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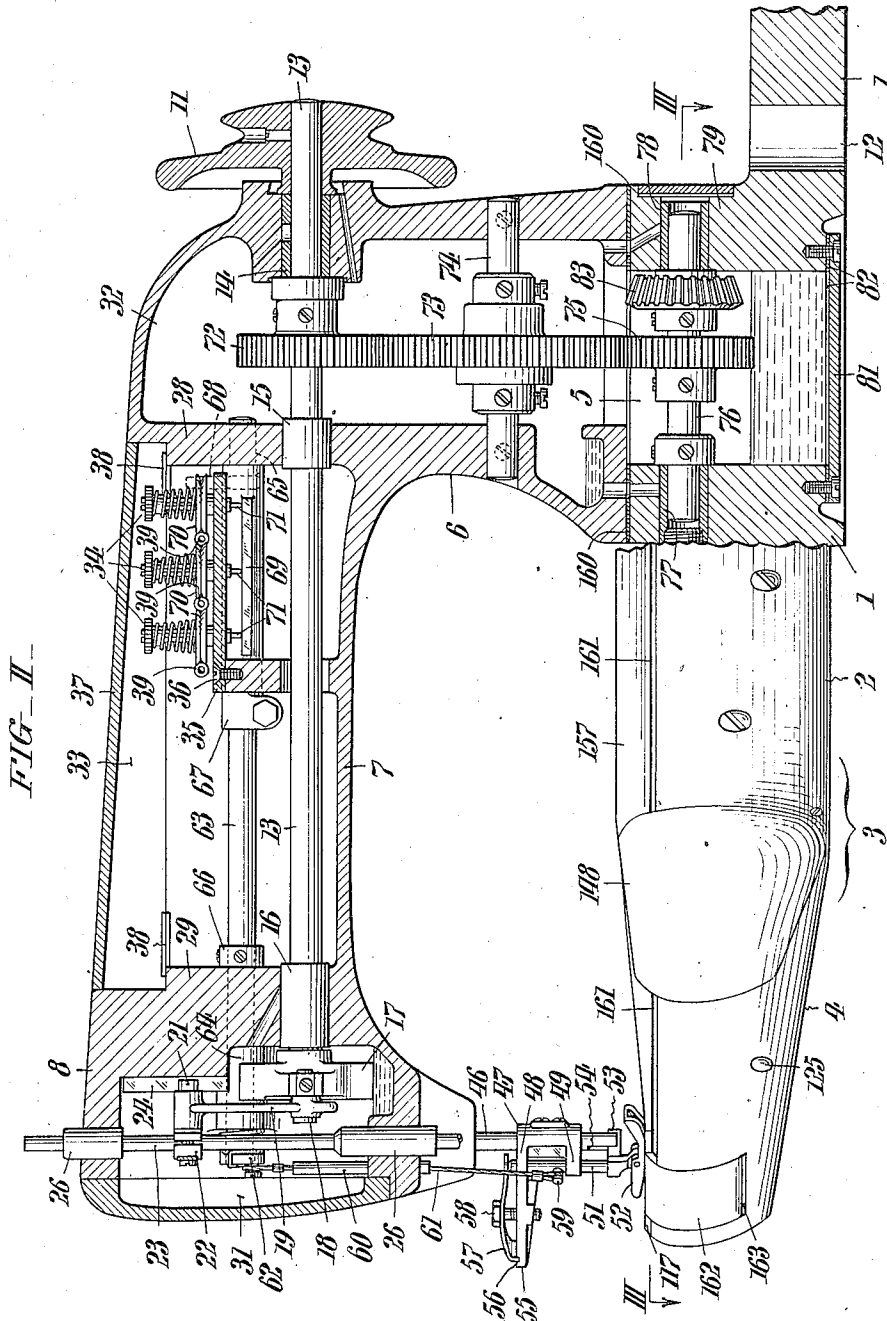
N. V. CHRISTENSEN

2,294,074

SEWING MACHINE

Filed Nov. 30, 1939

5 Sheets-Sheet 2



WITNESSES:

Hubert Fuchs
William Bell, Jr.

INVENTOR:

