallel with the direction of feed of the work.



Patented Sept. 8, 1970 3,527,183

Fig. 1.

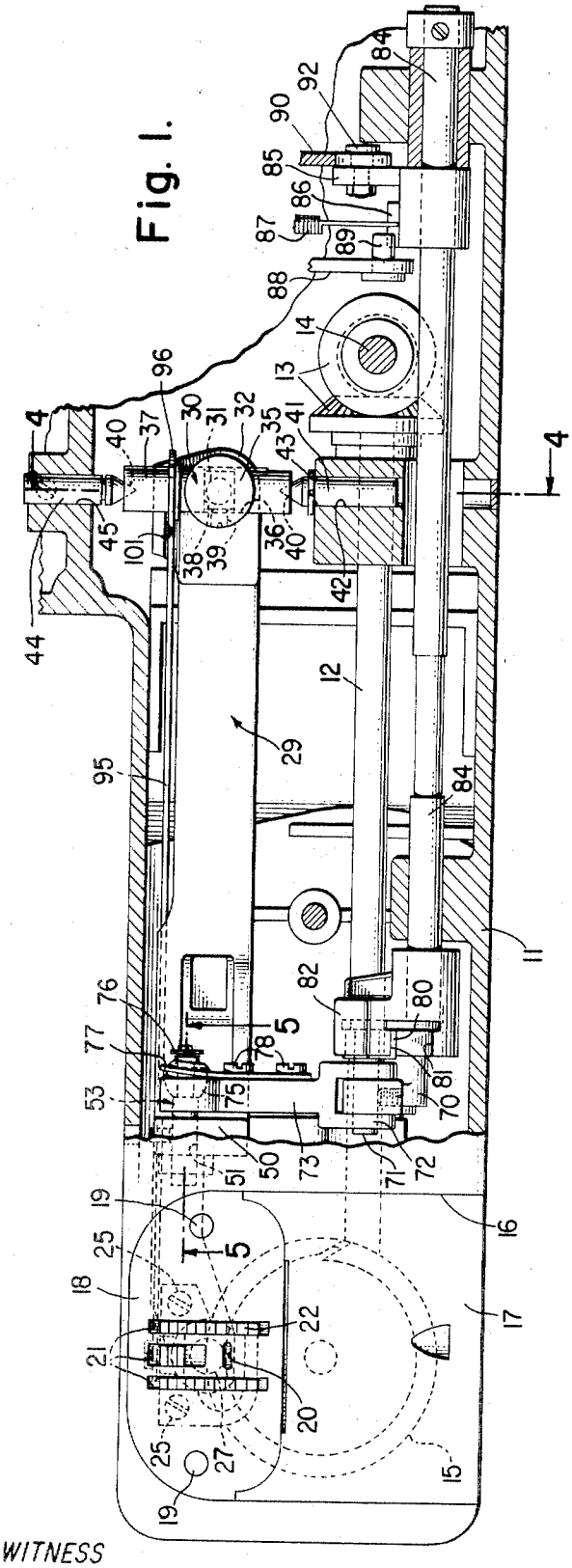
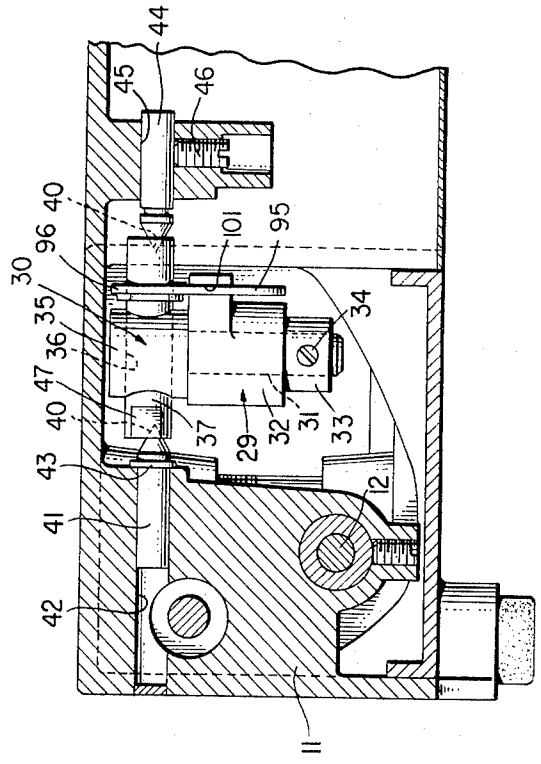


Fig. 4.



