Feb. 16, 1943. F. F. ZEIER 2,311,604

LUBRICATING SYSTEM FOR SEWING MACHINES

Original Filed Jan. 30, 1940 3 Sheets-Sheet 1

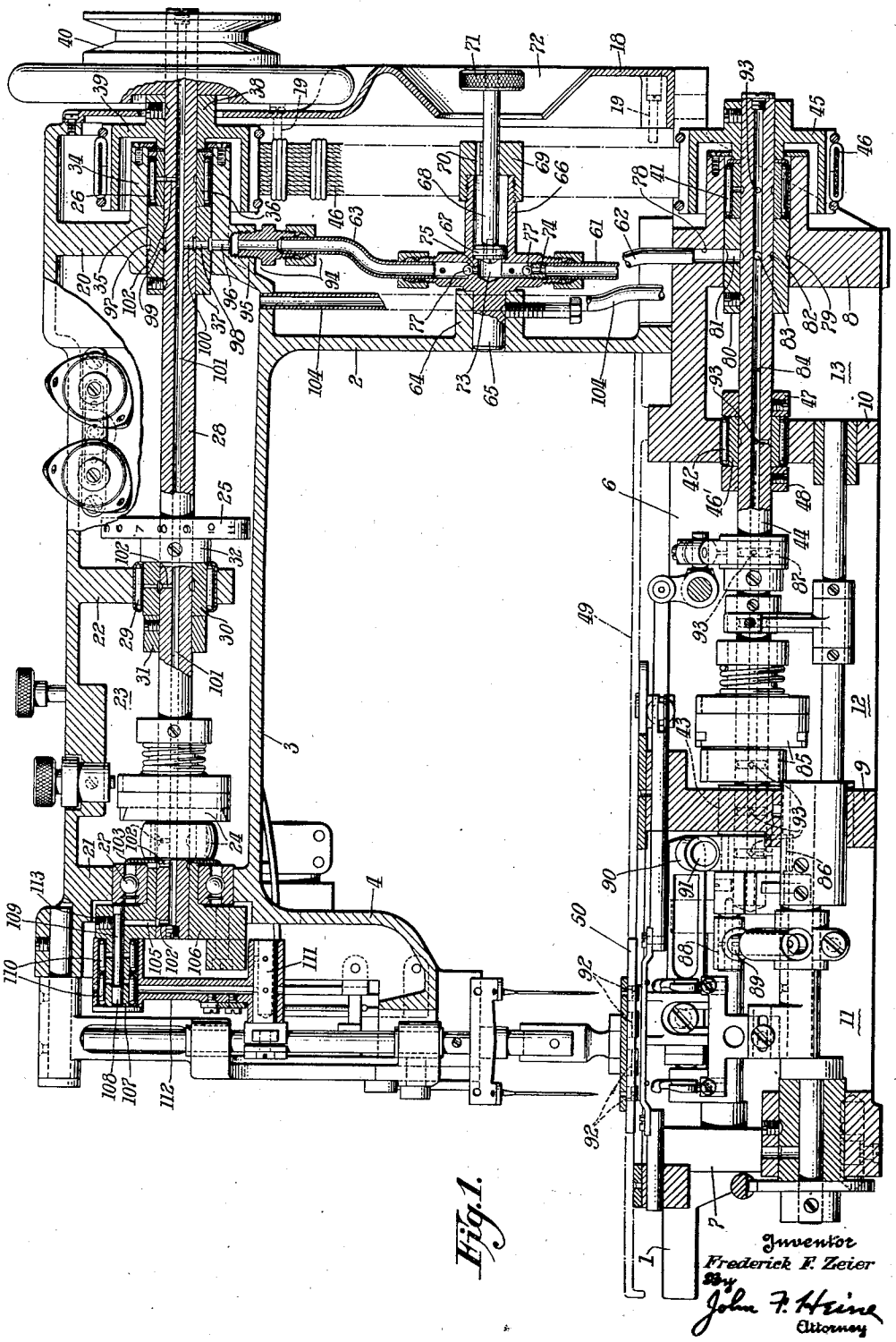

Fig. 1.

