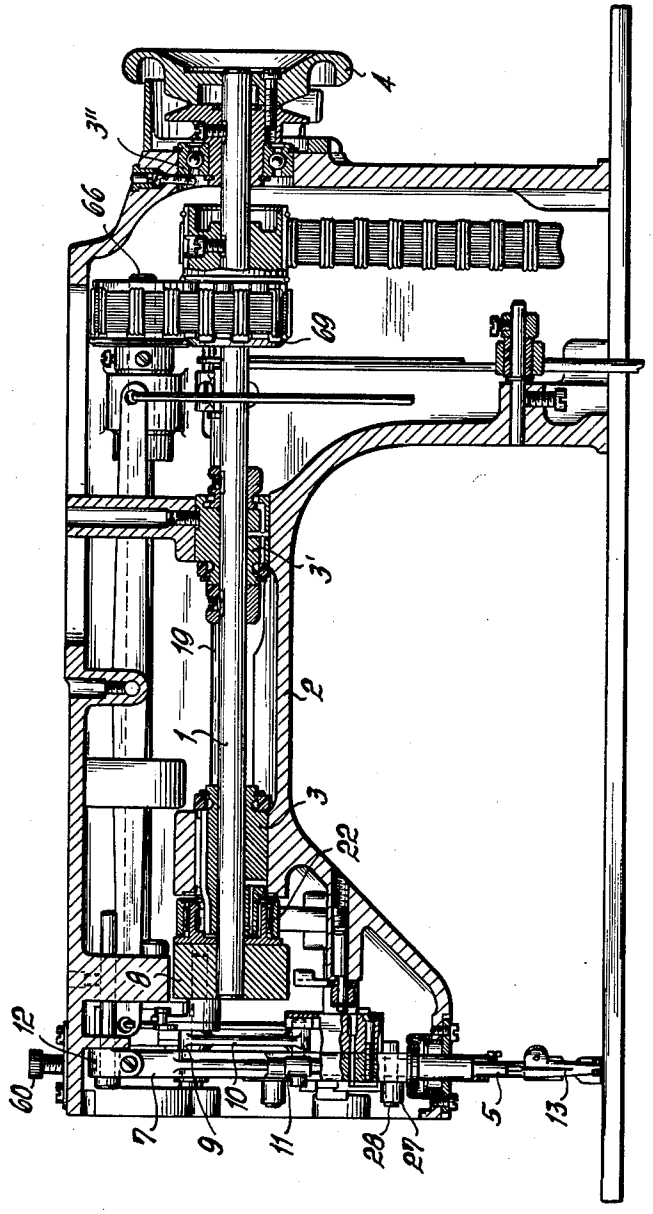
July 27, 1965 WOLF-RÜDIGER VON HAGEN 3,196,815

SEWING MACHINE HAVING LOWER AND UPPER WORK-FEEDING MEMBERS

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FIG. 1



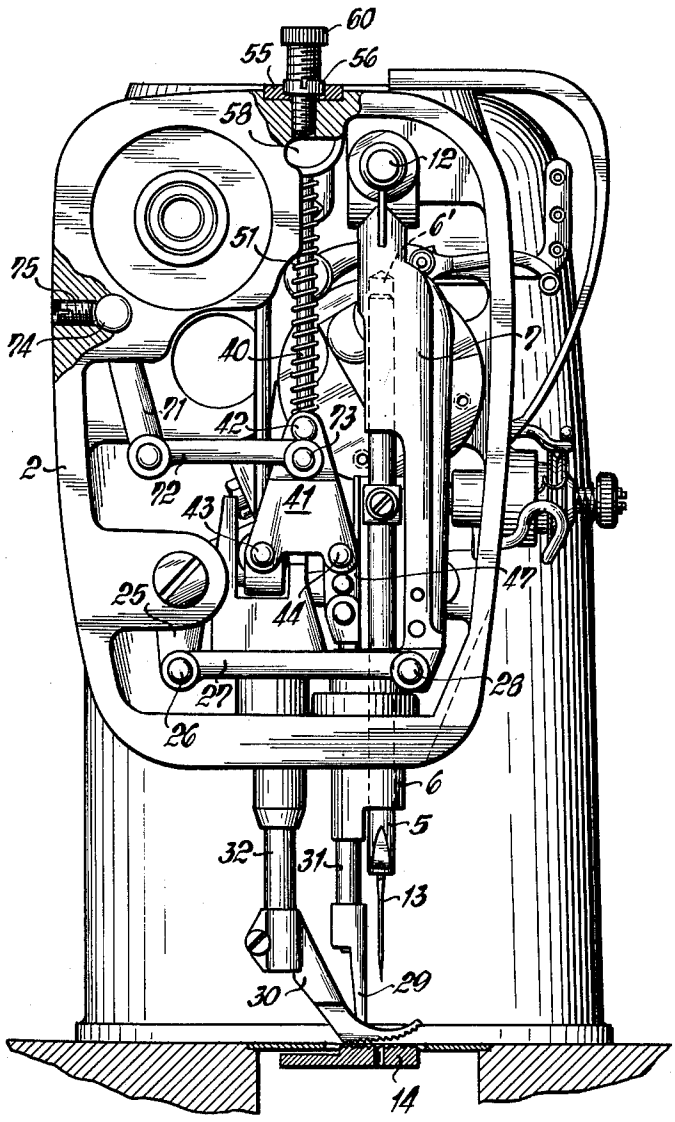
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SEWING MACHINE HAVING LOWER AND UPPER WORK-FEEDING MEMBERS

