

Feb. 11, 1958

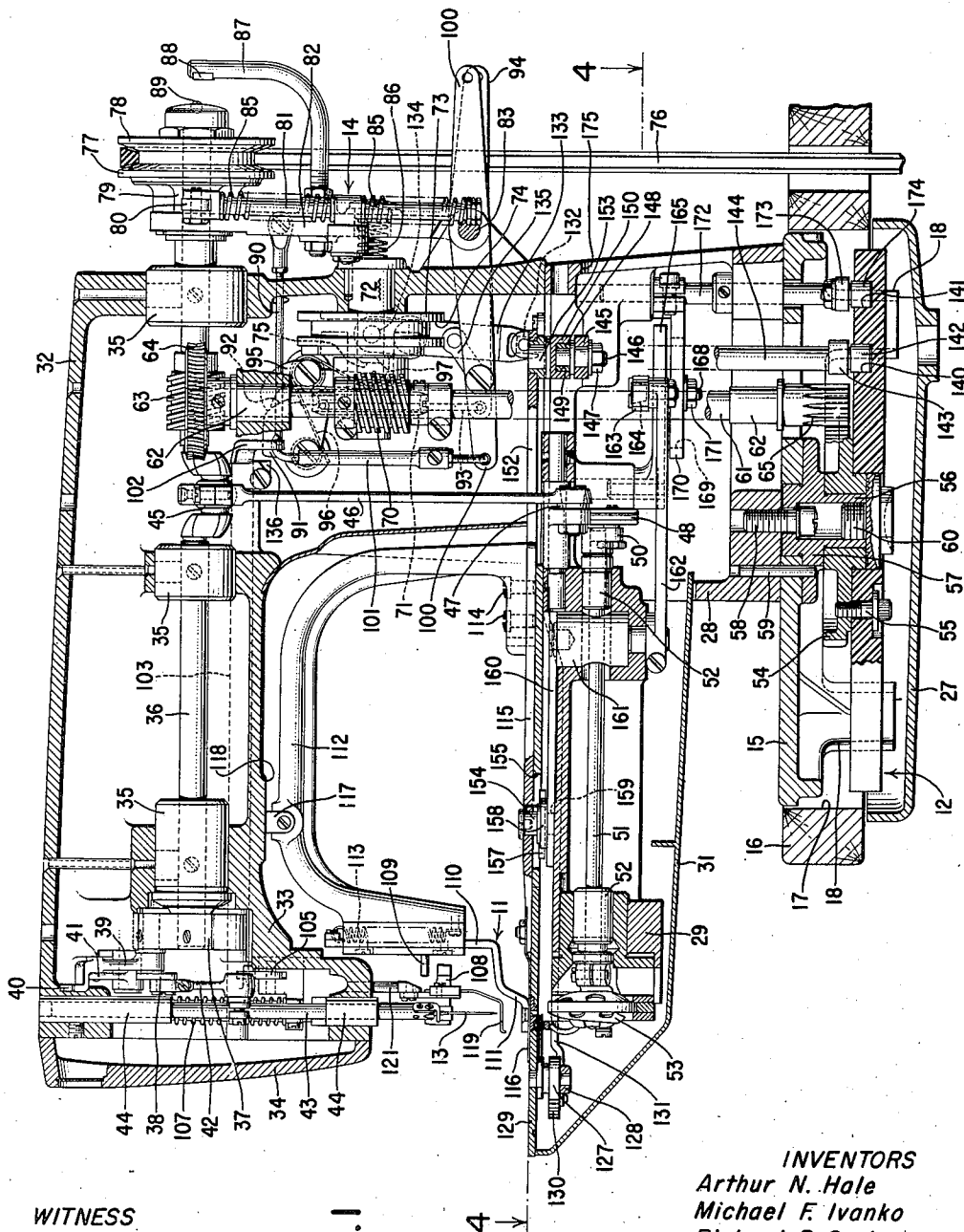
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SEWING MACHINES