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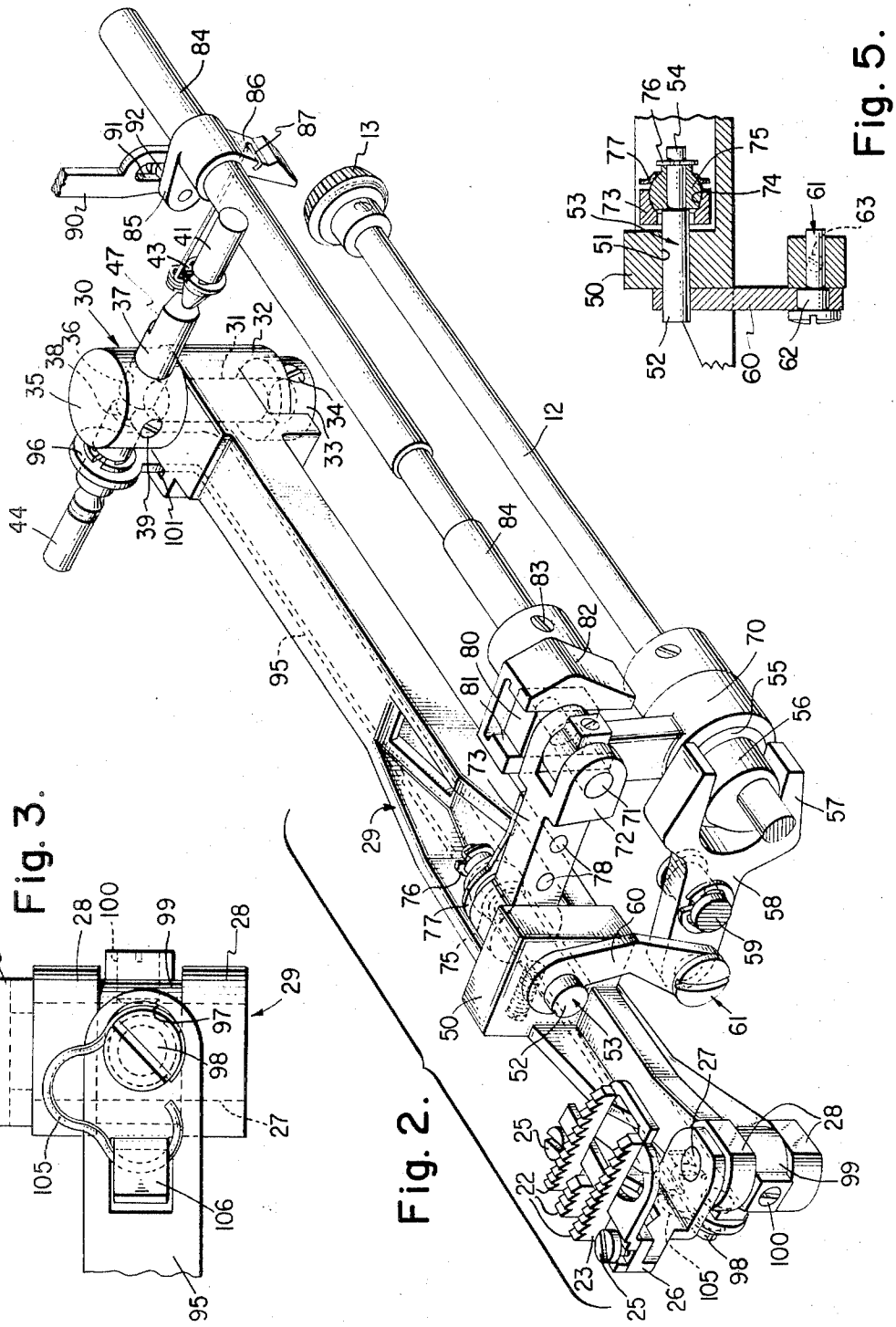

Fig. 2.

Fig. 3.

Fig. 5.

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WORK FEEDING MECHANISMS FOR SEWING MACHINES

BACKGROUND OF THE INVENTION

This invention relates to a sewing machine work feeding mechanism, particularly of the drop feed or four motion variety in which a work engaging feed dog is raised into work engagement during a feed advance stroke, and dropped out of work engagement during a return stroke.

It is an object of this invention to provide a work feeding mechanism which may be accommodated in either a cylinder bed or a flat bed sewing machine frame and which will provide consistent and dependable transport of work fabrics.