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FIG. 2



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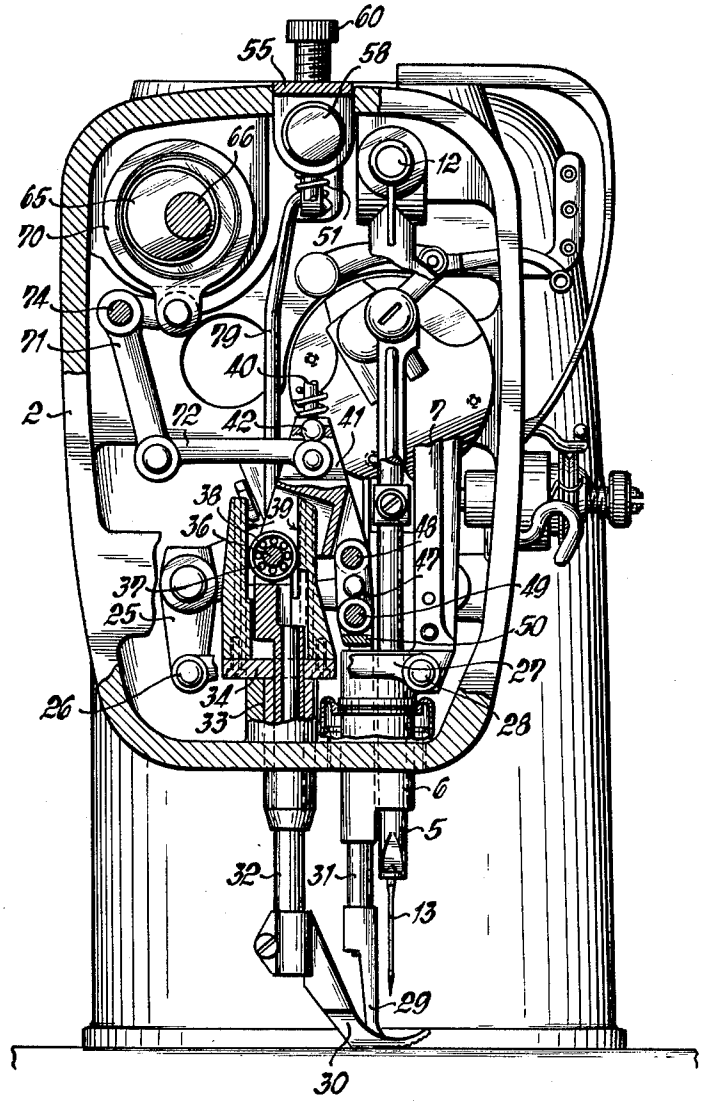
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SEWING MACHINE HAVING LOWER AND UPPER WORK-FEEDING MEMBERS

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FIG. 3



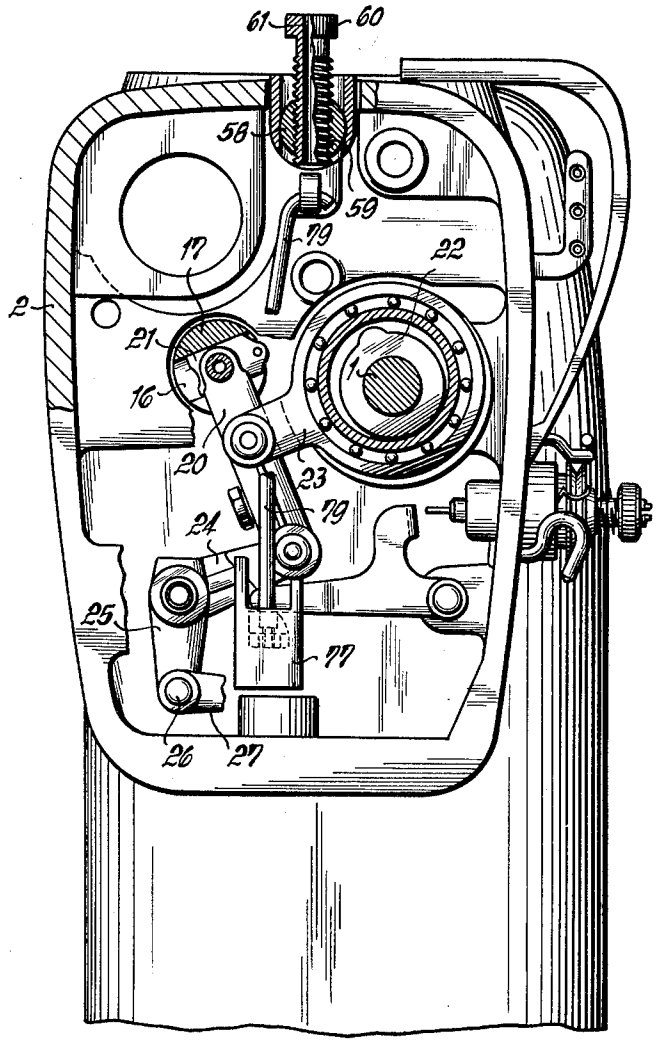
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SEWING MACHINE HAVING LOWER AND UPPER WORK-FEEDING MEMBERS