Norman V. Christensen,

BY

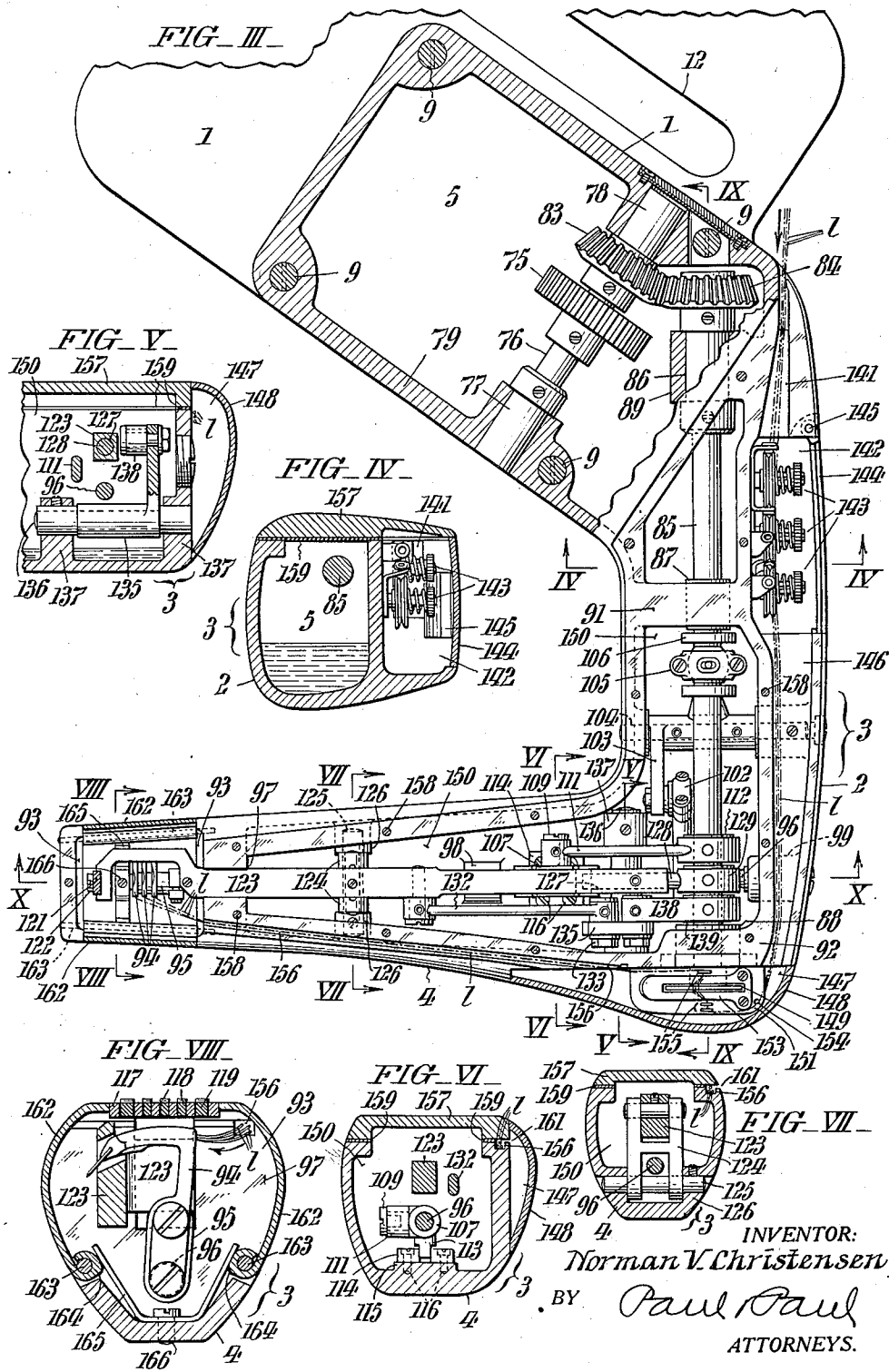
Paul Paul

ATTORNEYS.

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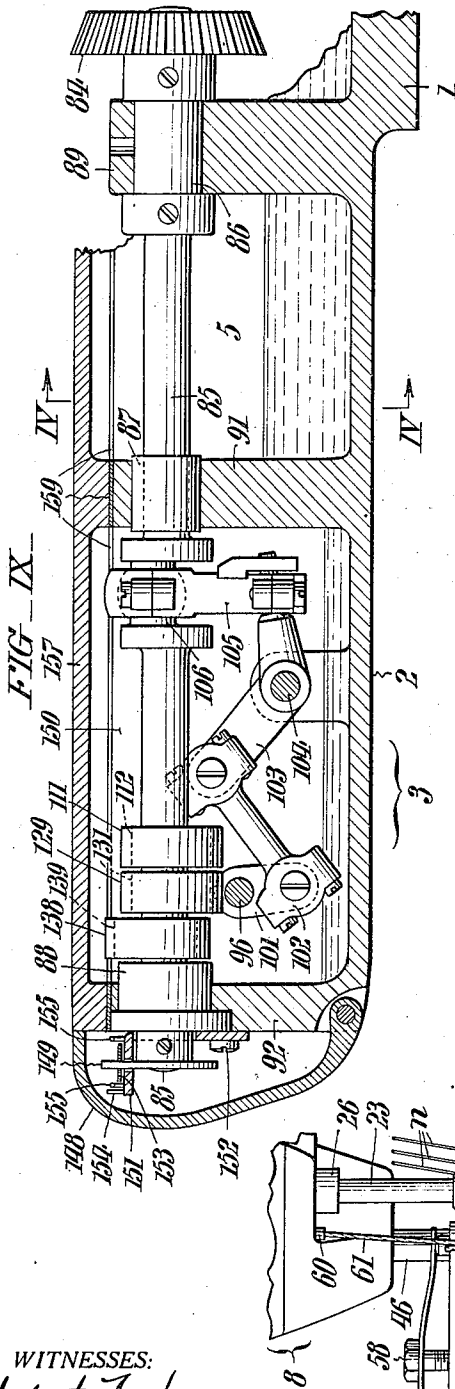
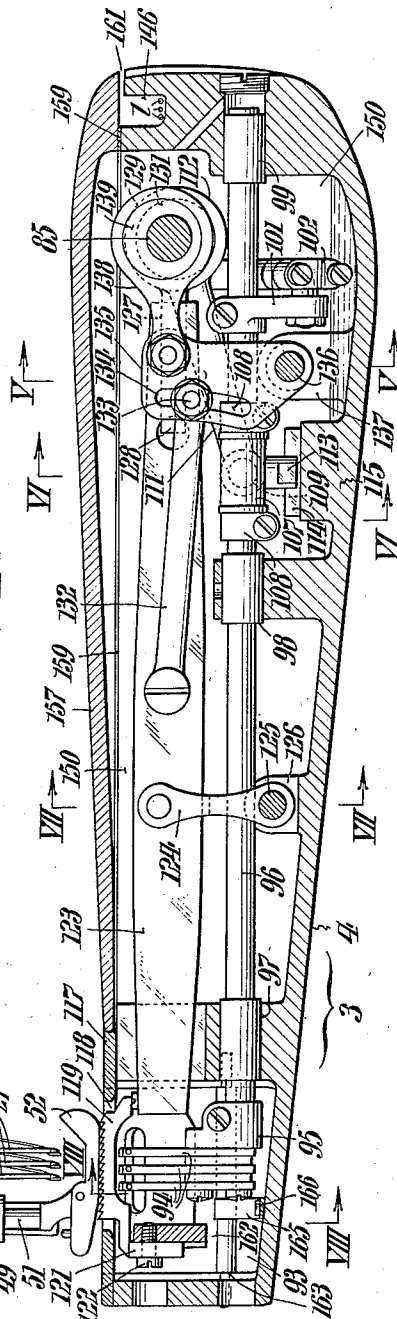


FIG. X



WITNESSES:
Hubert Fuchs
William Dill, Jr.

