May 23, 1939. N. V. CHRISTENSEN ET AL 2,159,204

LOCK STITCH SEWING MACHINE

Filed Jan. 25, 1936 3 Sheets-Sheet 1

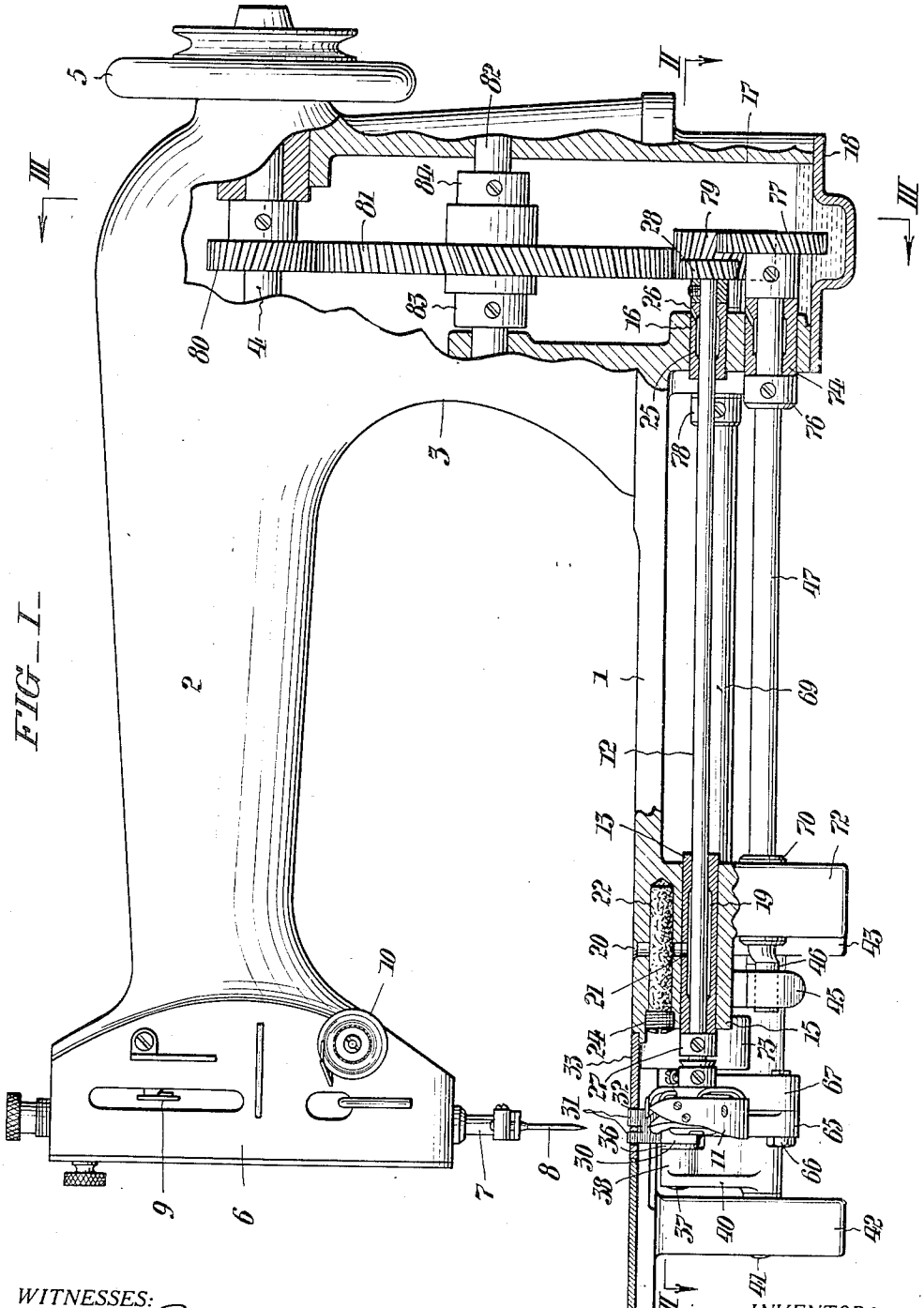


FIG. 1