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FIG. 4



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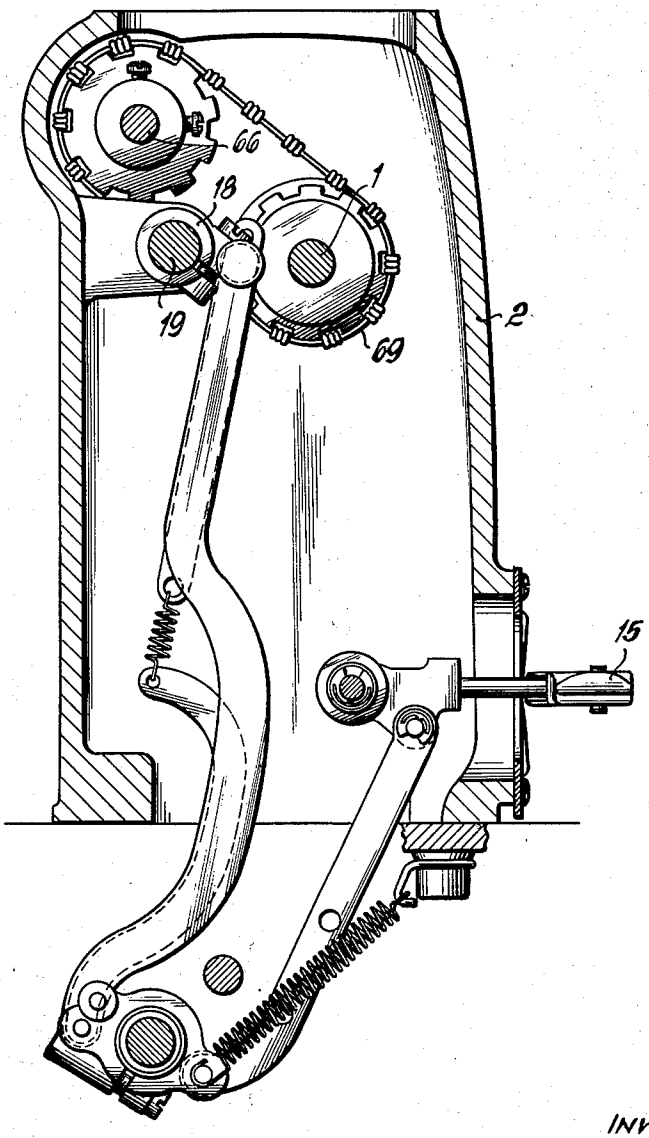
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SEWING MACHINE HAVING LOWER AND UPPER WORK-FEEDING MEMBERS