INVENTOR:
Norman V. Christensen,
BY Paul Paul
ATTORNEYS.

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N. V. CHRISTENSEN

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5 Sheets-Sheet 5

FIG. XII

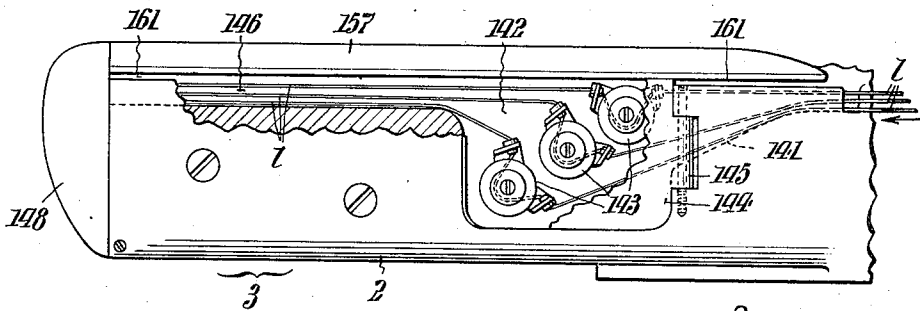


FIG. XIII

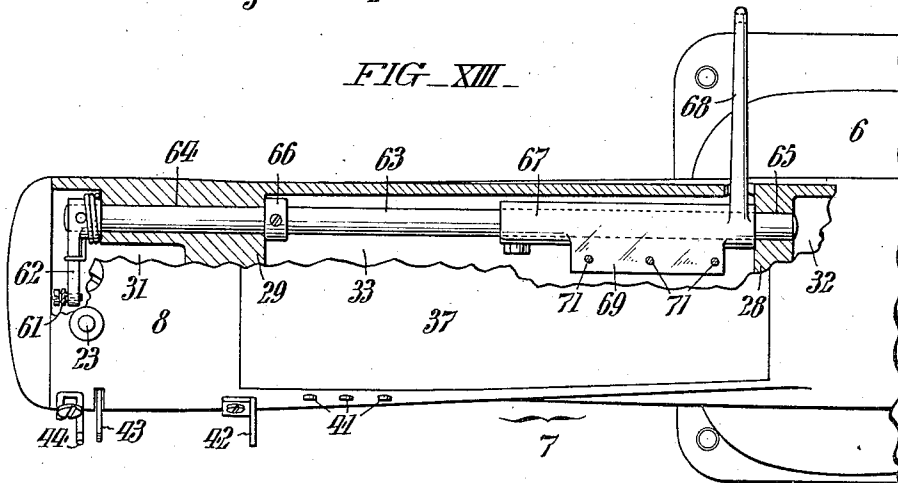


FIG. XI

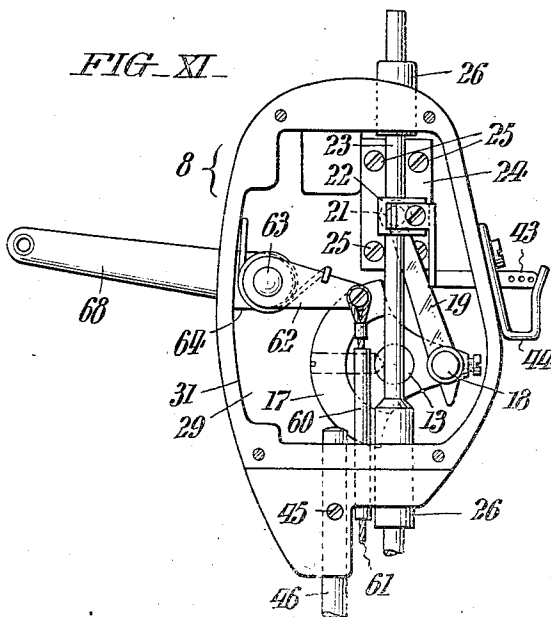
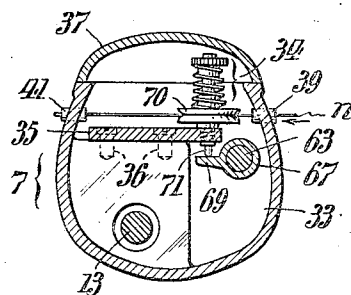


FIG. XIV



INVENTOR:
Norman V. Christensen,
BY *Paul Paul*
ATTORNEYS.

UNITED STATES PATENT OFFICE

2,294,074

SEWING MACHINE

Norman V. Christensen, Chicago, Ill., assignor to
Union Special Machine Company, Chicago, Ill.,
a corporation of Illinois

Application November 30, 1939, Serial No. 306,826

16 Claims. (Cl. 112—63)

This invention relates to sewing machines and has reference more particularly to feed-off-the-arm sewing machines. Of such machines there are four representative types which are characterized by differences in the shaping of the machine frames, one such type being shown in U. S. Patent No. 1,356,334, granted to Joseph Berger on October 19, 1920; another in U. S. Patent No. 1,741,095, granted to Norman Christensen and Harold J. Le Vesconte on December 24, 1929; another shown in U. S. Patent No. 999,718, granted to Hawes on August 1, 1911; and another shown in U. S. Patent No. 1,041,585, granted to Barton on October 15, 1912. By virtue of the particular shape of its frame, each of these machines has particular advantages. For example, the machine having the type of square configuration instanced in the Berger patent, supra, permits use of a drive means in which the shafts are all at right angles but has the disadvantage of requiring additional mechanism since the work supporting arm has three sides. In the machine of the Christensen and Le Vesconte type wherein the frame is triangular, less mechanism is required in the drive, but the component parts of such drive are more expensive to manufacture. Again machines of the Hawes and Barton types, in which the two portions of the work supporting arm lie substantially in the same plane, require less mechanism for driving than the machines having frames of the off-set type like Berger and Christensen et al., but such co-planar type machines are especially suited for sewing soft materials such as open or knit goods which are readily pliable.