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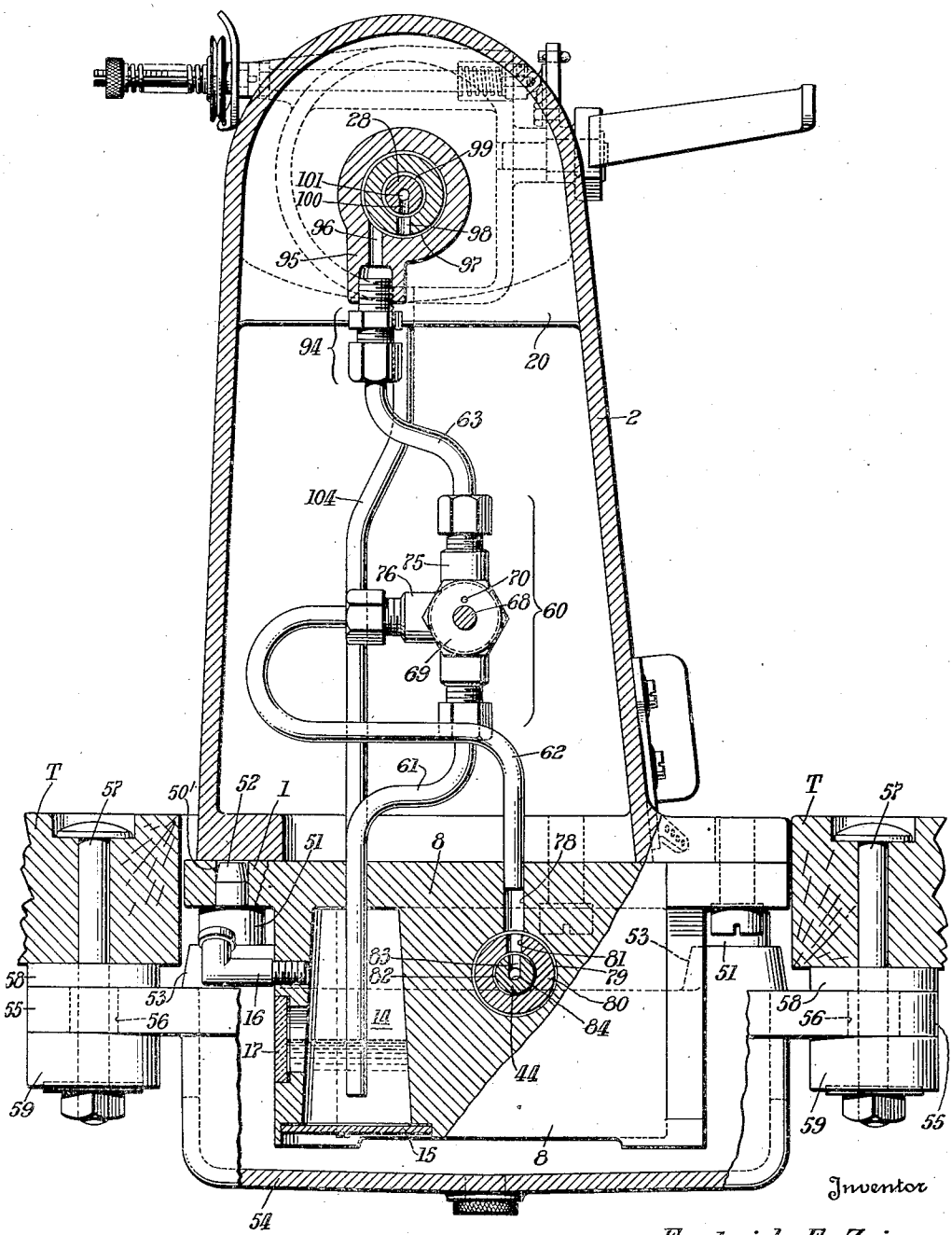

Fig. 2.