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FIG. 5



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SEWING MACHINE HAVING LOWER AND UPPER WORK-FEEDING MEMBERS

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FIG. 8

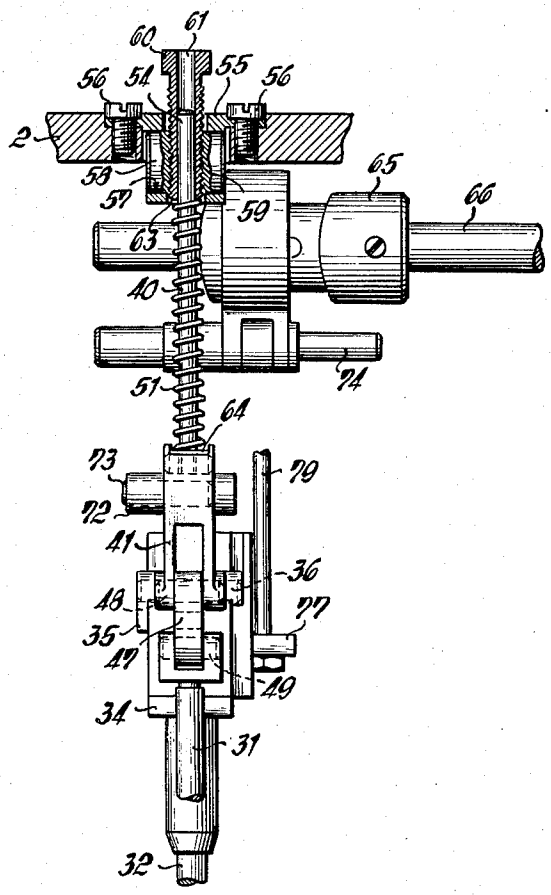


FIG. 7

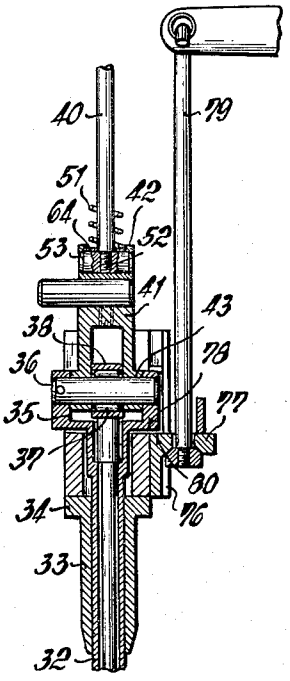
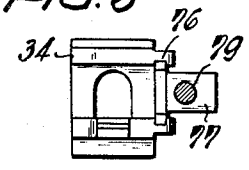


FIG. 6



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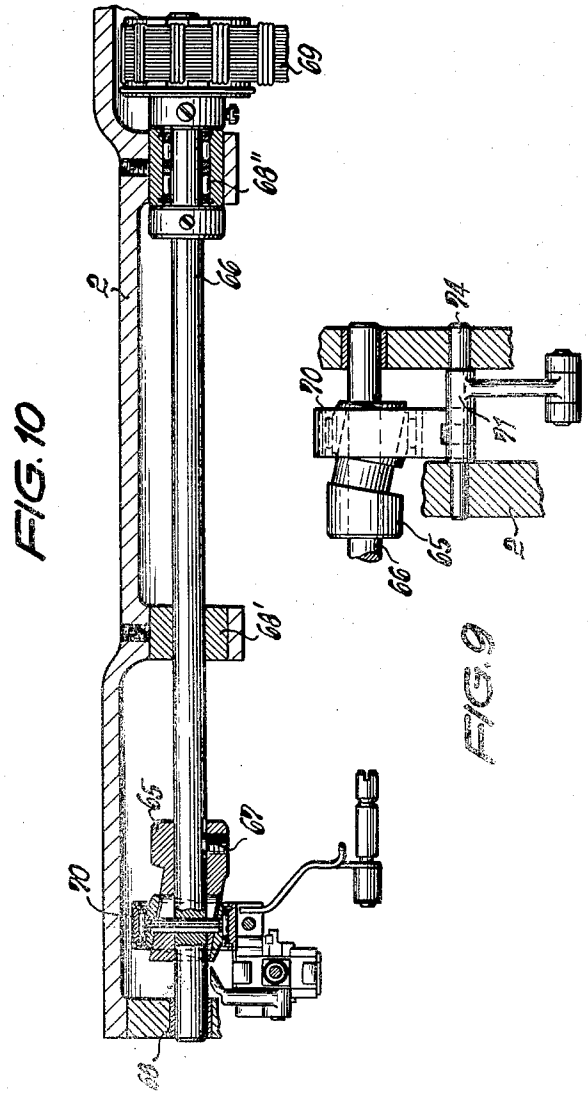