The chief aim of the present invention is to make it possible to combine all the advantageous features of these several different types of feed-off-the-arm machines in one machine with a view to eliminating as many as possible of the disadvantages heretofore experienced. A further aim is to secure the foregoing objectives in a sewing machine which is relatively small and compact, and in which rotary motion is utilized to the greatest possible extent, so that it can be operated at very high speeds with a minimum of vibration, as well as quickly started and stopped without injury to the mechanism.

Another aim of my invention is to avoid as far as possible external projections on the machine which desideratum I also attain as hereinafter more fully disclosed, through provision of a frame whereof the outer surfaces are smoothly mergent, and which affords at its interior cavities for the accommodation not only of the stitch

forming, feeding, and driving mechanisms, but also of the thread tensions and mechanism for lifting the presser element and the means for controlling the tensions for the needle thread or threads.

Still another object of my invention is to define within a hollow frame characterized as above, isolated chambers in which the needle mechanism, the feed mechanism, the drive mechanism, as well as other mechanisms of the machine are separately housed, said chambers having separate oil supply provisions for automatic lubrication of the several mechanisms.

Other objects and attendant advantages will appear from the detailed description which follows, having reference to the attached drawings wherein:

Fig. I is a plan view of a feed-off-the-arm sewing machine conveniently embodying my invention, a portion of the machine frame being broken out at the top to expose important details at the interior.

Fig. II is a view partly in front elevation and partly in vertical section, taken as indicated by the angled arrows II—II in Fig. I.

Fig. III is a horizontal sectional view of the base and work supporting arm taken as indicated by the angled arrows III—III in Fig. II.

Figs. IV, V, VI, VII and VIII, represent vertical sectional views taken transversely at intervals along the work supporting arm as respectively indicated by the angled arrows IV—IV, V—V, VI—VI, VII—VII and VIII—VIII, in Figs. III, IX, and X.

Fig. IX is a fragmentary detailed sectional view of the anchorage portion of the work arm, taken as indicated by the angled arrows IX—IX in Fig. III.

Fig. X is a vertical sectional view of the free end of the work arm taken as indicated by the angled arrows X—X in Fig. III.

Fig. XI shows the needle head of the machine in front elevation with its cover plate removed to expose parts at the interior.

Fig. XII is a side elevation of the overhanging arm of the sewing machine with a portion broken out to expose thread tension mechanism.

Fig. XIII is a plan view of the overhanging arm of the sewing machine with a portion broken out to show a presser foot lifting mechanism; and,

Fig. XIV is a transverse sectional view of the overhanging arm taken as indicated by the angled arrows XIV—XIV in Fig. I.

As herein shown, and with particular reference

to Fig. I, my improved sewing machine has a frame which comprises a base 1 of substantially rectangular configuration from which extends, at an angle in a horizontal plane, the anchorage portion 2 of a work arm 3 whereof the free end or terminal portion 4 extends substantially at right angles to the anchorage portion 2 and lies in the same horizontal plane with the latter portion and forms a rectangular elbow therewith. From Figs. II and III, it will be observed that the base 1 has a hollow 5 and that the work arm 3 is also hollow and that the connecting end of its anchorage portion 2 communicates directly with the aforesaid hollow in the base. Rising from the base 1 and secured thereto by screws 9 is a standard 6 which is hollow and communicates vertically into the hollow 5 of said base, said standard supporting a horizontal overhanging arm 7 which terminates in a needle head 8. As viewed in plan in Fig. I, the overhanging arm 7 forms a triangle with the portions 2 and 4 of the work arm 3, with the needle head at its outer end directly above the free end of the terminal portion 4 of said work arm.

For operation of the machine, a combined hand wheel and belt pulley 11 is provided; and beneath the pulley element the base 1 is slotted, as indicated at 12, for passage of a conventional driving belt. The combined hand wheel and belt pulley 11 is affixed to a driving shaft 13 which extends longitudinally of the overhanging arm 7, and which is journaled in suitable bearings 14, 15 and 16. At its distal end (Figs. II and XI), the driving shaft 13 enters the needle head 8 and drives a crank disc 17 carrying a crank pin 18. By means of a link 19, the crank pin 18 is connected to a pin 21 forming an integral part of a clamp collar 22 carried by the needle bar 23. The free end of the pin 21 extends beyond the end of the link 19 and is formed with flattened sides which engage guide plates 24 secured to the inner face of the needle head by screws 25, thus resisting any torsional forces exerted by the link 19. The needle bar 23 is mounted for reciprocation in suitable bearing bushings 26 in the needle head 8 and at its lower end carries one or more needles 27 (three such needles being shown in the illustrated example, Fig. X) which cooperate with complemental stitch forming mechanism situated in the free end of the work arm to effect the formation of stitches.

As best illustrated in Fig. II, the bearing bushings 15, 16 are mounted in cross walls 28, 29 in the overhanging arm 7 which serve to divide that arm into three compartments; namely, a needle head compartment 31, a gear compartment 32 within the hollow standard 6, and an intermediate compartment 33 in which suitable needle thread tensions 34 are mounted on a bracket plate 35 secured by screws 36. Access to the intermediate compartment 33 is had through a cover plate 37 mounted by hinges 38 on the overhanging arm of the machine. As shown in Fig. I, the needle threads n pass from a source of supply through eyelets 39, mounted in the rear wall of the overhanging arm, thence through the tension devices 34, and through eyelets 41 in the front wall of the overhanging arm, and ultimately through suitable guides and take-up members 42, 43 and 44 to the needles 27.