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4 Sheets-Sheet 1



WITNESS

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Fig. 1

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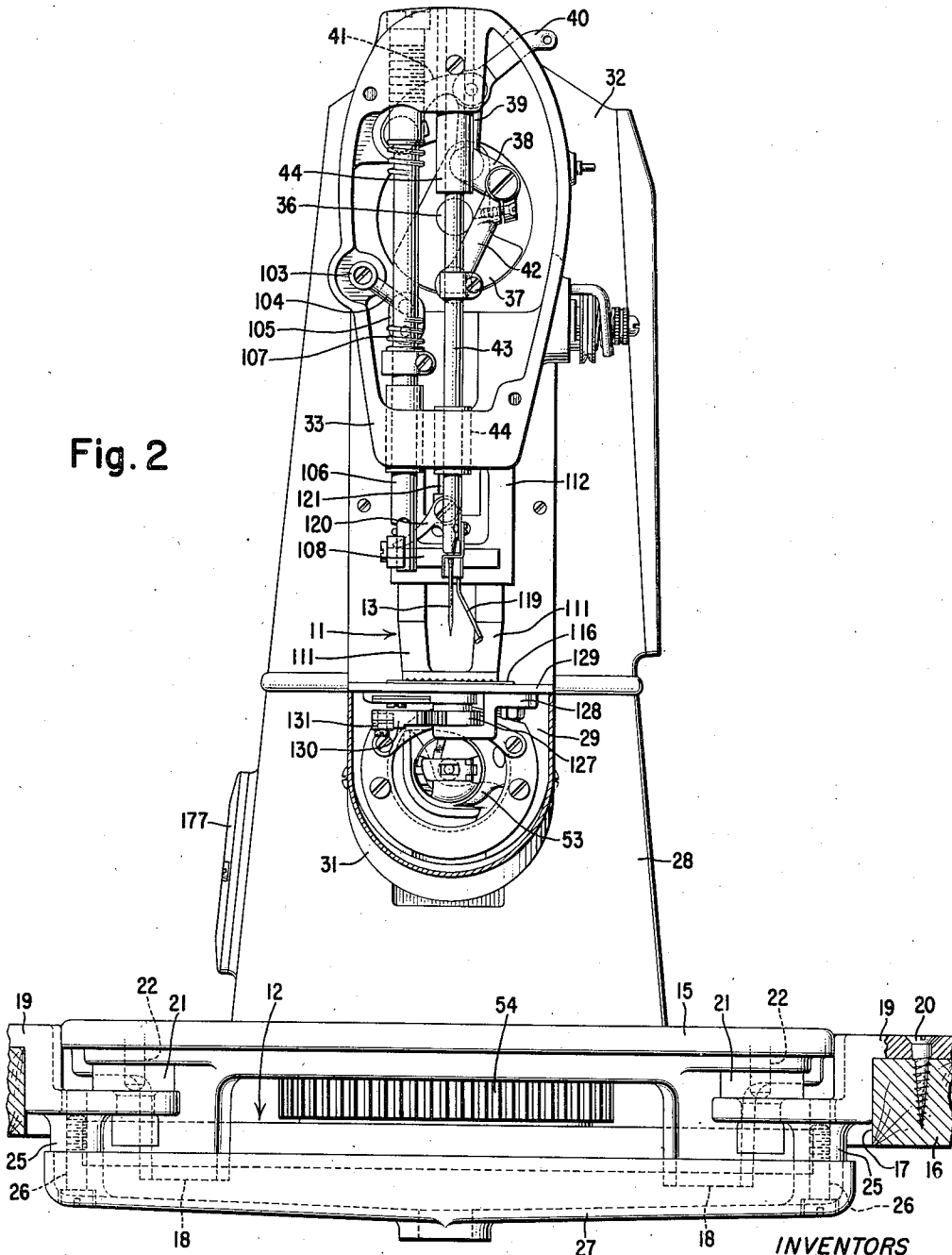
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Fig. 2



WITNESS

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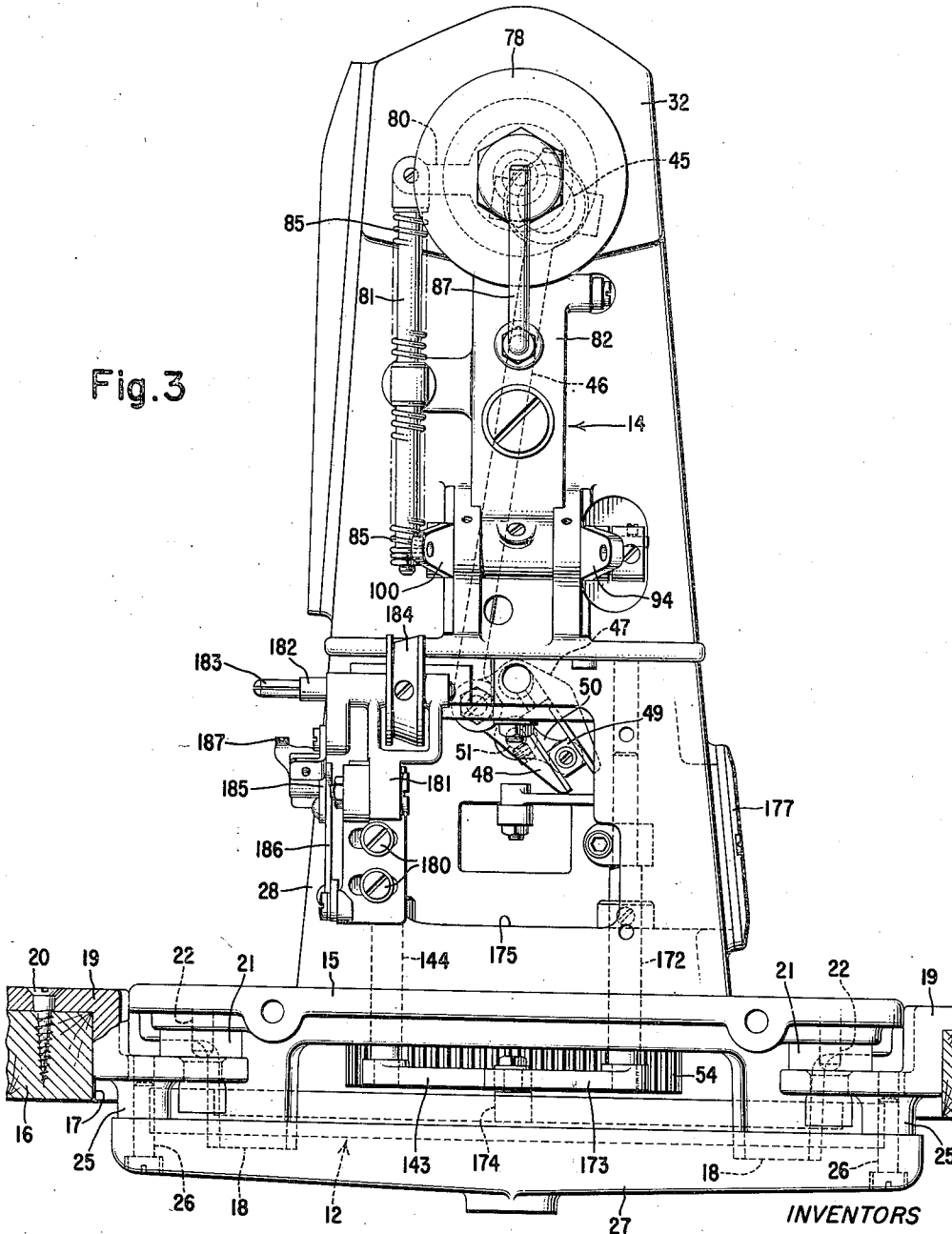
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Fig. 3