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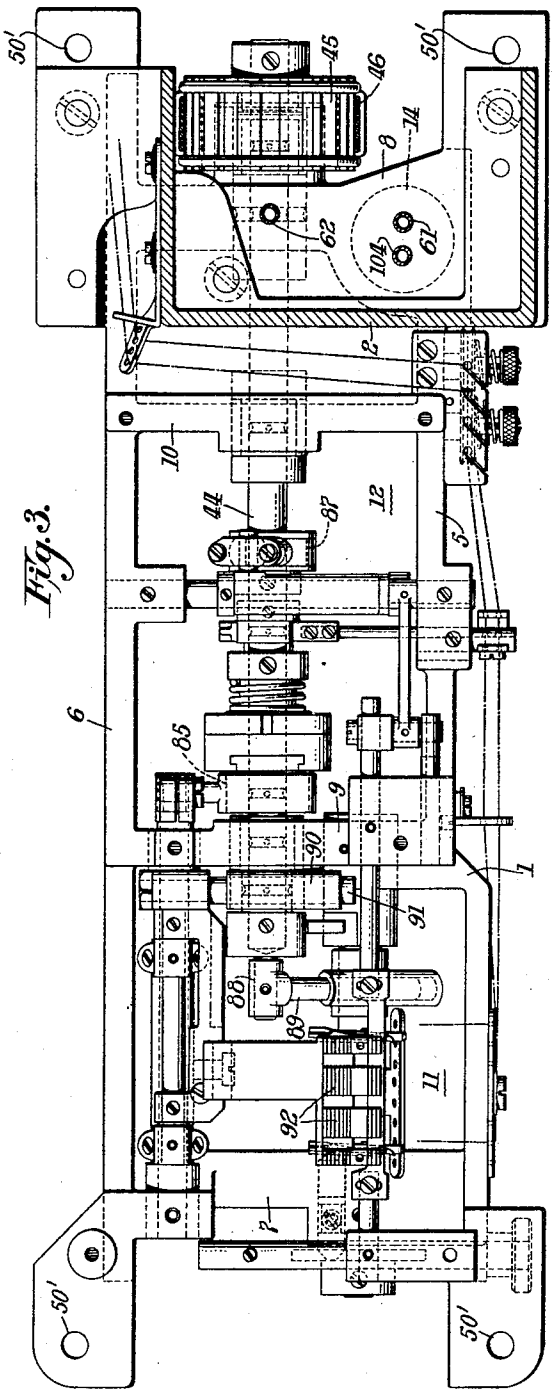

Fig. 3.

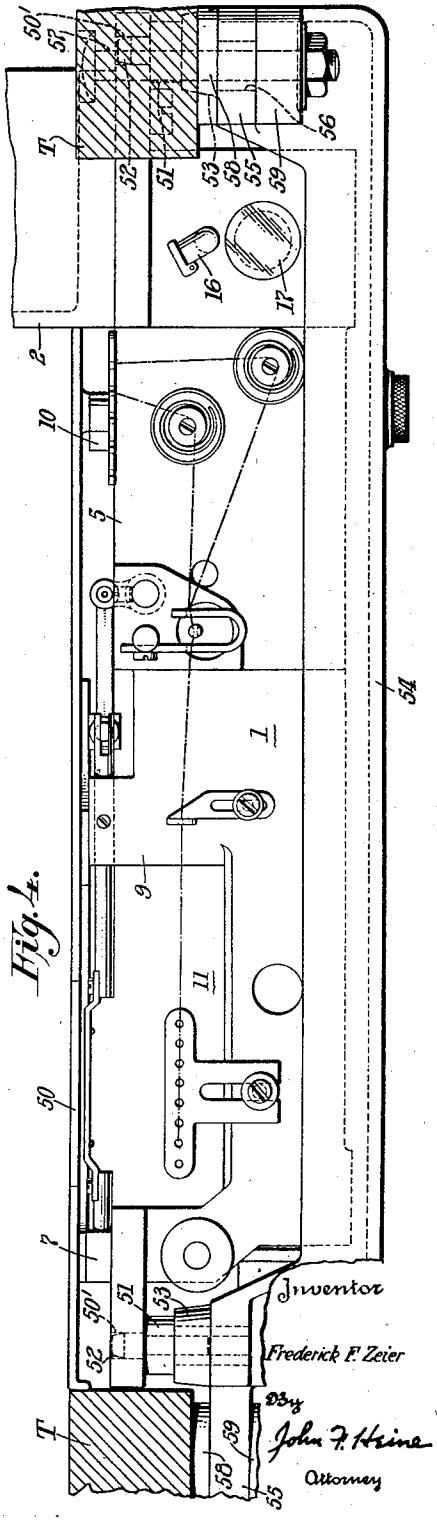

Fig. 4.