Secured in the lower portion of the needle head 8 by a set screw 45 is a depending bar 46 on which is mounted a collar 47 rigidly secured thereto. The collar 47 is provided with laterally extending lugs 48, 49 in which a presser bar 51, carrying at

its lower end a presser foot 52, is mounted for vertical movement. The presser bar 51 adjacent the presser foot 52 is provided with a laterally extending tongue member 53 which engages a slot 54 formed in the lower end of the depending bar 46, thus resisting any tendency of the presser bar 51 and presser foot 52 to turn about the axis of the presser bar. At its upper end the collar 47 is further provided with a rearwardly extending arm 55, which at its outer end has a notch 56 accommodating one end of a leaf spring 57. The leaf spring 57 at its other end engages the end of the presser bar 51 and through an adjustable screw 58 tends to urge the presser foot into yielding engagement with the work on the work arm 3. By means of the screw 58, the pressure exerted by the spring 57 on the presser bar 51 and presser foot 52 may be varied. Between the guiding lugs 48, 49, the presser bar 51 carries a shoulder screw 59 which, through a flexible member 61, is connected with a crank arm 62, as clearly shown in Figs. XI and XIII, affixed to a rock shaft 63 journaled in bearings 64, 65 in the overhanging arm of the machine. The endwise movement of this rock shaft 63 is prevented by engagement of the bearing 64 by the hub of the arm 62 and a thrust collar 66. Adjacent the bearing 65 the rock shaft 63 carries a collar 67 clamped thereto and having a laterally projecting crank arm 68, extending through a clearance opening in the wall of the overhanging arm of the machine, the free end of which is adapted to be engaged by a chain or other suitable means leading to a foot treadle or the like for rocking the shaft and thereby lifting the presser foot 52 from contact with the work on the work support. The collar 67 is further provided with a laterally projecting lug 69 which extends beneath the tension devices 34 and upon rocking of the shaft 63 to lift the presser foot 52, this lug 69 will engage the release pins 71 of the tension members 34, and separate the tension discs 70 (see Figs. II, XIII and XIV). From Fig. II, it is to be particularly noted that the flexible connecting member 61 extends through a tube 60 within the hollow of the head 8, the top of said tube being well above the level of an oil supply (conventionally indicated) at the bottom of said head and out of the range of oil splashed by the moving parts of the needle actuating mechanism.

Within the hollow standard 6, the driving shaft 13 carries a pinion 72 which meshes with an idler gear 73 journaled for rotation on a stationary shaft 74, and the idler gear 73 in turn meshes with a second pinion 75, identical to the pinion 72, mounted on a short countershaft 76 journaled in bearings 77, 78 in the upstanding portion 79 of the base 1. The cavity 5 in this portion of the base is closed at the bottom by a cover plate 81 and gasket 82, thus providing an oil-tight compartment in which the above mentioned gears operate.

With particular reference to Figs. III, IX and X, wherein the mechanism within the work supporting arm 3 may be viewed in detail, it will be observed that the shaft 76 in addition to the gear 75 carries a bevel gear 83 which meshes with an identical bevel gear 84 affixed to one end of a transmission shaft 85 journaled in bearing bushings 86, 87 and 88, supported respectively by an interiorly projecting lug 89, a cross wall 91 and an end wall 92 of the work supporting arm 3. At the free end of the work arm 3 in a compartment 93 are located one or more loopers 94, which constitute the complemental stitch form-

ing means previously referred to (three such loopers being shown in the illustrated example). As shown, the loopers 94 are mounted in a holder 95 secured to the end of a looper shaft 96, which is journaled for oscillation and endwise reciprocation in bearings 97, 98 and 99 interiorly of the free end portion 4 of the work arm 3. Intermediate the bearings 98 and 99, the looper shaft 96 carries an arm 101 clamped thereto, which arm at its outer end is connected by means of a link 102 to one end of a lever 103 for oscillation on a cross pin 104 carried by suitable formations in the interior of the work arm 3. The other end of the bell crank lever 103 is connected by a pitman 105 with a crank or eccentric member 106 on the shaft 85, located adjacent the bushing 87. Through the above described train of mechanism, the shaft 96 will be oscillated to give the loopers their loop taking and loop shedding movements.

Freely mounted on the looper shaft 96 is a collar 107 which is held against endwise movement by thrust collars 108. The collar 107 is provided with a laterally projecting stud 109 which is engaged by one end of a strap link 111, the other end of which embraces an eccentric 112 on the shaft 85. As the shaft 85 is rotated, the eccentric 112, through this train of mechanism, will induce endwise reciprocation of the looper shaft, and thus impart to the loopers 94 their needle avoiding movement. The collar 107 is further provided with a depending lug 113, the flattened sides of which engage guide blocks 114 secured by means of screws 116 to a boss 115 rising from the interior of the work arm. This guiding arrangement serves to absorb any torsion imparted to the collar 107 by the link 111.

Secured to the forward end of the work arm 3 is a throat plate 117 having needle holes and feed dog slots 118 through which the two sections of a four motion feed dog 119 operate to engage the fabric in the usual manner. The feed dog 119 is provided with a depending shank 121 secured by means of a screw 122 to the forward end of a feed bar 123. The feed bar 123 extends rearwardly along the work arm 3 and intermediate its ends is pivotally supported by a vertical link 124, which at its lower end is mounted for oscillation about a cross pin 125 mounted in suitable bosses 126 on the interior of the work arm. At its rear end the feed bar 123 is provided with a longitudinal bore 127 in which a rod 128 is engaged for sliding reciprocation. This rod 128 is formed as an integral part of an eccentric strap 129 embracing an eccentric 131 on the shaft 85. As the shaft 85 revolves, the feed bar 123 will not be affected by the endwise components of motion of the rod 128, but the vertical component of its motion will cause the feed bar to oscillate about its pivotal support on the links 124 and thus impart a rising and falling movement to the feed dog 119.

Pivotally connected to the feed bar 123 adjacent its pivotal support is a link 132, the other end of which is pivotally connected by a stud 133 in an arcuate slot 134 formed in a rock member 135 which at its lower end is pivotally mounted on a cross pin 136 secured in suitable lugs 137 projecting interiorly of the work arm 3. Pivotally connected to the rock member 135 is one end of a pitman 138, the other end of which embraces an eccentric 139 on the shaft 85. Rotation of the shaft 85 will impart oscillation to the rock member 135, and through the link 132 the other oscillations will be converted into reciprocating movement in the feed bar for its feed and return stroke. By adjusting the rear end of the link 132 along the slot 134, the length of the feed stroke can be varied.