WITNESS

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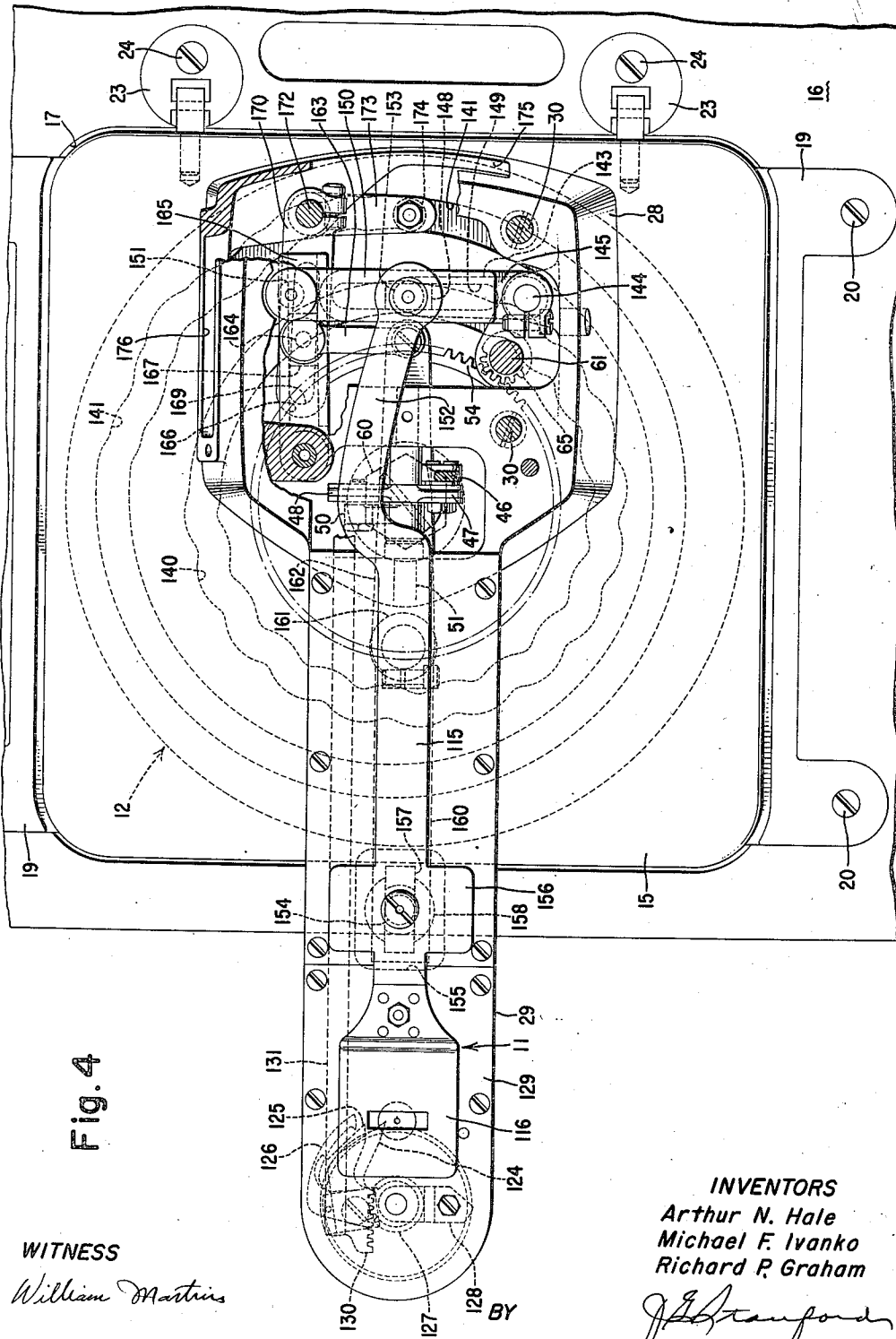