In work feeding mechanisms designed to be used exclusively in flat bed sewing machine frames, sufficient space exists beneath the work supporting bed on each side of the stitching point to accommodate widely spaced lateral supports for the feed bar and as a consequence, a number of exclusively flat bed drop feed mechanisms are known which provide paths of feed dog motion that are advantageously flat during the work advancing stroke.

In work feeding mechanisms which may be accommodated in a cylinder bed, however, the space limitations prevent the use of widely spaced lateral supports for the feed bar, and as a consequence, known drop feed mechanisms for cylinder bed machines are categorized either by complex linkages in which the tolerances are multiplied, or by the use of sliding constraint which gives rise to increased frictional resistance and problems of binding.

SUMMARY OF THE INVENTION

The work feeding mechanism of this invention includes an elongated feed bar to which the feed dog is pivoted adjacent the stitching point. At the extremity opposite the feed dog, the feed bar is supported in the sewing machine frame in gimbals so that by the use of simple actuating linkages, the feed bar may be oscillated in one direction to provide for feed advance and return motion, and in a perpendicular direction to provide for rising and falling motion of the feed dog. In order to provide for work transport in a straight line from the stitching point, the feed dog is provided with an anchor link extending substantially parallel to the elongated feed bar and so arranged as to maintain the feed dog always parallel to the line of feed.

DESCRIPTION OF THE DRAWINGS

In the accompanying drawings of a preferred embodiment:

FIG. 1 represents an elevational view principally of the bed portion of a sewing machine with portions broken away to expose the work feed mechanism of this invention applied thereto;

FIG. 2 is a perspective view of the work feed mechanism of this invention removed from the sewing machine and with only a portion of the sewing machine bed shaft illustrated therewith;

FIG. 3 is an enlarged elevational view of a fragment of the feed dog anchor link showing the connection thereof with the feed dog;

FIG. 4 is an enlarged cross sectional view taken substantially along line 4—4 of FIG. 1; and

FIG. 5 is an enlarged cross sectional view taken substantially along line 5—5 of FIG. 1.

Referring particularly to FIGS. 1 and 4, 11 indicates the work supporting bed portion of a sewing machine frame and is preferably in the form of a free arm so as to provide a work supporting cylinder upon which tubular fabric articles such as sleeves and trouser legs may be stitched conveniently. Journaled lengthwise in the cylinder bed 11 is a bed shaft 12 which is adapted to be driven by a set of bevel gears 13 from a vertical shaft 14 which is connected to the actuating mechanism of the sewing machine (not shown). At the free extremity of the work supporting bed a loop taker 15 is provided which is driven from the bed shaft 12. Preferably the bed shaft 12 is

rotated in synchronism with the actuating mechanism of the sewing machine and by suitable gearing or the like (not shown), the loop taker is driven a plurality of revolutions for each revolution of increased velocity, of the bed shaft 12.

The work supporting bed above the loop taker is formed with an access opening 16 which is closed partly by a retractable slide cover plate 17 and partly by a throat plate 18. The throat plate, which may be sustained on locating pins 19 in the bed, is formed with a needle aperture 20 and with feed dog accommodating slots 21 upwardly through which the serrated work fabric engaging rows of teeth 22 of a feed dog 23 move to effect transport of the work fabric across the work supporting bed.

The work feed mechanism of this invention, which will now be described in detail, is of the drop feed variety, *i.e.*, it provides not only motion to the feed dog in the line of feed, but it elevates the feed dog during the work feeding stroke and drops the feed dog beneath the level of the throat plate during the return stroke of the feed dog. Such sewing machine feed mechanisms are also referred to as four-motion work feeding mechanisms in the sewing machine art. The feed mechanism of this invention provides a drop feed mechanism which is particularly well adapted for incorporation into the cylinder bed construction in which space is at a premium.

As best illustrated in FIGS. 1 and 2, the feed dog 23 is secured by screws 25 to a bracket 26 which is fixed upon a pivot pin 27. The pivot pin 27 is journaled freely in bifurcations 28 formed at one extremity of an elongated feed bar 29. The feed bar 29 extends lengthwise of the sewing machine bed 11 and at the extremity opposite the bifurcations 28, the feed bar is supported relatively to the bed in gimbals indicated generally at 30.