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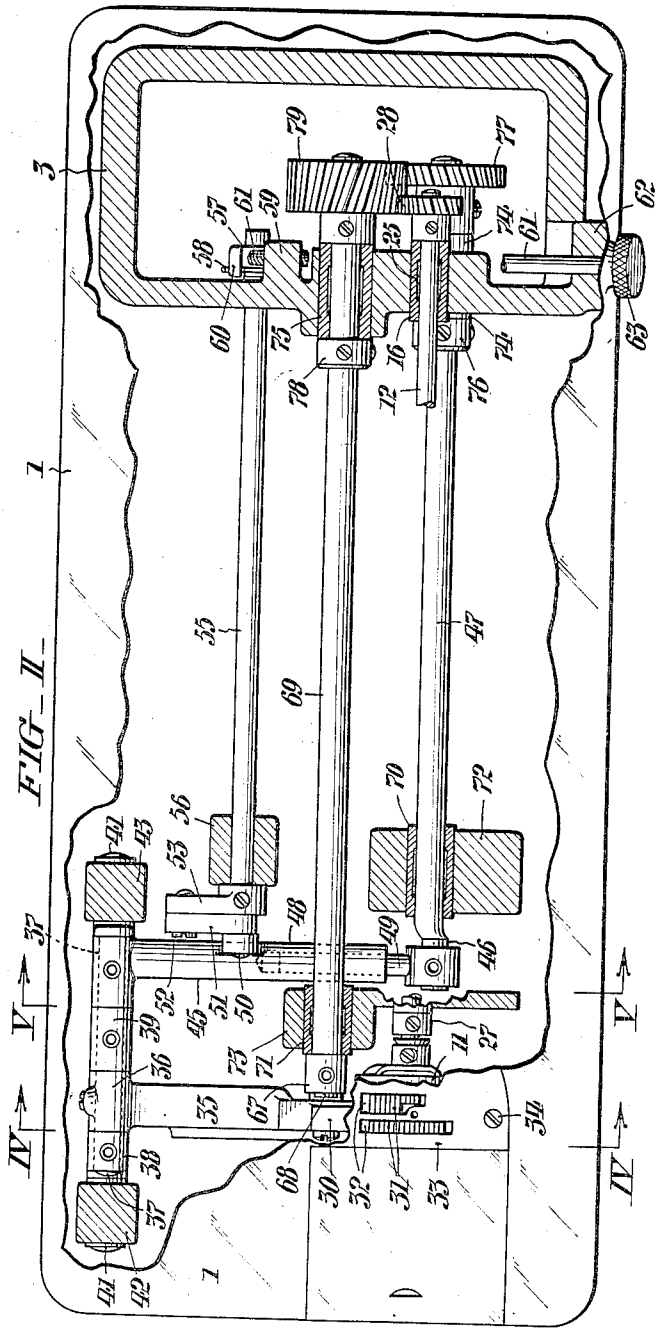


FIG. II.

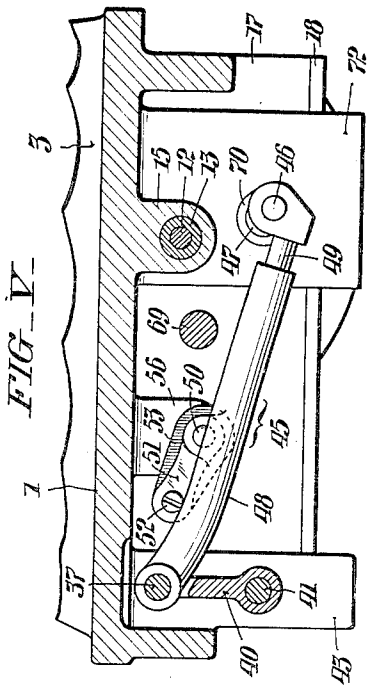


FIG. V.

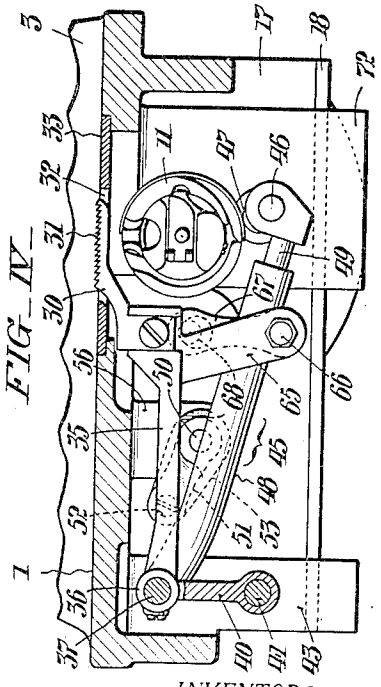


FIG. IV.