FIG. 10

FIG. 9

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SEWING MACHINE HAVING LOWER AND UPPER WORK-FEEDING MEMBERS

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FIG. 11

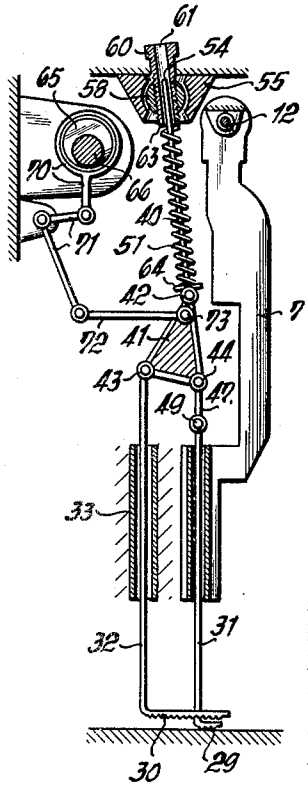


FIG. 12

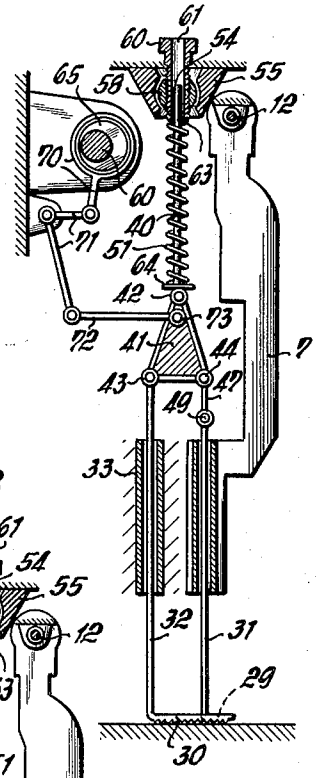
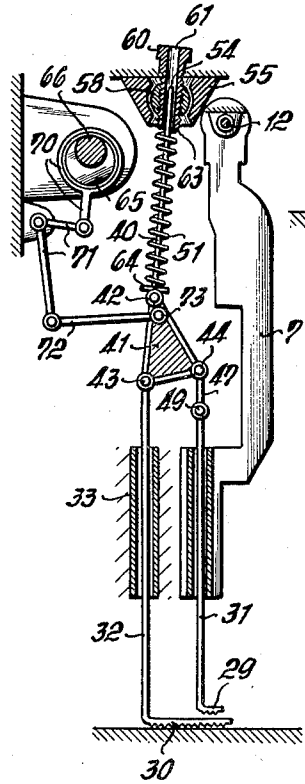


FIG. 13



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United States Patent Office

3,196,815

Patented July 27, 1965

3,196,815

SEWING MACHINE HAVING LOWER AND UPPER WORK-FEEDING MEMBERS

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Filed Dec. 31, 1962, Ser. No. 248,429
Claims priority, application Germany, Jan. 5, 1962, D 37,852
4 Claims. (Cl. 112—207)

This invention relates to a sewing machine of the type having lower and upper work-feeding members which engage on opposite sides of the moving material and co-operate with a presser foot, the raising of which foot is effected in timed relationship with the raising of the upper feeder member. In particular the invention relates to an arrangement in which the co-operation between the upper feeder member and the presser foot has a minimum retarding effect on the output of the sewing machine.

For the alternating operation of the upper feeder member (which is usually a feeder foot) and of the presser foot, in its co-operation with the lower feeder member or members of the sewing machine, the driving mechanism has to overcome periodically repeating strong stresses, in consequence of the high pressure which above all is necessary on the presser foot and the feeder foot at high working speeds, which stresses act unfavourably on the running of the machine and on the driving elements.

In addition, the alternating lifting movements of the presser foot and of the feeder foot, in particular at high speeds of the machine, produce an uncomfortable floating state brought about by the recoiling of the feet from the stitching plate and the lower feed members, whereby the work material lying in between the feeders floats loosely.

Arrangements are already known which counteract these drawbacks. Thus, an arrangement has been proposed which reduces to a minimum the retarding in their bearings on rods carrying the presser foot and the feeder foot such that a lever which is articularly connected to the two rods by means of the presser foot bar raises the feeder foot bar and vice versa and thus causes alternating lifting movements of the rods against the action of springs which act individually on the said rods against the pressure of the machine frame (see for example German Patent 564,551).

Another known apparatus provides for the feeder foot and the presser foot to be depressed by individual springs supported against the machine casing, and for an angle lever which has a part connected to each of the feet to be pivoted on another part such that the presser foot and the feeder foot are raised and pressed down alternately, whereby the spring pressure usually loading the other foot is transmitted to the depressed foot. The construction of this lifting apparatus reduces the loading of the machine in that at any given time only half of the whole spring pressure has to be overcome (see for example German Patent 867,946).

The apparatus according to this invention aims at obviating the unfavourable pressure effects of the alternating action of the feeder foot and of the presser foot in so far that they constitute only an unessential part of the necessary pressing pressure.

The invention provides a machine of the type referred to characterised in that a triangulated system of pivots including two lower pivots connected respectively to the upper feeder member or bar and the presser foot bar or pressure member and an upper pivot, a spring guide bar connected at its lower end to said upper pivot, a swivel bearing in which the upper part of said guide bar slides, a compression spring acting between said upper pivot and

said swivel bearing, means for repeatedly rocking said pivot system first about one of said lower pivots and then about the other and driving means. The connection of the triangular lever to the compression spring guide rod is preferably constructed as a toggle. In the operation of which a compression spring exercises the pressing pressure. The toggle is so constructed and arranged that on the straightening and breaking of the same, lifting and pressing alternately of the presser member and feed member occurs. As will become apparent from a further description of the toggle hereinafter, the lifting and pressing is effected through the use of only very small forces.