The gimbals 30 comprise a vertical pivot pin 31 on which a boss 32 formed on the feed bar 29 is freely journaled and sustained by a collar 33 secured by a set screw 34 to the pivot pin 31. An enlarged head 35 integral with the pivot pin 31 and disposed above the feed bar is formed with a transverse bore 36 accommodating a cylindrical trunion pin 37. The trunion pin is formed with an annular groove 38 which accommodates a set screw 39 threaded in the enlarged head 35 of the pivot pin and serving to lock the trunion pin relatively to the pivot pin 31. At each extremity, the trunion pin is formed with a conical seat 40 arranged eccentrically of the axis of the trunion pin. The conical seat 40 at one side of the trunion pin is engaged by a conical pintle 41 slidably disposed in a bore 42 in the bed 11 and retained against a stop defined by a snap ring 43 seated in an annular groove in the pintle 41. The conical seat 40 at the other side of the trunion pin is engaged by a conically formed pintle 44 accommodated in a bore 45 in the bed and secured therein by a set screw 46. The trunion pin 37 is preferably formed with a flat 47 so that it may be engaged by a wrench or the like and upon loosening of the set screw 39 the trunion pin may be turned on the pintles whereupon, by virtue of the eccentricity of the pintle seats 40, the position of the feed dog may be shifted lengthwise of the bed to align the rows of teeth 22 in the feed dog slots 21 of the throat plate.

Between the extremity thereof, the feed bar is formed with a block 50 extending transversely of the feed bar. Freely journaled in a bore 51 in the block 50 is the enlarged diameter portion 52 of a pin 53 which is shouldered and formed with a reduced diameter portion 54 at one side of the block 50. It is by means of the pin 53 that all of the motion is imparted to the feed dog.

The bed shaft 12, which as previously described, is driven in synchronism with the actuating mechanism of the sewing machine, has fast thereon a feed advance eccentric 55 and a triangular or constant breadth feed lift cam 56 for imparting motions to the feed dog.

The feed lift cam 56 is embraced by the bifurcated extremity 57 of a lever 58 fulcrumed on a stud 59 carried in the sewing machine bed 11. As illustrated in FIGS. 2 and 5, a link 60 which embraces the pin 53 in the feed bar is pivotally connected to the lever 58 by means of a connecting pin indicated

generally at 61. The connecting pin 61 is formed with an eccentric shoulder 62 embraced by the link 60, and a set screw 63 threaded in the lever 58 serves to maintain the angular position of the connecting pin in the lever 58. By loosening the set screw 63 and adjusting the connecting pin 61 angularly, the eccentric shoulder 62 provides for a fine adjustment of the height to which the feed dog will be elevated above the throat plate.

The feed advance eccentric 55 is embraced by a pitman 70 which is connected by a pivot pin 71 to a clevis 72 formed at one extremity of a link 73 which at the opposite extremity loosely embraces the pin 53 carried by the block 50 on the feed bar. As best shown in FIG. 5 the link 73 is formed with a semi-spherical seat 74 into which a semi-spherical bearing 75 is accommodated. The semi-spherical bearing 75 is journaled snugly on the reduced diameter portion 54 of the pin 53 and maintained thereon by a snap ring 76 seated in an annular groove in the reduced diameter portion 54 of the pin 53. A leaf spring keeper 77 which is secured by screws 78 to the link 73 urges the semi-spherical bearing 75 into the seat 74 and thus provides a connection which can transmit feed advance motion to the feed bar while compensating for the oscillatory motion of the feed bar without causing binding in the linkages which impart motion to the feed bar.

The link 73 and the pitman 70 together define a toggle at the pivotal connection therebetween provided by the pivot pin 71. The motion of the toggle in response to rotation of the feed advance eccentric 55 is controlled by a slide block 80 which is journaled on the pivot pin 71 and constrained in a guide slot 81 formed in a block 82 which is made fast by a set screw 83 to a feed control rock shaft 84 carried in the bed. A pair of rock arms 85 and 86 are fast on the rock shaft 84 and may be used alternatively to dictate the feed advance movement, *i.e.*, stitch length and direction of work feed, which is imparted to the feed dog. Preferably the rock shaft 84 is biased in a clockwise direction as viewed in FIG. 2 as by a spring 85 acting upon rock arm 86, as shown in FIG. 1. A stitch regulating control arm 88 formed with an abutment projection 89 may be shifted into engagement with the rock arm 86 to control the stitch length and direction of feed. Alternatively, a control link 90 formed with an elongated slot 91 embracing a pin 92 in the rock arm 85 may be used to control the stitch length and direction of feed. The control members 88 and 90 may form a part of any conventional sewing machine stitch length and direction control arrangement and may be regulated under pattern cam influence or may be manually adjustable. Since such stitch length control mechanism may be conventional and does not form a direct part of the present invention, only fragments of the members 88 and 90 are illustrated in the accompanying drawings.