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FIG. III.

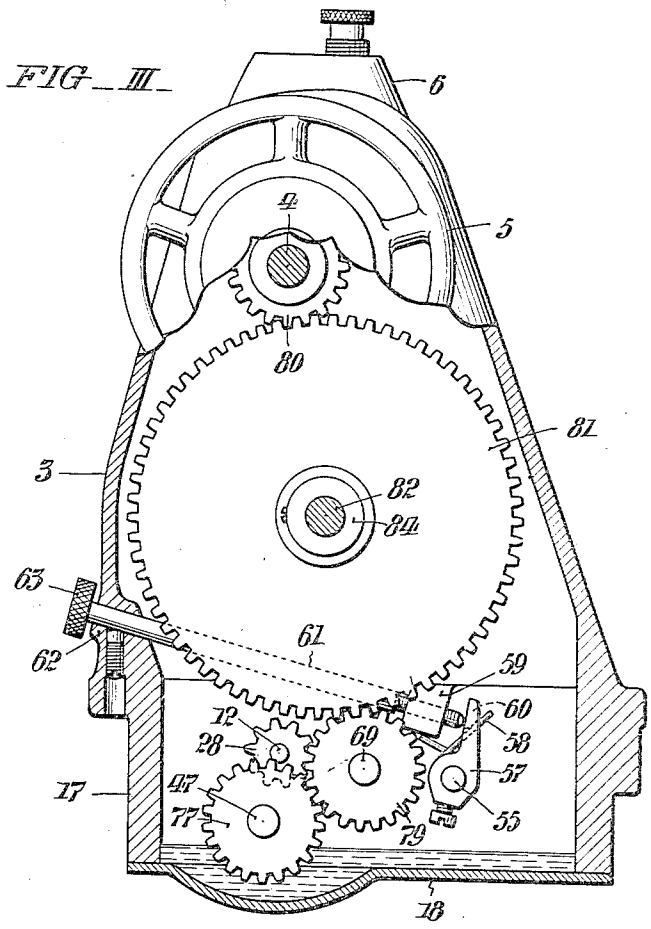
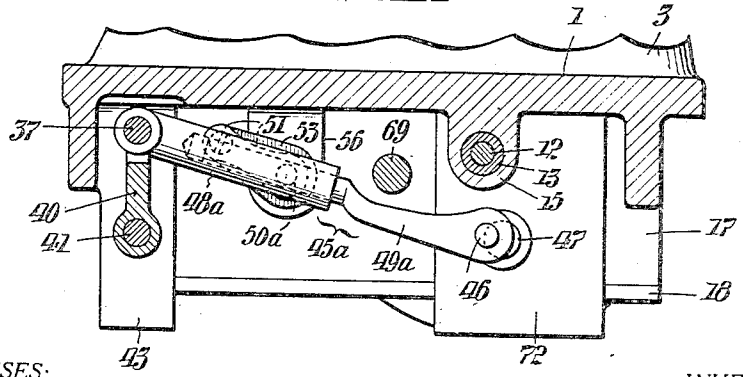


FIG. VI.



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UNITED STATES PATENT OFFICE

2,159,204

LOCK STITCH SEWING MACHINE

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Application January 25, 1936, Serial No. 60,765

22 Claims. (Cl. 112—220)

This invention relates to lock stitch sewing machines, that is to say, to sewing machines wherein a rotary hook cooperates with a needle in forming a series of lock stitches, the length of which is determined by intermittent progression of the fabric in the machine by a reciprocating feed dog.

The purpose of our invention is to reduce, as far as possible, friction and vibration in such machines so that they can be operated at much higher speeds than heretofore without undergoing derangement, and without heating up to a point where very rapid wear of the parts results.

As hereinafter more fully described we attain the foregoing objective by employing in a lock stitch sewing machine a number of relatively light parallel rotary shafts, one from which the needle is actuated, one carrying the rotary hook, one from which the feed dog receives its feed movements and still another from which lift movements are imparted to said feed dog; by mounting these several shafts in relatively short journals with liberal oil clearances around them; by driving said shafts through a system of intermeshing helical gears enclosed in a tight housing with a lubricant sump from which the oil is carried up through capillarity and by splash to lubricate the gear system as well as to lubricate contiguous bearings for the several shafts; and by substitution of small diameter cranks and light connecting rods for the eccentrics and comparatively heavy eccentric straps heretofore generally employed to communicate reciprocating movements to the parts requiring it.