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LUBRICATING SYSTEM FOR SEWING MACHINES

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8 Claims. (Cl. 112—256)

This invention relates to sewing machines and has for its primary object to provide for the thorough and efficient lubrication of the machine to insure long life under high speed operating conditions.

A further object of the invention is the provision of a pressure lubricating system which can be manually operated whenever desirable to effectively and properly lubricate various bearings of the sewing machine.

The above and other objects of the invention and the advantages attained thereby will be readily understood by those skilled in the art from the following detailed description of a preferred embodiment of the invention illustrated in the accompanying drawings in which:

Fig. 1 is a longitudinal vertical sectional view of a sewing machine, showing the inner workings thereof, the various bearings which require lubrication and the pressure lubricating system employed for distributing oil to said bearings.

Fig. 2 is a transverse vertical sectional view through the standard of the machine, showing the preferred location of the lubricating pump and the inlet and outlet conduits therefor.

Fig. 3 is a top plan view of the machine-bed with the standard of the machine-frame in section and the work-supporting plate removed from the bed to expose the mechanism within the same.

Fig. 4 is a front side elevation of the machine-bed and drip-pan, showing the manner in which the latter is suspended from the table structure and the resilient support of the machine-bed upon the drip-pan.

This application is a division of my copending application Serial No. 316,297, filed Jan. 30, 1940, and only such reference will be made to the general construction of the machine and the operating mechanism of the same as will enable a clear understanding of the lubricating system.

The machine comprises a hollow frame which is preferably cast in two sections and includes a rectangular bed 1 from one end of which rises a standard 2 of an overhanging bracket-arm 3 terminating in a head 4. The rectangular bed 1 (Fig. 3), is composed of vertically disposed front and rear walls 5 and 6, and end walls 7 and 8. Intermediate the end walls 7 and 8 are two transverse dividing walls 9 and 10 which separate the bed 1 into individual compartments 11, 12 and 13. Disposed in compartments 11 and 12 are the stitch-forming mechanism and the feeding mechanism, together with connections for actuating the same. Each of the two compartments 11 and 12 is opened at the bottom to permit the precipitation of spent oil, lint and dirt from the mechanism within these compartments. The end wall 8 of the bed adjacent the front wall 5 is formed with an oil reservoir 14, see Figs. 2 and 4, closed at its lower end by means of a gasket-fitted detachable plate 15 and adapted to be filled through an oil-cup 16 threaded into the side wall of the reservoir 14. Secured also in the side wall of the reservoir is a transparent window 17 through which the level of the oil in the reservoir may be observed.

Secured upon the rear end-portion of the bed 1 is the standard 2 of the bracket-arm 3, the open face of which standard is adapted to be closed by a cover-plate 18 secured by screws 19. Formed integral with the upper end of the standard 2 is the bracket-arm 3 provided at the standard end with an internal partition 20, at its head end with an internal partition 21 and intermediate the partitions 20 and 21 with a depending boss 22. The partitions 20 and 21 define a compartment 23 housing the actuating eccentric 24 and the stitch-length indicating disk 25 of the needle-feed mechanism. The partitions 20 and 21 provide supports for a commercial needle-bearing 26 and ball-bearing 27 in which is journaled the main or arm-shaft 28. To lend support to the arm-shaft and to prevent whipping thereof, the depending boss 22 is fitted with a second needle-bearing 29 embracing a sleeve 30 clamped to rotate with the main-shaft between a needle-thread nipper actuating cam 31 and the hub 32 of the stitch-length indicating disk 25.

The internal partition 20, Fig. 1, is preferably formed with an elongated bearing boss 34 having a bore 35 snugly receiving the outer casing of the needle-bearing 26, which bearing embraces a sleeve 36 clamped upon the arm-shaft 28 to rotate therewith between a collar 37 and the inner end of the hub 38 of a belt-sprocket 39. Fixed upon the end of the arm-shaft 28 in face-to-face contact with the hub 38 of the belt-sprocket is the usual belt-driven balance-wheel 40.