For producing the lifting and pressing motion of the presser foot and feeder foot according to a further feature of the invention, a double toggle is formed from a triangular lever and a compression spring guide rod whereby the spring guide rod at any given time serves as one arm of either toggle and is linked to one of the three articulation points of the triangular lever whilst the arms of the triangular lever which lead from the articulation point of the spring guide rod to the articulation of the presser foot and of the feeder foot form the other arm of the two toggles.

With regard to the expression "triangular lever" as used herein, the only triangularity concerned is that between the pivot points for the spring guide rod, the presser foot bar and the feeder foot bar. The actual member carrying these pivots will usually be triangular in shape but this is not essential. Moreover, as will be further developed hereinafter, each of the toggle systems is made effective as the other is made non-effective.

In the accompanying drawing one example of the improved sewing machine is illustrated, omitting those parts not necessary for a comprehension of the invention:

FIG. 1 shows in longitudinal section the upper part of a sewing machine incorporating a feed device according to the invention;

FIG. 2 is a front end view of the same upper part of the sewing machine;

FIG. 3 is a view similar to FIG. 2 but with parts shown in section;

FIG. 4 is a view similar to FIG. 3 but with the section on a plane further into the machine, to show the drive for the needle pivoting frame;

FIG. 5 is a section through the upper part of the sewing machine showing the stitch adjusting device;

FIG. 6 is a detail view (in plan) of a pusher means for the simultaneous lifting of the presser foot and the feeder foot;

FIG. 7 is a section through a part of the operating means for the presser foot;

FIG. 8 is a front view of a part of the operating means for the feeder foot;

FIG. 9 is a part-sectional view of the drive of the foot-operating arrangements;

FIG. 10 is a more extended part-sectional view of said foot-operating arrangements; and

FIGS. 11–13 are diagrammatic representations of the manner of operation of the foot-lifting arrangements.

From a top arm shaft 1, which is held in the bearings 3, 3', 3'' in the upper part 2 of the sewing machine and is driven via a driving wheel 4 in known manner, a needle bar 5 which is slidably mounted in bearings 6, 6' of a needle oscillating frame 7 is given its lifting movement by means of a crank drive 8, 9, 10, 11, see FIGURE 1. By pivoting of the needle oscillating frame 7 around a journal 12 in the head of the machine (FIG. 2) it is also attained that the needle 13 during its co-operation with the seam-forming tools participates in the feed stroke of the lower material feeder 14, which carries out the usual rectangular motion. Thereby, by means of a common adjusting device 15, see FIGURE 5, the rearward needle deflection and the feed stroke of the lower feed members 14 are

adjustable to the desired extent for synchronous operation. For this purpose there is included in the pivot drive of the needle oscillating frame 7, the slide 16 (FIGURE 4) of a slide body 17 which is located on a shaft 19 carried in bearings 18 (FIG. 5) of the upper part 2 of the machine so that slide blocks 21 carried at one end of a lever 20 of the pivot drive can be guided in the slide 16. The shaft 19 is connected in the usual manner for its adjustment (and thereby for adjustment of the slide 16) to the adjusting mechanism 15 for the lower feed members of the machine.

The said driving lever 20 of the pivot drive for the needle oscillating arm 7 and the sewing needle 13 is moved by an eccentric 22 (FIG. 4) which, due to its being fixed to the crank 8, see FIGURE 1, rotates with the arm shaft 1. A connecting rod 23 transmits the stroke of the eccentric 22 to the lever 20, to which it is connected at the centre of its length. The lever 20 is guided and held in the slide 16 on the one hand and, on the other hand, is pivotally connected to one arm 24 of a two-armed lever the second arm 25 of which, with a traction rod 27 linked to its arm joint 26, provides the connection to the needle oscillating frame 7, the said traction rod 27 being linked to that frame by means of a bolt 28. Upon rotation of the eccentric 22 then, according to the position of the slide 16 as influenced by the common stitch adjustment, the necessary stroke for the swinging movement of the needle 13 is transmitted to the frame 7 in agreement with the feed stroke of the lower feed members.

In the embodiment selected by way of example and illustrated in the drawings (in this connection it should be pointed out that one can also proceed from similar known arrangements for operating the upper transport and the needle) an upper feeder carries the feeder foot 29 which, see FIGURES 2 and 3, is lifted in timed relationship with the lifting of a presser foot 30, and is pressed on to the material to be fed.

The feeder foot 29 is fixed on the lower end of a feeder rod 31 which is mounted in the needle-oscillating frame 7 so as to slide up and down in a bore substantially parallel to but located behind the needle bar 5.