Other objects and attendant advantages will appear from the following detailed description of the attached drawings, wherein Fig. I is a front elevation of a lock stitch sewing machine conveniently embodying the present improvements, portions of the machine frame being broken away and sectioned to expose important details which would otherwise be hidden.

Fig. II is a view, partly in plan and partly in section, looking as indicated by the arrows II—II in Fig. I.

Fig. III is a vertical sectional view taken as indicated by the arrows III—III in Fig. I.

Figs. IV and V are transverse sectional views taken as indicated by the arrows IV—IV and V—V in Fig. II; and

Fig. VI is a view corresponding to Fig. V showing a slightly modified form of feed mechanism.

With more detailed reference first to Figs. I–V of these illustrations, the sewing machine there shown comprises a flat bed plate or work support 1, which is overhung by a hollow arm 2 reaching forwardly from an integrally formed hollow standard 3 at the rear end of said work support. Journaled within the overhanging arm 2 is a longitudinal rotary shaft 4 which may be regarded as the main shaft of the machine, and which at its protruding right hand end (Fig. I) is provided with a combined hand and belt wheel 5 so that the machine can be operated either manually or by power. Confined to vertical reciprocation in the head 6 at the forward end of the arm 2 is a bar 7 carrying the needle 8, said bar being actuated by suitable means (not illustrated) on the shaft 4. A needle thread take-up, indicated at 9, is also operated by suitable means on the main shaft concealed within the head 6. En route from the take-up 9 to the needle 8, the thread is passed through a tensioning device at 10.

Cooperating with the needle 8 below the work support 1 is a rotary hook 11 which is secured to the forward end of a light rotary shaft 12 of small diameter extending longitudinally beneath said work support. Near its front end the shaft 12 is journaled in a bushing 13 set into a pendant bracket lug 15 of the work support 1. At its right hand end the shaft 12 is journaled in a bushing 16 set into the front wall of an oil sump 17 formed as a hollow integral pendant projection of the bed plate 1 in direct communication with the hollow of the standard 3, said oil sump being closed at the bottom by a removable plate 18. The bushing 13, it will be particularly noted from Fig. I, affords a clearance 19 of substantial length about the shaft 12 for lubricating oil. The lubricant is introduced from above through a vertical hole 20 in the work support 1 and enters the clearance 19 by way of a registering lateral aperture 21 in the bushing 13. Also as shown, the oil hole 20 is intersected by a horizontal bore 22 which is packed with cotton or other fibrous absorbent material capable of holding a considerable quantity of reserve lubricant, the outer end of the bore being closed by a screw plug 24. The right hand bearing sleeve 16 for the hook shaft 12 likewise affords a circumferential oil clearance 25 which is kept filled with splash oil from the reservoir 17, the oil entering said clearance by way of a port 26 open at the top of the inner end of said sleeve. The shaft 12 is held against axial displacement by a collar 27 and by the hub of a helical gear pinion 28 secured thereto at opposite ends thereof and respectively engaging the

remote faces of the bearing sleeves 13 and 16 as shown in Fig. I.