Longitudinally of the bed 1 there is journaled in needle-bearings 41, 42 and 43, the lower rotary main-shaft 44 having secured upon the inner end thereof a belt-sprocket 45 of the same diameter as the belt-sprocket 39. These two belt-sprockets 39 and 45 are connected together by means of a conventional clip-belt 46 to rotate at a ratio of one-to-one. It will be observed in Fig. 1 that the needle-bearing 41 supports the

inner end portion of the lower main-shaft 44 in a manner identical with that of the hereinbefore described mounting for the needle-bearing 26 on the arm-shaft 28 and, therefore, no further description of the mounting for the needle-bearing 41 is believed necessary. The needle-bearing 42 is located in the transverse wall 10 of the bed 1 and embraces a sleeve 46' clamped upon the lower main-shaft 44 to rotate therewith between two collars 47 and 48. Needle-bearing 43 is mounted in the transverse wall 9 of the bed 1 in a manner differing only from needle-bearing 42 in that the sleeve embraced by the needle-bearing is clamped between the feed-advance eccentric and the feed-lift eccentric of the lower feeding mechanism. The main-shaft 44 at its forward end-portion has secured thereto a plurality of eccentrics and a suitable crank for actuating the mechanism located within the bed 1.

Referring now to Figs. 1 and 4, it will be seen that the bed 1 is provided with a detachably secured work-supporting plate 49 formed with a cut-out to receive the usual throat-plate 50. When the machine is mounted upon a table-structure the surface of the work-supporting plate 49 is adapted to be substantially flush with the table-top T. This is accomplished preferably by resting the four corners of the machine-bed 1, which are apertured as at 50', upon resilient pads 51; composed of rubber, felt, neoprene, or the like, fitted with locating pins 52 adapted to enter the apertures 50'. The resilient pads 51 are suitably fastened upon posts 53 rising from the side walls of an open-topped box-like drip-pan 54. The drip-pan has preferably integral therewith three horizontally projecting lugs 55, two at the standard end of the machine, see Fig. 2, and one centrally of the head end of the machine, apertured as at 56 to receive the lower ends of suspension bolts 57 depending from the table-top T. Interposed between the upper face of each of the lugs 55 and the table-top T is a resilient pad 58 and disposed between the lower face of each of the lugs and the nut on the suspension bolts 57 is a second resilient pad 59. The resilient pads 51, 58 and 59 are provided to dampen vibrations set up in the machine during high speed operation.

In order that the machine may be operated at high speed there is provided a lubricating system which is manually controlled to distribute oil under pressure to various bearings in the machine. In the machine chosen for illustration, Figs. 1 and 2, there is provided within the standard 2 a suitable pump 60 fitted with an inlet pipe 61 and two outlet pipes 62 and 63, pipe 63 supplying oil to the mechanism within the bracket-arm 3 and head 4 and pipe 62 supplying oil to the mechanisms within the bed 1.

Referring to Fig. 1, one wall of the standard 2 is preferably formed with a lug 64 apertured to receive a supporting extension 65 integral with the housing of the pump 60. The pump is preferably of the plunger type and comprises a cylinder 66 fitted with a piston 67 fastened upon the end of a rod 68 slidably journaled in a head 69 vented as at 70 and threaded upon the cylinder 66. The exposed end of the piston-rod 68 is equipped with a knurled head 71 which is normally disposed within a cavity 72 formed in the cover-plate 18 which closes the open face of the standard 2. The pump at the base of the cylinder 66 is formed with a chamber 73 having an inlet port 74 and two outlet ports 75 and 76. Each of the three ports is opened and closed automatically by a ball-valve 77 active in response to pressure created by the manual actuation of the piston 67.

The inlet port 74 of the pump 60 is connected by the pipe 61 to lubricant reservoir 14 in the bed 1, Fig. 2. The two outlet ports 75 and 76 of the pump 60 are connected by pipes 62 and 63 to the lower main-shaft 44 and the arm-shaft 28, respectively. The lower end of the outlet pipe 62 is received in the upper end of a hole 78 in the end-wall 8 of the bed 1. The lower end of the hole 78 registers with an annular groove 79 formed in the periphery of the rotatable collar 80 fixed upon the lower main-shaft 44. The oil supplied under pressure to the annular groove 79 by the pump is led through a radial duct 81 in the collar 80 to an annular groove 82 in the periphery of the main-shaft 44 and from said groove through the radial duct 83 into the longitudinal bore 84 in the main-shaft 44. In this manner oil is conducted to the shaft-bore which is closed at its opposite ends, the oil in the bore being dispersed to the various needle-bearings 41, 42 and 43, the eccentrics 85, 86 and 87, the crank-pin 88 and tubular pin 89 for actuating the looper mechanism, and the pin-and-sleeve connections 90 and 91 for raising and lowering the feed-dog 92 through a series of small radial ducts 93 in the main-shaft 44.