The presser foot 30 is located on the lower end of a presser foot bar 32 which is mounted so as to move up and down in a bore 33 of a composite presser foot guide bearing 34 firmly inserted in the upper part 2 of the machine and secured against rotation. For securing the bar 32 against rotation, and for linking its lifting members, such rod 32 carries on its upper end a two-sided bearing 35, see FIGURE 7, for a pivot bolt 36. In the middle, between its bearing points, there is arranged on the bolt 36 a needle bearing 37 the race 38 of which can run with its outer face on the opposite faces 39 of a fork on the projecting collar of the presser-foot guide bearing 34, see FIGURE 3.

According to the invention toggle arrangements may serve for the alternate pressure and lifting motions of the presser-foot 30 and feeder foot 29. Thus, in the construction illustrated, an arrangement is shown with a rod 40 carrying a compression spring, see FIGURES 2 and 3, and a triangular tilt lever 41 which is connected to the presser foot rod 32 and to the feeder foot rod 31 each at one lower corner of its triangle and, on the third (upper) corner the pin 42 connects the triangle to the said rod 40. The parts are therefore so connected that the compression spring guide rod 40 forms the common arm of two toggles, of which the connection going from the joint 42 to the two pivots 43, 44 of the presser foot and feeder-foot 30 and 29 are the second arms. The pivot 43 connects the triangular lever 41 to the presser foot rod 32 in that it surrounds the said bolt 36, see FIGURE 7.

For connecting the triangular lever 41 to the feeder foot rod 31 a joint member 47 is used, see FIGURES 3 and 8, which is pivoted on the one hand to the triangular lever 41 with the aid of a bolt 48 and to the part 50 of the feeder rod 31 carrying the feeder foot 29 on the other

hand, by means of a bolt 49. For the resilient pressing of the presser foot and feeder foot 29, 30 the toggle arrangement is sprung. For this purpose a compression spring 51, see FIGURES 2 and 8, is located on the compression spring guide rod 40, i.e. on the common arm of the two bent levers.

For receiving the compression spring 51 a round spring guide rod 40 is used, see FIGURE 7, on which the compression spring 51 is placed, and the threaded projection 52 of which is firmly screwed to a pivot bolt 53 of the bent lever joint 42. The compression spring guide rod 40, see FIGURE 8, is mounted with its other end 54 axially movable in a bearing located in the upper part 2 of the machine, which bearing is pivotable so as to accommodate the toggle motion. The said bearing consists of a bearing body 55 which is inserted in the upper part 2 of the machine and is secured with fixing screws 56. In a bore 57 of the bearing body 55 there is furthermore rotatably mounted a bolt 58 which has a threaded bore 59 perpendicular to its pivot axis. The threaded bore 59 serves for the adjustable holding of an adjusting screw 60 which has a bore 61 into which the other end 54 of the compression spring guide rod 40 is introduced, and is moved there sliding up and down and, upon bending of the bent lever arrangement, this screw can pivot with it. Thereby the compression spring 51 is supported on the lower end 63 of the adjusting screw 60 and acts according to the screwing-in depth of the adjusting screw 60 on the bent lever arrangement via a pressure ring 64 which lies between the lower end of the compression spring and the toggle articulation of the compression spring guide rod 40, that is to say, in the corresponding working position of the toggle arrangement, presses the presser foot 30 or the feeder foot 29 down on to the material with an adjustable pressure.

The lifting motion for the operation of the toggle is derived from an adjustable eccentric 65, see FIGURES 9 and 10, and is transmitted by means of bell cranks 71, 72 to the triangular lever 41.

The eccentric 65 is located on a shaft 66 which runs parallel to the arm shaft 1 in the upper part 2 of the machine and the eccentric is so held by a fixing screw 67 that for the purpose of adjustment of its stroke magnitude is also movable on the shaft. The shaft 66 rotates in bearings 68, 68′ and 68″ of the upper part 2 of the machine and is driven from the arm shaft 1 by means of a conventional parallel drive 69.

For the transmission of its lifting motion, the eccentric 65 is enclosed by an eccentric strap 70 which is pivotally linked to a double armed lever 71 and an intermediate member 72, the end joint of which last is connected to the triangular lever 41 on the free end of pivot bolt 73 carried by it and firmly located in it, see FIGURE 8. The double arm 71, see FIGURE 9, is rotatably mounted on a stepped bolt 74 and is held in its bearing by a fixing screw 75, see FIGURE 2.

For the combined lifting of the presser foot 30 and of the feeder foot 29, as is necessary for the insertion or removal of the material, a pusher guide 76, see FIGURES 6, 7 and 8, is arranged on the upper part of the presser foot guide bearing 34 in which guide a pusher 77 can slide up and down. Its position in the guide 76 is so arranged in respect of an edge 78, see FIGURE 7, on the double sided bearing 35 that upon upward movement of the pusher 77 by means of a set of lifting rods 79, one edge 80 of the pusher 77 strikes the edge 78 of the double sided bearing 35 of the presser foot articulation and thereby raises the whole toggle arrangement with the presser-foot 30 and the pusher foot 29.