The feed mechanism of the machine is located beneath the work support 1 and includes a feed dog 30 (Figs. II and IV) with toothed portions 31 operating in slots 32 of a throat plate 33 made fast by screws 34 to the top of said work support. The feed dog 30 is secured, with provisions for vertical adjustment, to the front end of a feed bar 35 (Fig. IV), which, at its other end, has an apertured boss 36 wherein is secured a wrist pin 37. The opposite ends of this wrist pin 37 are engaged by spaced bosses 38 and 39 of a rocker 40 secured to a rock shaft 41 whereof the ends are in turn journaled in spaced pendant lugs 42 and 43 of the work support, see Figs I and II. The feed dog 30 receives its feed movements through oscillation of the rocker 40 by means of a link 45, which, at one end, has pivotal connection with the wrist pin 37, and which, at the other end, is connected to a small crank 46 at the forward end of another rotary shaft 47 below the work support 1 extending longitudinally of the machine parallel with the hook shaft 12. The link 45 comprises two components 48 and 49 which are telescopically interengaged as shown, the tubular component 48 having a pivotal connection at 50 with one end of a link 51. The other end of the link 51 is in turn pivotally connected at 52 to the outer end of an arm 53 on a regulating shaft 55 also extending longitudinally of the machine below the work support. At its left hand end the regulating shaft 55 is journaled in a pendant boss 56 of the work support 1, while its right hand end extends through a bearing opening in the front wall of the lubricant sump 17. Affixed to the regulating shaft 55 within the oil sump 17 is a finger 57, which, by means of a helical torsion spring 58 having one end engaging a fixed lug 59 within the oil sump 17 and the other with a lateral lug projection 60 on the finger, maintains said finger in contact with the end of an adjusting screw 61. As shown, this adjusting screw 61 has threaded engagement with the lug 59 above referred to, and extends to the exterior through a bearing 62 in the front wall of the standard 3, where it is provided with a knurled finger knob 63. By turning the screw 61 it is possible to vary the feed movement of the feed dog 30 after the manner disclosed in a copending application Serial No. 673,738 filed by George Sauer et al. on May 31, 1933. By reference to Fig. IV it will be observed that the feed bar 35 has a downwardly extending arm 65 which is pivotally connected at 66 to the bottom end of a vertical link 67. At the top, the link 67 engages a small crank pin 68 at the left hand end of still another longitudinal rotary shaft 69 which is parallel with the rotary shafts 12 and 47 below the work support 1. By the connections just described, the necessary up and down or lift movements are imparted to the feed dog 30. Adjacent their left hand ends, the rotary shafts 47 and 69 are respectively journaled in bushings 70 and 71 constructed like the bushing 13 for the hook shaft 12, the bushing 70 being set into a pendant lug 72 on the work support 1, while the bushing 71 is set into a separate lug 73 on said work support. At the right hand end of the machine the shafts 47 and 69 pass through bushings 74 and 75 set into the front wall of the lubricant housing 17, said bushings being of the same construction as the bushing 16 for the rotary hook shaft 12 so as to be automatically supplied with splash oil from the reservoir 17. The shaft 47 is held against axial displacement through a collar 76 and the boss of a helical gear wheel 77 respectively engaging opposite ends of the bushing 74. The shaft 69 is held against axial displacement in a like manner by a collar 78 and the hub of a gear wheel 79 respectively abutting the outer and inner ends of the bushing 75. The gear wheels 77 and 79 are of one to one ratio so that the feed advance and feed lift shafts 47 and 69 are driven at the same speed, while the pinion 28 which meshes with the gear wheel 79 has a diameter half that of said gear wheel so that the rotary hook shaft 12 revolves at twice the speed of the shafts 47 and 69. The gear wheel 79 on the feed lift shaft 69 receives rotary motion from the main shaft 4 through a gear wheel 80 on the latter and an interposed idler gear 81 of larger diameter. As shown, the idler gear wheel 81 is mounted for free rotation on a shaft 82 extending crosswise of the hollow standard 3 and is held against axial shifting by thrust collars 83 and 84 secured to said shaft and engaging the opposite ends of the hub of said gear. During the operation of the machine oil is carried up from the sump 17 by the gear wheel 77 and through splash and capillarity passed to the other gears of the system within the hollow standard 3 and the communicating sump 17, the gear system being thereby self-lubricating, and part of this oil finding its way into the bearing bushings 16, 74 and 75 in a manner already understood.

Due to employment, as herein shown and described, of separate shafts of small diameter with small cranks and light associated links for imparting the feed and lift movements to the feed dog and a separate small diameter shaft for the rotary hook, provision of relatively short, self-lubricating bearings affording liberal oil clearances around said shafts, and utilization of a system of rotary gears to interconnect the three shafts with each other and with the shaft from which the needle derives its movements, the machine of our invention can be operated at very much higher speeds than ordinary types of lock stitch sewing machine without liability to derangement, and without danger of heating to a point where very rapid and excessive wear would result.

Fig. VI shows a slight modification wherein the axis of the telescoping portions of the components 48*a* and 49*a* of the link 45*a* lies in the plane containing the wrist pin 37 and the crank pin 46, instead of being offset from such plane as is the case with the construction of Figs. IV and V. This modified construction necessitated shortening of the link component 48*a* and corresponding lengthening of the component 49*a* as shown, as well as downward bowing of the latter component so as to clear the shaft 69. All the other elements shown in Fig. VI having their counterparts in Figs. I–V, have been designated by the same reference numerals previously employed in order to preclude the necessity of repetitive description.