Fig. 4

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SEWING MACHINES

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Application September 30, 1955, Serial No. 537,704

9 Claims. (Cl. 112--65)

This invention relates to sewing machines and, more particularly, to cyclically operated sewing machines adapted to produce groups of stitches in a predetermined pattern.

It is an object of this invention to provide an improved cyclically operated group stitching machine with a pattern cam adapted to control the organization of the stitch group produced by the machine.

In prior sewing machines of the group stitch type, the pattern cam has been disposed either within the sewing machine frame i. e., within either the bed portion or the hollow bracket arm portion of the sewing machine frame, or it has been supported on the sewing head but outside of the sewing machine frame. In either case, the size of the pattern cam was definitely limited. On one hand, the space problem within a sewing head is always critical, and on the other, an exposed pattern cam hung on the outside of a sewing head presents an annoying dust and sleeve catcher, and furthermore, cannot be increased sufficiently in dimension without seriously hindering the flow of materials being stitched as well as making access difficult to various other sewing machine parts and adjustments.

It is an object of the present invention to provide a cyclically operated sewing machine of the above character with a pattern cam arranged beneath the machine frame.

Another object is to provide a sewing machine frame having, in addition to the customary sewing head made up of a bracket-arm and a work support, a sub-base with provision for housing a pattern cam at or beneath the level of the supporting table for the sewing machine.

Still another object of this invention is to provide a cyclically operated sewing machine with a pattern cam disposed so as to cooperate effectively with vibration dampening and noise isolating features of a sewing machine.

With the above and other objects and advantages in view as will hereinafter appear, our invention comprises the devices, combinations and arrangements of parts hereinafter described and illustrated in the accompanying drawings of a preferred embodiment in which:

Fig. 1 represents a vertical cross sectional view taken longitudinally of a sewing machine constructed in accordance with this invention.

Fig. 2 represents a front or head end elevational view of the sewing machine of Fig. 1 with the bracket-arm cover plate removed and the work-support bottom cover illustrated in cross section.

Fig. 3 represents a rear or standard end elevational view of the sewing machines of Fig. 1, and

Fig. 4 is a cross sectional view taken substantially along line 4-4 of Fig. 1.

In the accompanying drawings, this invention is illustrated as embodied in a group stitching machine of the so-called "bar tacking" variety. The designation of bar tacking refers to a general purpose group stitching ma-

2

chine as distinguished from certain special purpose varieties such as button sewing machines, buttonhole machines, etc. The present invention would find utility, however, in any of the varieties of group stitching machines.

Referring to Fig. 1, the general organization of the sewing machine of this invention includes a work gripping clamp indicated at 11 adapted for both turning movement and translatory movement with respect to the machine frame, the work clamp movements being controlled by a pattern cam 12 so as to effect a predetermined pattern of movement of the work fabrics in a horizontal plane with respect to a vertically arranged endwise reciprocatory needle 13. The sewing machine is rendered cyclic and capable of group stitching with the provision of a stop-motion mechanism indicated generally as 14. The stop-motion mechanism provides a means whereby actuation of the stitch forming instrumentalities and of the work clamp shifting mechanism may be initiated and interrupted after a predetermined period of operation.

It is advantageous in the production of accurately formed, high quality stitch groups with a tacking machine as described generally above, that the pattern cam be as large as is possible in physical size. One reason for this is that the total number of stitches which can be made in any one group increases as the cam diameter increases. Another reason is that as the cam diameter increases the amplitude variation of the cam track between successive stitches may be increased, thus not only increasing the scope of permissible stitch patterns but also minimizing the effect in the resulting tack of possible cam inaccuracies, tolerances in the parts, wear, etc.

With group stitching machines known in the art prior to this invention, practical considerations have served to limit the overall size of the pattern cam. In certain of the prior art machines, the pattern cam has been housed within either the bracket-arm or the work-supported arm of the sewing machine. With this type of construction, the size of the pattern cam is severely limited because of the space limitations within the machine bed and bracket-arm. In those instances in the prior art in which the pattern cam is arranged outside the machine frame, the cam must be made small enough to avoid interference with the work fabric, and in addition must be limited in size for machine stability i. e., to prevent the sewing machine from becoming excessively top heavy.

The present invention represents a departure from the prior art in that the pattern cam is carried beneath a sub-base 15 which is disposed flush with the top of a machine supporting table 16 in a cut-out 17 formed therein. The sub-base together with the pattern cam constitute an assembly which is of approximately the same thickness as the table top so that the pattern cam is in effect concealed within the table top and thus presents far less of a space problem than with prior pattern cam arrangements. The pattern cam may be made a great deal larger in diameter than has been possible heretofore without incurring the disadvantages inherent in the prior constructions and without otherwise adversely affecting the operation of the machine.