Manner of operation

The manner of operation of the arrangement for the lifting and pressing of the presser foot 30 and of the feeder foot 29 follows from the movement positions of the toggle arrangement illustrated diagrammatically in FIGURES 11 to 13.

FIG. 11 shows the position in which the lower material feeder 14, see FIGURE 2, together with the upper feeder foot 29, acts in a tongs-like movement to commence the advance of the material for the next stitch. In this condition the feeder foot 29, in consequence of the swinging out of the toggle arrangement 41 to the side on which the part connected to the feeder foot 29 becomes effective, is pressed on to the upper side of the material by the pressure of the compression spring 51 located in the common arm of the toggles acting in the direction of the foot. By means of its articulated connection by the joint member 47 and the time agreement of the effectiveness of the toggle, the upper feeder foot 29 in the pressed-down state then participates in the advancing stroke of the lower material pusher 14.

Meanwhile the presser-foot 30 is raised because the toggle arrangement is supported on the upper feeder-foot 29 and at the moment of the pivoting of the triangular lever 41 around the corner 44 of its lever triangle lifts the other corner 43 on which the presser-foot 30 is pivoted.

FIG. 12 shows the toggle arrangement in the middle position of its pendulum movement, that is, in the position in which the pressure action can alternate from one toggle 40, 41 to the other 40, 42. If the toggle arrangement 41 is now pivoted out to the other side, where the corner connected to the presser foot 30 is effective, it is now supported on the presser foot 30 and raises (FIG. 13), the upper feeder-foot 29, alternating with the presser foot by means of the triangle lever articulation of the two feet. The material has therefore been transported by the tongs-like advancing movement by a stitch length (forward or backwards) and is held by the presser-foot 30 during the return of the lower material feeder 14 and the lifting off of the upper feeder-foot 29. With the renewed running through of the workpiece to the so-called middle position (FIG. 12) the working procedure begins in the same manner for the next stitch.

With this device the normal requirement of equal pressing of the front feeder foot and of the presser foot on the material suffices. A different pressing of the feet may however also be attained with the toggle arrangement according to the invention if the toggle arrangement is so applied that the two toggles, instead of having a common compression spring guide rod arm, have a guide rod arm each, which then carry the corresponding compression spring for giving the different pressures on to the feet.

For the alternating operation of the presser-foot 30 and upper feeder 29, therefore, only the oscillations of the two toggles are necessary, and these are effected with comparatively weak forces. Upon alternating, the lifting movement at the time is directed essentially not direct against the pressure of the spring exercising the pressing pressure of the alternating member to be lifted. Because the compression spring exercising the pressing pressure is only slightly compressed the spring inertia of the compression spring is therefore also slight and the pressing pressure is therefore rapidly effective on the feet whereby the directionless floating of the work material at high speeds is prevented.

What I claim is:

1. A sewing machine having a feed device with lower and upper feed members, a presser member having a presser foot at one end thereof, the upper feed member of said device comprising a feeder foot, toggle means having a centered position and being positionable on either side of center for alternately raising said presser foot and upper feed foot and for alternately lowering said presser foot and said feed foot, operating means connected to said toggle means, said toggle means comprising a double toggle formed from a triangular lever having three articulation points, and a compression spring and spring guide member, which serve as the one common arm of the double toggle and are articulated on one of the three articulation points of the triangular lever, a portion of the triangular lever connecting the one of the three articulation points to a second of the three articulation points and constituting the second arm of one toggle of the double toggle and a portion of the triangular lever connecting the one of the three articulation points to the third of said three articulation points constituting the second arm of the second toggle of said double toggle, means connecting the presser member to the lever at the second articulation point, means connecting the upper feed member to the lever at the third articulation point, and means connected to said upper feed member to impart feeding motion to said feeder foot.

2. A sewing machine according to claim 1, characterized in that the said operating means being located immediately adjacent said one of said articulation points, first pivot means being provided at said second articulation point and second pivot means being provided at said third articulation point, said pivot means and triangular lever when centered, allowing both of said double toggles to be in a partially broken position with both feet in engagement with the material to be sewn by the machine and so said triangular lever when articulated about said one of said articulation points may pivot about said first pivot means to raise said feed member from said material to be sewn by said machine and may pivot about said second pivot means to raise said presser foot from said material to be sewn by said machine.

3. A sewing machine according to claim 1, characterized in that said sewing machine comprising a machine housing, bearing means mounted in said machine housing for pivotally and slidably receiving the compression spring guide member so that the effective length of said one common arm of the double toggle is variable between articulations in the bearing and on the triangular lever.

4. A sewing machine according to claim 1, characterized in that the pressing pressure of the spring is adjustable by means of an adjustable screw.

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JORDAN FRANKLIN, *Primary Examiner.*