The looper thread or threads 1 are led from a source of supply into a slot 141 formed in the outer wall of the anchorage portion 2 of the work arm 3, and through this slot are led into a thread tension recess or cavity 142 formed in the rear side of the work arm. This recess or cavity 142 contains thread tension devices 143, and access thereto for the purpose of threading is had through a retractable cover plate 144 hinged to the side wall of the work arm at 145. After passing through the thread tension devices 143, the looper thread is led through a slot 146 formed in the upper rear wall of the work arm, and thence into a housing 147 at the elbow of the work arm formed by a hinged cover 148, and in the housing 147 there is located a suitable take-up device comprising a rotary cam 149 carried by the end of the shaft 85 and suitable thread guiding means including a slotted plate 151 secured to the end wall of the work arm by a screw 152 and slotted stripper blade 153, together with suitable thread guiding means including a pin 154 and thread guides 155. From the take-up devices the thread 1 is led through a groove 156 formed in the upper edge of the side wall of the work arm 3 to the loopers 94. With particular reference to Fig. III, the above described course of the looper threads 1 is indicated by dot-and-dash lines.

The entire work arm 3, including its anchorage portion 2, is closed at the top by a correspondingly configured cover plate 157 secured thereon by screws 158, as most clearly indicated in Fig. I. Between the work arm 3 and the cover plate 157, there is a gasket 159, which encloses the mechanism within the work arm in an oil-tight casing in which an oil bath is maintained. The cover plate 157 extends lengthwise of the free end 4 of the work arm 3 beyond its point of attachment by the screws 158 and also extends along the anchorage portion 2 of the work arm beyond its point of attachment, and along this edge it is spaced to some extent from the edge of the work arm wall to provide an opening or slot 161 into which the thread 1 may be led to guide it into the thread guiding slots 141, 146 and 156.

As may be seen from the drawings, the mechanism of the machine is enclosed in three oil-tight compartments or chambers in each of which a quantity of oil is encased for splash lubrication applied to the mechanism situated therein. These compartments are the needle head compartment 31 in which the parts are lubricated as already explained, the gear compartment 32 within the standard 6, which at its lower end extends laterally to the cross wall 91 in the work arm 3, and a compartment 150 extending along the work arm from the cross wall 91 to the cross wall 97 at the free end of the work arm 3. As a consequence of this arrangement, different grades of oil may be employed for the three different mechanisms above referred to. Not only is a gasket employed to secure the cover plate 157 for the work arm including its anchorage portion, but an additional gasket 160 is also located between the upper and lower portions of the frame which are held together by screws.

For access to the loopers for inspection and threading, the work arm is provided at its free end with side openings, which are closed by cov-

ers 162 hinged at 163 and provided at their hinged point with cam surfaces 164 (Fig. VIII) which engage the arms of a leaf spring 165 secured to the work arm 3 by a screw 166 and operating to hold the covers either in open or closed position.

From the above description, it will be particularly observed that the driving mechanism of the sewing machine comprises gear-connected shafts which extend from the standard 6 through the overhanging arm 7 and from the standard through the anchorage portion 2 of the work arm 3. Power is transmitted to points relatively remote from the standard by rotary elements exclusively. For imparting the desired movements (reciprocatory or oscillatory) to the needle bar 23, the loopers 94 and the feed dog 119, additional actuating mechanism, driven by said gear-connected shafts, is provided, which additional mechanism is confined to the needle head compartment 31 and the compartment 150 extending throughout the free end of the work arm 3. Thus this invention materially reduces, from the standpoint of size and weight, the moving parts required for imparting such special movements to the stitch forming and feeding mechanism, permitting high speed operation, and at the same time resulting in obvious simplification, economy, and avoidance of vibration with respect to the entire driving mechanism. Moreover, the advantages of the co-planar type of work supporting arm are also obtained.

It will also be observed that numerous other advantages are gained, including especially an efficient system of lubrication for the moving parts most subject to wear, a particularly convenient method of conducting the looper threads around an angular work supporting arm, and other advantages which follow from the particular design of the work supporting arm and the accessibility of parts within the interior thereof.

While I have described my invention in some detail with reference to a specific embodiment thereof in a feed-off-the-arm machine, it will be apparent that numerous changes may be made in the form of the apparatus disclosed herein, without departing from the spirit of my invention, and that various features of my invention may at times be used to advantage without a corresponding use of other features.

Having thus described my invention, I claim:

1. In a sewing machine, a frame having a main support including a base and a standard rising therefrom, a substantially horizontal angular work arm extending laterally and thence forwardly from said main support, an arm extending laterally from said support with its free end overhanging the free end of the work arm, the axes of said work arm, main support and overhanging arm presenting in plan a right angle triangle with acute angles respectively at the region of the free ends of the two arms and at the region of the main support, of which angles the latter is not greater than the first.

2. In a sewing machine, a frame having a main support including a base and a standard rising therefrom, a substantially horizontal angular work arm extending laterally and thence forwardly from said main support, an arm extending laterally from said support with its free end overhanging the free end of the work arm, the axes of said work arm, main support and overhanging arm presenting in plan a right angle triangle with acute angles respectively at the region of the free ends of the two arms and at

the region of the main support, of which angles the first mentioned angle is the greater of the two.

3. In a sewing machine, a frame having a hollow base with a substantially horizontal hollow angular work arm extending laterally and thence forwardly therefrom, a hollow standard rising from the base and sustaining a laterally extending hollow arm with its free end overhanging the free end of the work arm, the axes of said work arm, standard and overhanging arm forming a right angle triangle in plan configuration with acute angles respectively at the region of the free ends of the two arms and at the region of the standard, of which angles the latter is not greater than the first; stitch forming and feeding means respectively at the free ends of the overhanging and work arms; and drive means for said stitch forming and feeding means with parts thereof in the hollows of said standard and said work and overhanging arms.