The upper end of the second outlet pipe 63 has secured thereto a commercial fitting 94 threaded into a boss 95 integral with the internal partition 20 adjacent the balance-wheel end of the bracket-arm 3. In alinement with the fitting 94 the boss 95 is formed with a port 96 of which the upper end is in register with an annular groove 97 cut into the rotatable collar 37 fixed upon the arm-shaft 28. From the annular groove 97 the oil is led through a duct 98 into an annular groove 99 in the periphery of the arm-shaft 28 and from the annular groove 99 through the radial duct 100 into the bore 101 of the arm-shaft. As in the lower mainshaft 44, the oil in the bore 101 is dispersed to the needle-bearings 26 and 29, the ball-bearing 27, the needle-bar vibrating eccentric 24, and to the needle-bar reciprocating mechanism through a series of small radial ducts 102 in the arm-shaft 28. In Fig. 1, it will be observed that oil is conducted to the balls in the ball-bearing 27 by means of a disk 103 fixed to rotate with the arm-shaft 26 and having its inner face in position to receive oil from the end of the radial duct 102. During rotation of the arm-shaft, the oil collected on the face of the disk 103 is thrown to the outer inturned edge thereof and is directed between the raceways and onto the balls in contact therewith. Excess oil from the mechanism within the compartment 23 in the bracket-arm 3 is returned to the lubricant-reservoir 14 by means of a return pipe 104.

The needle-bar reciprocating mechanism is lubricated in a manner clearly shown in Fig. 1. The oil in the arm-shaft bore 101 is delivered by the small radial duct 102 to the inner end of a port 105 formed in the needle-bar crank 106. The outer end of the port 105 intercepts the hollow bore of the crank-pin 107. This bore receives a stud 108 having a shank formed with the reduced section 109 providing a passageway for distributing the oil supplied by the port 105 to the needle-bearings 110 and to the bearing surface between the needle-bar pin 111 and the actuating link 112 through the bore of the latter. The stud 108 is retained in the bore of the crank-

pin 107 by the set-screw 113 which closes the outer end of the bore 105 in the crank 106.

It can be understood from the above description taken in connection with the accompanying drawings, that I have provided a sewing machine lubricating mechanism which is designed to deliver oil under pressure to the various bearing points in the machine requiring lubrication at intervals, or whenever the bearings are in need of lubrication, and that the pressure of the oil depends upon the force applied by the operator to the piston 67. It will be seen that by manually reciprocating the pump-piston 67, oil will be distributed under pressure to the bore of both the upper and the lower shafts 28 and 44, repectively, and that the oil then is conducted to the various bearings by radial ducts. These radial ducts are purposely made of such a diameter that a sufficient quantity of oil will be delivered to each bearing, and also small enough so that the system will be maintained filled with oil, thereby to eliminate the formation of air-pockets in the systems. In the embodiment chosen to illustrate my invention, the pump 60 employed is of the well known plunger type which is adapted to be manually actuated by the operator whenever it is necessary to lubricate the machine. It is to be understood that any suitable type of pump may be substituted for the plunger-pump disclosed, and that automatic means may be used to actuate the pump at the end of a predetermined number of stitches.

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

1. In a sewing machine; the combination of a frame including a bed, a standard having an internal lug, and a bracket-arm; stitch-forming devices and work-feeding means; an actuating shaft journaled in bearings in said frame and having a longitudinal bore; mechanism connected to said shaft for actuating either the stitch-forming devices or the work-feeding means; means connecting the bore of said actuating shaft with the bearings in which said shaft is journaled and with the various bearing surfaces of the mechanism operated by said shaft; a lubricant reservoir; and means including a manually operated pump for delivering lubricant under pressure controllable directly by the operator from said reservoir to the bore in said actuating shaft for distribution to the bearings supporting said shaft and to the bearing surfaces of the mechanism operated by said shaft, said pump having a housing fitted with a supporting extension adapted to be secured to said standard lug.