The sub-base 15 is formed with depending feet 18-18 by which the machine may be supported satisfactorily upon any flat surface, however, the sub-base preferably is supported in the table top cut-out 17 by means of a pair of bracket members 19-19 fastened one at each side of the cut-out as by screws 20-20. The bracket members 18-18 provide a shelf at each side of the cut-out and carry annular rubber pads 21-21 adapted to embrace dowel pins 22-22 depending one at each corner from the sub-base. As illustrated in Fig. 4, the sub-base may be

hinged to the table top by a pair of conventional hinges 23—23 having one leaf secured as by a screw 24 to the table top and having the other leaf let into the sub-base 15. The bracket members are each formed with depending bosses 25—25 drilled and tapped to receive fastening screws 26—26 which secure a drip-pan 27 in place beneath the sub-base.

The frame of the sewing machine includes a bed 28 having a free work supporting arm 29 of the so-called "cylinder bed" variety which is adapted to be secured upon the sub-base by fastening screws 30—30 as illustrated in Fig. 4, and is preferably fitted with a removable sheet metal bottom cover 31. A bracket-arm portion 32 of the frame rises from the bed portion, extends over the work supporting arm 29 and terminates in a sewing head 33, which is closed by a cover plate 34. The bracket-arm portion, the bed, and the sub-base are preferably made as separate parts and are secured together during assembly of the machine.

Journalled in bushings 35 in the bracket-arm portion 32 of the frame is a main drive shaft 36 provided within the sewing head 33 with a counterbalance 37 fitted with an offset crank pin 38. One portion of the crank pin is engaged by the driven arm 39 of the needle thread take-up lever 40 which is constrained by an anchor link 41 pivoted to the bracket-arm. The free end of the crank pin is embraced by a needle bar driving link 42 pivoted in turn to a needle bar 43 slidable vertically in bushings 44—44 in the sewing head and carrying at its lower extremity the needle 13.

A crank 45 formed on the main drive shaft 36 is embraced by a pitman 46 extending vertically into the bed portion 28 of the frame. The pitman is operatively connected to oscillate a lever 47 pivoted in the bed and formed with a radially bifurcated limb 48 adapted to embrace a slide block 49 pivoted on a rock arm 50 fast on a shuttle drive shaft 51 journalled lengthwise of the cylinder bed work supporting arm 29 in bushings 52—52. A conventional oscillating shuttle 53 is carried at this free extremity of the shuttle drive shaft 51 and disposed to cooperate with the needle 13 in the formation of lock stitches.

As best illustrated in Fig. 1, the pattern cam 12 is journalled beneath the sub-base 15 by way of a gear 54 to which the pattern cam is secured by fastening screws such as that indicated at 55. The hub of the gear 54 is rotatable upon a depending stud shaft portion 56 of a bearing member 57 secured by a screw 58 and a lock pin 59 beneath the sub-base. The gear 54 is locked in place on the depending stud shaft by the head of a fastening screw 60 threaded into the stud shaft. The pattern cam is rotated in timed relation with the sewing machine stitch forming mechanism by means of a cam shaft 61 journalled in bushings 62—62, one in the bracket arm and one in the work supporting bed. A worm 63 on the main drive shaft is disposed in mesh with a worm wheel 64 fast on the upper extremity of the cam shaft. The cam shaft at its lower extremity is fitted with a pinion 65 disposed in mesh with the gear 54 to which the pattern cam is secured.

Fast on the cam shaft 61 is a worm 70 arranged in mesh with a worm wheel 71 journalled on a stud shaft 72 fixed horizontally in the bracket arm 32. Interlocked for rotation with the worm wheel 71 on the stud shaft is a small barrel cam 73 formed with a radial cam groove 74 which serves to control the operation of a thread cutting mechanism as will be hereinafter described. The barrel cam 73 is provided at one side with a set of axially extending cam lugs 75 which control the operation of the stop motion mechanism 14.

The stop motion mechanism is constructed substantially in accordance with the U. S. application of M. Ivanko, Serial No. 385,097, filed October 9, 1953, to which reference may be had. This stop motion comprises a two part separable pulley for a V belt 76 adapted to be driven

continuously by motor (not shown). The pulley includes an inner portion 77 fixed for rotation with the main drive shaft 36 and an outer portion 78 journalled freely on the main drive shaft. The fixed pulley portion 77 is formed with a notched hub 79 adapted to cooperate with a stop member 80 carried by a stop rod 81 journalled in a lever 82 pivoted as at 83 to the machine frame. The stop rod 81 is resiliently centered with respect to the lever 82 by means of a pair of coil springs 85—85. A spring 86 arranged between the machine frame and the lever 82 serves to bias the stop rod 81 and the stop member 80 toward the notched hub 79 thus biasing the parts toward a stopped position in which the stop member 80 locks the main drive shaft in a definite predetermined stopped position of rotation. Extending from the lever 82 is an arm 87 fitted with a wear plate 88 disposed in axial alignment with the main drive shaft for engagement with a thrust bearing ball 89 carried by the loose outer pulley portion 78. The stop motion lever 82, therefore, when turned in opposition to the coil spring 86, will in seriatim disengage the stop member 80 from the notched hub 79 of the fast pulley, and then by way of arm 87 shift the loose pulley toward the fast pulley and in so doing frictionally engaging the V belt between the pulley portions 77 and 78 thus establishing a driving relation between the motor and the sewing machine.