4. In a sewing machine, a frame having a hollow base with a substantially horizontal hollow angular work arm extending laterally and thence forwardly therefrom, a hollow standard rising from the base and sustaining a laterally extending hollow arm with its free end overhanging the free end of the work arm, the axes of said work arm, standard and overhanging arm forming a right angle triangle in plan configuration with acute angles respectively at the region of the free ends of the two arms and at the region of the standard, of which angles the latter is not greater than the first; stitch forming and feeding means respectively at the free ends of the overhanging and work arms; and rotary drive means for said stitch forming and feeding means with parts thereof in the hollows of said standard and said work and overhanging arms.

5. In a sewing machine, a frame having a hollow base with a substantially horizontal hollow angular work arm extending laterally and thence forwardly therefrom, a hollow standard rising from the base and sustaining a laterally extending hollow arm with its free end overhanging the free end of the work arm, the axes of said work arm, standard and overhanging arm forming a right angle triangle in plan configuration with acute angles respectively at the region of the free ends of the two arms and at the region of the standard, of which angles the latter is not greater than the first; stitch forming and feeding means respectively at the free ends of the overhanging and work arms; and drive mechanism including actuating shafts for said stitch forming and feeding means respectively within the overhanging and work arms, and means within the standard connecting the two shafts for synchronous rotation.

6. In a sewing machine, a frame having a hollow base with a substantially horizontal hollow angular work arm extending laterally and thence forwardly therefrom, a hollow standard rising from the base and sustaining a laterally extending hollow arm with its free end overhanging the free end of the work arm, the axes of said work arm, standard and overhanging arm forming a right angle triangle in plan configuration with acute angles respectively at the region of the free ends of the two arms and at the region of the standard, of which angles the latter is not greater than the first; stitch forming and feeding means respectively at the free ends of the overhanging and work arms; and drive mechanism including actuating shafts for said stitch

forming and feeding means respectively within the overhanging and work arms, and a train of gear wheels within the standard connecting the two shafts for synchronous rotation.

7. In a sewing machine, a frame having a hollow base with a substantially horizontal hollow angular work arm extending laterally and thence forwardly therefrom, a hollow standard rising from the base and sustaining a laterally extending hollow arm with its free end overhanging the free end of the work arm, the axes of said work arm, standard and overhanging arm forming a triangle in plan configuration with acute angles respectively at the region of the free ends of the two arms and at the region of the standard, of which angles the latter is not greater than the first; stitch forming and feeding means respectively at the free ends of the overhanging and work arms; and drive mechanism including actuating shafts for said stitch forming and feeding means respectively within the overhanging and work arms, an idler shaft extending across the standard, a train of spur gears connecting the idler shaft with the shaft in the overhanging arm, and a pair of bevel gears connecting said idler shaft with the shaft in the laterally-extending hollow arm of the standard.

8. A feed-off-the-arm sewing machine having a forwardly projecting work arm, a transverse supporting member therefor, a rotatable shaft in said member, work feeding and stitch forming devices in said work arm actuated by said shaft, a bearing in the end wall of said transverse member through which said shaft protrudes, and thread controlling means operated by said shaft on the exterior of said work arm.

9. A sewing machine comprising a hollow frame with a base, a work arm with an anchorage portion extending horizontally at an angle from the base and a free end portion extending substantially at right angles to the anchorage portion, and a standard supporting a uni-directional overhanging arm which terminates above the free end of the work arm; a needle bar vertically reciprocable in the free end of the overhanging arm; a needle operating shaft extending lengthwise of the overhanging arm in a vertical plane which intersects the vertical plane of the work arm inward of the free end of the latter; a looper to cooperate with the needle at the free end of the work arm; a counter-shaft within the frame base below the needle actuating shaft; a transmission shaft extending lengthwise of the interior of the anchorage portion of the work arm and protruding at the elbow of the latter; mechanism within the free end portion of the work arm for actuating the looper from the transmission shaft; a train of spur gears within the standard connecting the needle shaft and the counter-shaft; a pair of bevel gears within the base connecting the counter-shaft with the transmission shaft; a rotary take up for the looper thread mounted on the protruding end of the transmission shaft; a tension means for the looper thread within a recess in the outer side of the anchorage portion of the work arm; a guide channel in the back side wall of the anchorage portion of the work arm for the looper thread en route from the tension to the take-up; a channel in the outer side wall of the free end portion of the work supporting arm for guiding the looper thread from the rotary take-up to the looper.

10. A sewing machine comprising a hollow frame with a base, a work arm with an anchor-

age portion extending horizontally at an angle from the base and a free end portion extending substantially at right angles to the anchorage portion, and a standard supporting a uni-directional overhanging arm which terminates above the free end of the work arm; a needle bar vertically reciprocable in the free end of the overhanging arm; a needle operating shaft extending lengthwise within the overhanging arm in a vertical plane which intersects the vertical plane through the work arm inward of the free end of the latter; a looper to cooperate with the needle at the free end of the work arm; a counter-shaft within the frame base below the needle actuating shaft; a transmission shaft extending lengthwise of the interior of the anchorage portion of the work arm and protruding at the elbow of said arm; mechanism within the free end portion of the work arm for actuating the looper from the transmission shaft; a train of spur gears within the standard connecting the needle shaft with the counter-shaft; a pair of bevel gears within the base connecting the counter-shaft with the transmission shaft; a rotary take-up for the looper thread mounted on the protruding end of the transmission shaft; a looper thread tension within a recess in the outer side wall of the work arm; and retractable protecting covers respectively for the tension accommodating recess and the rotary take-up having their outer surfaces flush with the corresponding surfaces of the work arm.