2. A sewing machine having; in combination; a frame including a bed, a standard having a lug, and a bracket-arm; stitch-forming devices including a needle and a complemental loop-taker, work-feeding means; an actuating-shaft journaled in bearings in said bed and having a longitudinal bore; a second actuating-shaft journaled in bearings in said bracket-arm and having a longitudinal bore; means connecting the bores of said actuating-shaft with the bearings supporting the same; a lubricant-reservoir; and a pump for delivering lubricant under pressure from said reservoir to the longitudinal bore in each of said actuating-shafts, said pump having a housing fitted with a supporting extension adapted to be received in said standard-lug, an inlet connection extending into said reservoir and outlet connections for supplying lubricant to the bores of the two actuating-shafts.

3. A sewing machine having, in combination; a frame provided with an anti-friction bearing; stitch-forming devices including a needle and a complemental loop-taker; work-feeding means; an actuating shaft journaled in said bearing and having a longitudinal bore; a lubricant reservoir; means for delivering oil from said reservoir to the bore in said actuating shaft; and a disk secured on said shaft and having one of its faces in register with a duct extending from the bore in said shaft, said disk adapted to collect lubricant from said duct and deliver it to said anti-friction bearing to lubricate the same.

4. A sewing machine having a frame including a bracket-arm terminating in a head; a needle-bar journaled in said head; an actuating shaft journaled in said bracket-arm; needle-bar actuating mechanism operated by said shaft for imparting reciprocatory movements to said needle-bar, said mechanism including a crank having a hollow crank-pin and a link connecting said crank-pin to said needle-bar; a stud adapted for securing said link upon said crank-pin and having a reduced shank disposed in the hollow of said crank-pin and forming therewith a lubricant passageway for conducting oil to the bearings in said needle-bar actuating mechanism; and means for supplying oil to said lubricant passageway.

5. A sewing machine having a frame including a head; a needle-bar journaled in said head; an actuating shaft journaled in said frame and having a longitudinal bore; needle-bar actuating mechanism operated by said shaft for imparting reciprocatory movements to said needle-bar, said mechanism including a crank having a hollow crank-pin and a link connecting said crank-pin to said needle-bar; a stud adapted for securing said link upon said crank-pin and having a reduced shank disposed in the hollow of said crank-pin and forming therewith a lubricant passageway for conducting oil to the bearings in said needle-bar actuating mechanism; means for conducting lubricant from the bore in said actuating shaft to the lubricant passageway in said hollow crank-pin; and means for delivering lubricant to the bore in said actuating shaft.

6. A sewing machine having, in combination; a frame; stitch-forming devices including a needle and a complemental loop-taker; work-feeding means; a partition in said frame providing a bearing boss; an anti-friction bearing in said boss; an actuating shaft journaled in said anti-friction bearing and having a longitudinal bore and a plurality of radial ducts; a member secured on said shaft on one side of the anti-friction bearing; a sleeve secured on said shaft within said bearing-boss and on the other side of the anti-friction bearing; a lubricant duct in said sleeve in register with one of said radial ducts in said shaft; a lubricant reservoir in said frame; and means for conducting lubricant from said reservoir to the lubricant duct in said sleeve and thence to the bore in said actuating shaft.

7. A sewing machine having; in combination; a frame including a bed and a bracket-arm connected by a standard, said standard having an open face; a cover-plate adapted to close the open face of said standard and having a cavity formed therein; stitch-forming devices including a needle and a complemental loop-taker; work-feeding means; actuating mechanism within said frame for imparting operative movements to said stitch-forming devices and work-feeding means; and means for lubricating said actuating mechanism including a manually actuated pump,

said pump being located within said standard and having its actuating member extending through said cover-plate and when not in use disposed within said cavity in said cover-plate.

8. A sewing machine having; in combination; a frame including a bed, standard and bracket-arm, stitch-forming devices including a needle and a complemental loop-taker; an actuating-shaft journaled in bearings in said bed and having a longitudinal bore; a second actuating-shaft journaled in bearings in said bracket-arm and having a longitudinal bore; means connecting the bores of said actuating-shafts with the bearings supporting the same; a lubricant-reservoir; and a manually operable pump for delivering lubricant under pressure developed by the pump from said reservoir to the longitudinal bore in each of said actuating-shafts, said pump being supported within the confines of said standard between the levels of said actuating-shafts and having an operating member extending through one of the walls of said standard for convenient manipulation by the operator.

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