In order to control turning movement of the lever 82, a pull rod 90 is pivoted thereto and is operatively connected at its opposite extremity to a latch block 91 pivoted within the sewing machine bracket arm. The latch block 91 is formed at one edge 92 with two notches and is connected by means of a push rod 93 to an operator influenced starting lever 94 pivoted on the machine frame. Pivoted within the sewing machine bracket arm adjacent the latch block is a latch lever 95 biased by means of a spring 96 into engagement with the notched edge 92 of the latch block 91. The latch lever is formed with a finger 97 disposed in the path of the set of cam lugs 75 on the barrel cam 73.

Referring to Fig. 1, in which the machine is illustrated in stopped position, manual actuation of the starting lever 94 will turn the latch block 91 in a counterclockwise direction and thus draw the pull rod 90 and the lever 82 toward the left disengaging the stop member 80 from the notched pulley hub 79 and by means of the arm 87 urging the free outer pulley portion 78 and the V belt 76 into operative frictional engagement with the fast pulley portion 77. The sewing machine will thus be actuated and the latch lever 95 will fall into the lowest of the notches along edge 92 of the latch block to maintain the stop motion mechanism out of action. As the cycle of stitching operation nears completion, as determined by one revolution of the barrel cam 73, the set of cam lugs 75 will first trip the latch lever 95 into the second of the notches along edge 92 of the latch block so as to permit the spring 86 to shift the lever 82 slightly to the right as viewed in Fig. 1. This shift of the lever is sufficient to release the loose pulley portion 78 and the V belt, but is not enough to shift the stop member 80 into the notched hub of the fixed pulley portion 77. The machine then coasts until the set of stop lugs 75 on the barrel cam 73 trips the latch lever into the position illustrated in Fig. 1 in which the stop motion mechanism is rendered fully effective to bring the sewing machine to a stop in the definite predetermined position of the actuating mechanism.

Pivoted on the machine frame coaxially with the starting lever 94 is an operator influenced clamp opening lever 100 connected by a push rod 101 with a rock arm 102 carried by a rock shaft 103 journalled in the bracket arm 32. As shown in Figs. 1 and 2, the rock shaft is provided in the sewing head 33 with a rock arm 104 connected by means of a link 105 to an endwise shiftable presser bar 106 arranged vertically in the sewing head and spring biased downwardly by a coil spring 107. At

its lower extremity the presser bar is fitted with an angle bracket 108 disposed to underlie a pin 109 extending from a shank portion 110 of a pair of work engaging feet 111 which provide the upper jaw of the work clamp 11. The shank portion 110 is slidable vertically in an arched work clamp frame 112 and is biased downwardly by a coil spring 113. Actuation of the clamp opening lever, therefore, raises the presser bar and the angle bracket 108 carries with it the pin 109 and the work engaging foot 111. The arched frame 112 is secured as by screws 114 to a base portion 115 of the work clamp disposed on the work supporting arm 29 of the machine frame. The base portion of the clamp is fitted with a relatively thin plate 116 disposed to underlie the work engaging foot 111 to provide the lower jaw of the work clamp 11. The work clamp is shiftable with respect to the machine frame as will be described hereinbelow and to stabilize the clamp during machine operation, a wear plate 117 is fixed to the arched work clamp frame 112 and arranged to engage a bearing surface 118 machined beneath the bracket-arm 32.

A needle thread wiper is provided in the form of a spring wire 119 formed with a hooked free extremity carried by a lever 120 pivotally secured at the extremity of a pin 121 depending from the sewing head 33. The lever 120 is disposed to overlie the work clamp opening angle bracket 108 on the presser bar so that each time the work clamp is opened the lever 120 will be turned in a clockwise direction as viewed in Fig. 2 thus sweeping the thread wiping wire 119 between the needle and the loop taker so as to draw out the needle thread in preparation for the succeeding group of stitches.