11. A sewing machine comprising a hollow frame with a base, a work arm with an anchorage portion extending horizontally at an angle from the base and a free end portion extending substantially at right angles to the anchorage portion, and a standard supporting a uni-directional overhanging arm which terminates above the free end of the work arm; a needle bar vertically reciprocable in the free end of the overhanging arm; a needle operating shaft extending lengthwise within the overhanging arm in a vertical plane which intersects the vertical plane through the work arm inward of the free end of the latter; a looper to cooperate with the needle at the free end of the work arm; a countershaft within the frame base below the needle actuating shaft; a transmission shaft extending lengthwise of the interior of the anchorage portion of the work arm and passing outward through a bearing at the elbow of said arm; mechanism within the work arm for actuating the complementary stitch forming element from the transmission shaft; a train of spur gears within the standard connecting the needle shaft with the counter-shaft; a pair of bevel gears within the base connecting the counter-shaft with the transmission shaft; a recess in the outer side of the anchorage portion of the work arm; a tension for the looper thread disposed within the recess; an oil sump in the bottom of the work arm from which the looper actuating mechanism is lubricated; and a partition whereby the recess for the thread tension is isolated from said oil sump.

12. In a sewing machine, a frame structure comprising a base, a standard rising therefrom, an upper arm projecting laterally from said standard, and a lower right-angled arm projecting laterally from the base with its free end beneath the free end of said upper arm; stitch forming and work feeding devices at the free ends of said upper and lower arms; means for actuating said devices including upper and lower shafts respectively journaled on said arms; and

means at the standard connecting the two shafts for synchronous rotation including an idler shaft which is connected by a train of spur gears with the upper shaft and by a pair of bevel gears with the lower shaft.

13. A sewing machine comprising a hollow frame with a base, a work arm with an anchorage portion extending horizontally at an angle from the base and a free end portion extending substantially at right angles to the anchorage portion, and a standard supporting a uni-directional overhanging arm which terminates above the free end of the work arm; a needle bar confined to up and down movement in the free end of the overhanging arm; a needle operating shaft extending lengthwise within the overhanging arm in a vertical plane which intersects the vertical plane through the work arm inward of the free end of the latter; a complemental stitch-forming element to cooperate with the needle at the free end portion of said work arm; a counter-shaft within the frame base below the needle actuating shaft; a transmission shaft extending lengthwise of the interior of the anchorage portion of the work arm; actuating mechanism within the free end portion of the work arm for actuating the complemental stitch forming element from the transmission shaft; a train of spur gears within the standard connecting the needle shaft with the counter-shaft; a pair of bevel gears within the base connecting the counter-shaft with the transmission shaft; a partition dividing the hollow of the base and the standard from the hollow of the work arm to provide separate sumps for oil into one of which sumps the lowermost of the gear wheels of the spur train dips for the purpose of splash lubricating the parts within the base and the standard, and into the other of which sumps the actuating mechanism for the complemental stitch-forming element dips for splash lubrication of the parts within the work arm.

14. A sewing machine comprising a hollow frame with a base, a work arm with an anchorage portion extending horizontally at an angle from the base and a free end portion extending substantially at right angles to the anchorage portion, and a standard supporting a uni-directional overhanging arm which terminates above the free end of the work arm; a needle bar confined to up and down movement in the free end of the overhanging arm; a needle operating shaft extending lengthwise within the overhanging arm in a vertical plane which intersects the vertical plane through the work arm inward of the free end of the latter; a complemental stitch forming element to cooperate with the needle at the free end portion of the work arm; a counter-shaft within the frame base below the needle actuating shaft; a transmission shaft extending lengthwise of the interior of the anchorage portion of the work arm; actuating mechanism within the free end portion of the work arm for actuating the complemental stitch forming element from the transmission shaft; a train of spur gears within the standard connecting the needle shaft with the counter-shaft; a pair of bevel gears within the base connecting the counter-shaft with the transmission shaft; a pendent needle

head at the free extremity of the overhanging arm for guiding the needle bar and for housing actuating mechanism by which the needle bar is connected with the needle shaft; a sump at the bottom of the needle head into which the parts of the needle mechanism dip to splash about the oil within the head; a sump at the bottom of the frame base for oil into which the lowermost gear wheel of the spur train dips to splash lubricant, about within the base and the standard; partitions separating the hollow of the base and standard from the hollows of the overhanging arm and work arm; and a sump within the bottom of the work arm for oil into which the actuating mechanism for the complemental stitch forming element dips to splash lubricate the moving parts within said work arm.

15. In a sewing machine, a frame having a main support including a base with a standard rising therefrom, a substantially horizontal angular work arm extending laterally and then forwardly from the main support, a hollow arm extending laterally from said support with its free end overhanging the free end of the work arm, the axes of said work arm, the main support and overhanging arm forming a right angle triangle in plan configuration with acute angles respectively at the region of the free ends of the two arms and at the region of the main support, of which angles the latter is not greater than the first; needle actuating mechanism at the free end of the overhanging arm; work feeding means and complementary stitch forming means at the free end of the work arm; driving means for the needle actuating means and for the work feeding means and the complementary stitch forming means extending respectively through the overhanging arm and through the standard and the laterally extending portion of the work arm; said base, standard and arms completely enclosing said driving means, and providing a plurality of isolated oil sumps for lubrication of the driving means, and said driving means acting to distribute the oil from said sump by splash action.

16. In a sewing machine, a frame having a main support including a base with a standard rising therefrom, a substantially horizontal angular work arm extending laterally and thence forwardly from said main support; a uni-directional arm extending laterally from said support with its free end overhanging the free end of the work arm, the axes of said work arm, main support and overhanging arm forming a right angle triangle in plan configuration with acute angles respectively at the region of the free ends of the two arms and at the region of the main support, of which angles the latter is not greater than the first; work feeding and stitch forming devices at the free ends of said arms including a reciprocatory needle bar in said overhanging arm, and uni-directional rotary driving means for said devices extending through the overhanging arm, the main support and the lateral portion of the work arm, the said overhanging arm being so constructed and the driving means arranged therein as to eliminate vibration during high-speed operation of the machine.

NORMAN V. CHRISTENSEN.