The motion which is imparted to the feed dog 23 by the feed bar in response to the feed lift connections and the feed advance connections just previously described occurs in arcuate paths about the mutually perpendicular axes defined by the gimbals 30. It has been found that if the feed dog is permitted freedom to pivot without constraint about the pivot pin 27 work fabrics will be transported in a curved path across the cylinder bed, which path will have a radius substantially equal to the length of the feed bar 29. In order to adapt this feed mechanism for transporting work fabrics in a straight line transversely across the cylinder bed, the pivotal movement of the feed dog about the pivot pin 27 is constrained to maintain the rows of feed dog teeth 22 constantly parallel to the feed dog slots 21 in the throat plate. Such constraint of the feed dog is accomplished by means of an anchor link 95 which at one extremity is formed with an apertured boss 96 embracing the trunion pin 37. At the other extremity the anchor link is formed with a clearance opening 97 which, as shown in FIG. 3, embraces a stud 98 projecting from a collar 99 which is secured to the pivot pin 27 between the bifurcations 28 of the feed bar by a set screw 100. The anchor link 95 is disposed substantially parallel to the feed bar 29 and is stabilized by passage through a clearance slot 101 formed in the boss 32 of the feed bar. In order to minimize lost motion of the feed dog, a spring clip 105 is arranged in compression between the stud 98 and a tang 106 which is struck out from the anchor link adjacent to the clearance opening 97. With the above described constraining linkage effective to stabilize the feed dog, the rows of feed dog teeth 22 although swinging in an arcuate path during work feeding strokes will be maintained always parallel to the feed dog slots 21 in the throat plate and the resulting transport of the work fabrics will occur in a substantially straight line transversely across the work supporting bed of the sewing machine.

We claim:

1. A work feeding mechanism for a sewing machine having a work supporting bed, and a throat plate carried on said bed and formed with a feed dog accommodating slot defining a direction of work feed transversely across said bed, said work feeding machanism comprising an elongated feed bar arranged in said bed and extending substantially perpendicular to said feed dog accommodating slot in said throat plate:

a feed dog including a work engaging rib arranged in said feed dog accommodating slot;

means pivotally securing said feed dog to one extremity of said feed bar beneath said throat plate;

gimbals mounted in said bed and engaging the opposite extremity of said feed bar;

drive mechanism operable in timed relation with said sewing machine for imparting oscillation to said feed bar about said gimbals in mutually perpendicular directions, one direction being transversely across said bed to provide work advancing and return movements to said feed dog, and the other direction being toward and away from said throat plate to raise said feed dog to a position above said throat plate during work advancing movement and to drop said feed dog below said throat plate during return movement;

an anchor link extending substantially parallel to said feed bar;

means pivotally connecting said anchor link relatively to said sewing machine frame adjacent to said gimbals, and means pivotally connecting said anchor link to said feed dog adjacent to said means pivotally connecting said feed dog to said feed bar.

2. A work feeding mechanism as set forth in claim 1 in which said gimbals include a pivot pin which extends substantially perpendicular to said work supporting bed and is journaled in said feed bar providing for oscillation of said feed bar to provide work advance and return movements thereof, a cylindrical trunion pin extending transversely through said pivot pin and having an axis arranged in said bed substantially parallel to said direction of work feed:

means for locking said trunion pin relatively to said pivot pin;

bearing means for said trunion pin carried in said bed providing for oscillation of said feed bar to provide raising dropping movement thereof;

said bearing means being eccentric to the axis of said trunion pin to provide for adjustment of said feed dog rib into registry with said feed dog slots.

3. A work feeding mechanism as set forth in claim 2 in which said means pivotally connecting the anchor link relatively to said sewing machine frame comprises an apertured boss formed on said anchor link pivotally embracing said trunion pin.

4. A work feeding mechanism as set forth in claim 3 in which said anchor link comprises a flat sheet metal member and in which said feed bar includes a guide slot embracing said anchor link between said pivoted extremities of said anchor link to maintain said anchor link in substantially perpendicular relation to said trunion pin.

5. A work feeding mechanism as set forth in claim 1 in

which said means pivotally connecting said anchor link relatively to said feed dog comprises a pin projecting from said feed dog, said anchor link being formed with a clearance aperture for said projecting pin.

spring means secured in compression between said pin on said feed dog and said anchor link.