The present machine is preferably provided with a thread cutting and nipping mechanism similar to that of the U. S. patent to Horton No. 807,676, December 19, 1905, except that the thread cutting motion in the machine of the present invention is supplied by the machine operator. In the present instance thread cutters 124 and 125 and a thread holding finger 126 are connected with a sector gear 127 journaled in a bracket 128 attached beneath a work plate 129 fitted on the work supporting arm 29. Meshing with the sector gear is a rack 130 carried by a bar 131 slidably supported in the work supporting arm 29 beneath the work plate 129 and having pivoted at its rear end a block 132 embraced by the bifurcated extremity of a control lever 133 pivoted in the bracket arm and carrying a cam follower 134 disposed to track the cam groove 74 in the barrel cam 73. The cam groove 74 is formed so as to effect a partial movement of the cutters 125 and 126 when a group of stitches is nearly complete causing the cutters to engage the shuttle thread and the needle thread loop as in the disclosure of the Horton Patent No. 807,676. The cam groove 74 is then formed with a clearance which will accommodate but will not effect movement of the cutters into cutting position. Movement of the cutters into cutting position is instead effected by actuation of the clamp opening lever 100 by means of a link 135 connecting the lever 100 with the cutter control lever 133. The cam groove 74 is also formed in such a manner as to effect slight movement of the thread cutters when the machine is started for the next succeeding stitching operation so that the cutters in moving back into retracted position after the first stitch has been made will nip and hold the free end of the needle thread sufficiently to prevent the needle thread from being drawn upwardly and out of the tack being formed.

A safety interlock is provided between the mechanism for opening the work clamp and cutting the threads and the stop motion mechanism of the machine to prevent starting of the machine while the work clamp is raised and, conversely, to prevent opening of the clamp while the machine is running. To this end the hub of the clamp lifting rock arm 102 is shouldered as indicated at 136 in Fig. 1 to accommodate the stop motion latch

block 91 only when the clamp is closed thus preventing the machine being started while the clamp is open. The latch block 91 by the same token when turned into running position will be disposed to overlap the shoulder 136 to prevent actuation of the clamp opening mechanism until the machine is stopped and the latch block 91 has returned to the position illustrated in Fig. 1.

In the present machine the needle bar 43 is supported on a fixed axis in the sewing head and, consequently, the pattern in any particular stitch group will depend entirely upon movements of the work clamp between successive stitches. The work clamp 11 is mounted, therefore, for movement lengthwise along the bed toward and away from the needle in response to variations in a cam groove 140 in the pattern cam as well as transverse movements across the work supporting arm in response to variations in a cam groove 141 in the pattern cam.

The cam groove 140 is tracked by a roller follower 142 carried by a lever arm 143 fast on the lower extremity of a vertical shaft 144 journaled in the machine bed 28. As illustrated in Figs. 1 and 4, a slotted lever 145 secured to the upper extremity of the vertical shaft 144 accommodates a bolt 146 provided with a clamp nut 147 by which the bolt may be secured in any selected position along the slotted lever 145. Pivotally carried on the upper end of the bolt 146 is a slide block 148 disposed in a slot 149 formed in the underside of a lever 150 pivoted at 151 in the machine bed. A rearward extension 152 of the work clamp base portion 115 is pivoted on a pin 153 secured atop the lever 150.

The base plate 115 of the work clamp embraces a pin 154 which passes through a clearance aperture 155 formed in the work plate 129 and closed by a rectangular enlargement 156 of the base plate 115 of the work clamp. The pin 154 has fixed to it an elongated slide block 157 confined in the slotted head 158 of a fulcrum pin 159 which is freely journaled in the free extremity of a lever arm 160 fast on a stud shaft 161 journaled in the bed. The shaft 161 is formed with a clearance bore adapted to accommodate the shuttle drive shaft 51 and has secured at its lower extremity a lever arm 162 connected by means of a link 163 to a pin 164 secured atop a lever 165 pivoted in the machine bed. The underside of the lever 165 is slotted as at 166 to accommodate a slide block 167 journaled on a bolt 168 disposed in a slot 169 formed in a lever 170. A clamp nut 171 is provided by which the bolt 168 may be secured in any selected position along the slotted lever 170. The lever 170 is fast on a shaft 172 journaled vertically in the machine bed. At its lower extremity, the shaft 172 carries a lever 173 to which is secured a cam follower roller 174 arranged to track the cam groove 141 in the pattern cam 12. A frame opening 175 at the rear of the machine and an opening 176 at the side, which may be closed as by a cover plate 177, provide for convenient access to the clamp nuts 147 and 171 by which the degree of work clamp movement along the bed and transversely thereof, respectively, may be adjusted and, therefore, by which the size of any particular tack may readily be adjusted.

As illustrated in Fig. 3, a bobbin winder may be applied as by fastening screws 180—180 to the machine frame for actuation by the driving belt 76 of the machine. The bobbin winder illustrated in Fig. 3 is of the type in which a swinging frame 181 carries a shaft 182 formed with a bobbin engaging extremity 183 and having a driving pulley 184 fast thereon. The frame 181 may be swung to bring the inclined face of the pulley into engagement with one side of the V belt 76, a toggle linkage 185—186 being provided to maintain operative position of the pulley against the belt until a trip finger 187 carried by the toggle link 185 is forced outwardly by the thread mass at the bobbin fills to throw out the toggle joint and disengage the pulley from the belt.