Having thus described our invention, we claim:

1. In a lock stitch sewing machine, a needle; a cooperating rotary hook; a feed dog; parallel rotary shafts, one carrying the rotary hook, and two others respectively having means whereby lift and feed movements are imparted to the feed dog; and rotary drive means interconnecting said shafts.

2. In a lock stitch sewing machine, a needle; a cooperating rotary hook; a feed dog; parallel rotary shafts, one carrying the rotary hook, and

two others respectively having cranks whereby feed and lift movements are imparted to the feed dog; and rotary drive means interconnecting said shafts.

3. In a lock stitch sewing machine, a needle; a cooperating rotary hook; a feed dog; parallel rotary shafts, one carrying the rotary hook, and two others respectively having means whereby lift and feed movements are imparted to the feed dog; and a system of gear wheels interconnecting said shafts.

4. In a lock stitch sewing machine, a needle; a cooperating rotary hook; a feed dog; parallel rotary shafts, one carrying the rotary hook, and two others respectively having means whereby lift and feed movements are imparted to the feed dog; a system of intermeshing gear wheels interconnecting said shafts; and a closed housing for said gears containing oil for their lubrication.

5. In a lock stitch sewing machine, a work support; a needle; a cooperating rotary hook and a feed dog beneath the work support; parallel rotary shafts journaled beneath said work support, one carrying the rotary hook, and two others respectively having means whereby lift and feed movements are imparted to the feed dog; and rotary drive means interconnecting said shafts.

6. In a lock stitch sewing machine, a work support, a needle; a cooperating rotary hook and a feed dog beneath the work support; parallel rotary shafts journaled beneath said work support, one carrying the rotary hook, and two others respectively having means whereby lift and feed movements are imparted to the feed dog; and a system of intermeshing gear wheels interconnecting said shafts.

7. In a lock stitch sewing machine, a work support, a needle; a cooperating rotary hook and a feed dog beneath the work support; parallel rotary shafts journaled beneath said work support, one carrying the rotary hook, and two others respectively having means whereby lift and feed movements are imparted to the feed dog; a system of intermeshing gear wheels interconnecting said shafts; and a closed housing for the gear wheels containing oil for their lubrication.

8. In a lock stitch sewing machine, a work support; a needle; a cooperating rotary hook and a feed dog beneath the work support; parallel rotary shafts journaled beneath said work support, one carrying the rotary hook, and two others respectively having means whereby lift and feed movements are imparted to the feed dog; intermeshing gear wheels interconnecting the feed and lift shafts in one to one ratio; and a pinion on the rotary hook shaft driven at double speed from one of said gear wheels.

9. In a lock stitch sewing machine, a needle; a rotary shaft from which said needle receives its movements; a cooperating rotary hook; a feed dog; parallel rotary shafts, one carrying the rotary hook, and two others respectively having means whereby lift and feed movements are imparted to the feed dog; and rotary drive means interconnecting the hook and the feed shafts with the needle actuating shaft.

10. In a lock stitch sewing machine, a needle; a rotary shaft from which said needle receives its movement; a cooperating rotary hook; a feed dog; parallel rotary shafts, one carrying the rotary hook, and two others respectively having cranks whereby feed and lift movements are imparted to the feed dog; and rotary drive means interconnecting the hook and the feed actuating shafts with the needle actuating shaft.

11. In a lock stitch sewing machine, a needle; a rotary shaft from which said needle receives its movements; a cooperating rotary hook; a feed dog; parallel rotary shafts, one carrying the rotary hook, and two others respectively having means whereby lift and feed movements are imparted to the feed dog; and a system of intermeshing gear wheels interconnecting the rotary hook and the feed shafts with the needle actuating shaft.

12. In a lock stitch sewing machine, a needle; a rotary shaft from which said needle receives its movements; a cooperating rotary hook; a feed dog; parallel rotary shafts, one carrying the rotary hook, and two others respectively having means whereby lift and feed movements are imparted to the feed dog; a system of intermeshing gear wheels interconnecting the rotary hook and the feed shafts with the needle actuating shaft; and a closed housing for the gear wheels containing oil for their lubrication.

13. In a lock stitch sewing machine, a work support; a needle; a shaft above the work support from which the needle is actuated; a rotary hook to cooperate with the needle, and a feed dog beneath the work support; parallel rotary shafts journaled beneath said support, one carrying the rotary hook, and two others respectively having means whereby lift and feed movements are imparted to the feed dog; and rotary drive means interconnecting the rotary hook shaft, the two feed actuating shafts and the needle actuating shaft.