Having thus described the nature of the invention, what we claim herein is:

1. A sewing machine having a frame including a sub-base portion having a substantially flat upper surface suitable for disposition flush with a supporting table-top, a bed unit including a standard portion adapted to be secured upon said sub-base portion, and a work-supporting arm extending from said standard in spaced relation above the upper surface of said sub-base portion, and a head unit including a standard disposed to extend vertically upward from the standard of said bed unit, a bracket-arm extending from said head unit in vertically spaced relation to said work-supporting arm, a work penetrating needle carried in said bracket-arm, means within said bracket-arm for imparting endwise work penetrating reciprocations to said needle, stitch forming mechanism complementary to said needle carried in said work-supporting arm, actuating means for said stitch forming mechanism disposed in said work-supporting arm, a work holding clamp slidably pivoted to said work-supporting arm, a pattern cam carried in said sub-base portion, means controlled by said pattern cam for imparting relative motion between said work holding clamp and the path of endwise work penetrating reciprocation of said needle, and drive means extending into the sub-base portion, the bed unit and the head unit for synchronizing the operation of the needle, the complementary stitch-forming instrumentalities, and said pattern cam.

2. A sewing machine comprising a frame including a sub-base section, a work-supporting bed section carried upon said sub-base section, and a bracket-arm section carried upon said work-supporting section, cooperating stitch forming instrumentalities carried in said bracket-arm section and in said work-supporting section, a work-gripping clamp carried by said frame and disposed to control a work fabric in the region of said stitch forming instrumentalities, a pattern cam arranged in said sub-base section, cam following mechanism carried by said frame, and operative connections between said work-gripping clamp and said cam following mechanism.

3. A mechanism for stitching articles comprising a sub-base, a sewing machine carried upon said base, a shiftable work-holding clamp carried on said sewing machine, a pattern cam disposed in said sub-base, driving connections from said sewing machine to said pattern cam, and cam-following mechanism extending from said pattern cam to said work-holding clamp.

4. A sewing machine comprising a frame including a sub-base section, a work-supporting bed section carried upon said sub-base section, and a bracket-arm section carried upon said work-supporting section, cooperating stitch-forming instrumentalities carried in said bracket-arm section and in said work-supporting section, a work-gripping clamp carried by said frame and disposed to control a work fabric in the region of said stitch-forming instrumentalities, a pattern cam arranged in said sub-base section, cam-following mechanism carried by said frame, operative connections between said work-gripping clamp and said cam-following mechanism, a drive shaft journaled for turning movement in said frame, operative connections between said drive shaft and said pattern cam, other operative connections between said drive shaft and said cooperating stitch-forming instrumentalities.

5. A sewing machine comprising a frame including a machine supporting sub-base section formed substantially to enclose a pattern cam, a bed section carried upon said sub-base section, said bed section including a work-supporting surface extending in spaced relation over said sub-

base section, and a bracket-arm section carried on said bed section, a needle carried for endwise reciprocatory movement in said bracket-arm, stitch-forming mechanism carried in said bed section for cooperation with said needle in the formation of stitches, a shiftable work-gripping clamp carried by said frame and disposed between said bed and said bracket-arm sections, and a pattern cam disposed substantially within said sub-base section, cam following mechanism carried by said frame and operatively connected with said work-gripping clamp, actuating mechanism carried by said machine frame including a main drive shaft, operative connections between said main drive shaft and said stitch-forming instrumentalities and other operative connections between said main drive shaft and said pattern cam.

6. In a cyclically operated sewing machine having a machine frame, a main actuating shaft journaled in said machine frame, a positive-acting stop-motion mechanism associated with said shaft, and a shiftable work-gripping clamp, a sub-base unit adapted to support said sewing machine frame, a pattern cam journaled for turning movement in said sub-base unit, cam-following mechanism carried by said sewing machine and extending into said sub-base unit in operative relation with said pattern cam, operative connections between said cam-following mechanism and said work-gripping clamp, a shaft carried by said sewing machine and extending into said sub-base unit drivingly to interconnect said pattern cam with said main actuating shaft, and cam means carried in said sewing machine frame and adapted to be driven by said last mentioned shaft for controlling said positive acting stop-motion mechanism.

7. In combination, a pattern cam controlled sewing machine, a sewing machine supporting platform provided with an aperture extending adjacent said sewing machine, a pattern cam disposed substantially within said platform aperture, and operative connections between said sewing machine and said pattern cam.

8. In combination, a sewing machine having a work holding clamp and pattern cam operated work clamp shifting mechanism, a horizontally extending sewing machine supporting platform formed with a pattern cam accommodating aperture, a flat cylindrical pattern cam carried beneath said sewing machine substantially within said platform aperture, and operative connections between said work clamp shifting mechanism and said pattern cam.

9. In combination with a table top having an aperture formed therein, a sub-base having a substantially flat upper surface, means for sustaining said sub-base in said aperture with said upper surface disposed substantially flush with said table top, a sewing machine carried on said sub-base, a shiftable work-manipulating mechanism carried on said sewing machine, cam means disposed beneath the upper surface of said sub-base and substantially within said table-top aperture, driving connections from said sewing machine to said cam means, and cam-following mechanism extending from said cam means to said work-manipulating mechanism.

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