14. In a lock stitch sewing machine, a work support; a needle; a shaft above the work support from which the needle is actuated; a rotary hook to cooperate with the needle, and a feed dog beneath the work support; parallel rotary shafts journaled beneath said support, one carrying the rotary hook, and two others respectively having means whereby lift and feed movements are imparted to the feed dog; and a system of intermeshing gear wheels interconnecting the rotary hook shaft, the two feed actuating shafts and the needle actuating shaft.

15. In a lock stitch sewing machine, a work support; a needle; a shaft above the work support from which the needle is actuated; a rotary hook to cooperate with the needle, and a feed dog beneath the work support; parallel rotary shafts journaled beneath said support, one carrying the rotary hook, and two others respectively having means whereby lift and feed movements are imparted to the feed dog; a system of intermeshing gear wheels interconnecting the rotary hook shaft, the two feed-actuating shafts and the needle actuating shaft; and a closed housing for the gear wheels and containing oil for their lubrication.

16. In a lock stitch sewing machine, a work support; an overhanging arm reaching forwardly from a hollow standard at one end of the work support; a needle; a longitudinal shaft journaled in the arm from which the needle derives its movements; an oil sump projecting below the work support and communicating directly with the hollow standard; a rotary hook to cooperate with the needle, and a feed dog beneath the work support; parallel longitudinal rotary shafts journaled beneath said work support, one carrying the rotary hook, and two others respectively hav-

ing means whereby lift and feed movements are imparted to the feed dog; and self-lubricating rotary drive connections interconnecting the several shafts within the hollow standard and the communicating oil sump.

17. In a lock stitch sewing machine, a work support; an overhanging arm reaching forwardly from a hollow standard at one end of the work support; a needle; a longitudinal shaft journaled in the arm from which the needle derives its movements; an oil sump projecting below the work support and communicating directly with the hollow standard; a rotary hook to cooperate with the needle, and a feed dog beneath the work support; parallel rotary longitudinal shafts journaled beneath said work support, one carrying the rotary hook, and two others respectively having means whereby lift and feed movements are imparted to the feed dog; and a system of intermeshing self-lubricating gear wheels interconnecting the several shafts within the hollow standard and the communicating oil sump.

18. A lock stitch sewing machine comprising a rotary hook; a feed dog; and three rotary shafts journaled adjacent their ends in spaced bearings, and all having drive means interconnecting them at one end, one of said shafts carrying the rotary hook at its opposite end, and the other shafts having, at their other ends, means for respectively imparting feed and lift movement to the feed dog.

19. A lock stitch sewing machine comprising a rotary hook; a feed dog; and three parallel rotary shafts, journaled adjacent their ends in spaced bearings, and all having drive means interconnecting them at one end, one of said shafts carrying the rotary hook at its opposite end, and the other shafts, having at their other ends, means for respectively imparting feed and lift movements to the feed dog.

20. A lock stitch sewing machine comprising a rotary hook; a feed dog; three parallel shafts journaled adjacent their ends in spaced bearings, one carrying the rotary hook at one of its ends, and the other shafts having at the corresponding ends, means for respectively imparting feed and lift movements to the feed dog; and drive gears in intermeshing relation secured to the respective shafts at their opposite ends.

21. A lock stitch sewing machine comprising a work support; a needle operated from above the work support; a rotary hook cooperating with the needle beneath the work support; a feed dog below the work support; and three parallel rotary shafts journaled adjacent their ends in spaced bearings beneath the work support, all having drive means interconnecting them at one end, one of said shafts carrying the rotary hook at its opposite end, and the other shafts having at their other ends, means for respectively imparting feed and lift movements to the feed dog.

22. A lock stitch sewing machine comprising a work support; a needle; a longitudinal shaft journaled adjacent its opposite ends in spaced bearings above the work support; means at one end of said shaft for actuating the needle; a rotary hook cooperating with the needle below the work support; a feed dog below the work support; three parallel longitudinal rotary shafts journaled adjacent their ends in spaced bearings beneath the work support, one of said shafts carrying the rotary hook at its forward end, and the others of the three shafts having, at the corresponding ends, means for respectively imparting feed and lift movements to the feed dog; and drive connections respectively on the other ends of said three shafts coordinated with drive means at the corresponding end of the needle-actuating shaft.

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