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R. K. HOHMANN ET AL

2,247,382

SEWING MACHINE FEED MECHANISM

Original Filed Dec. 29, 1939 2 Sheets-Sheet 1

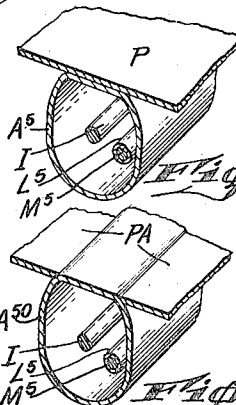
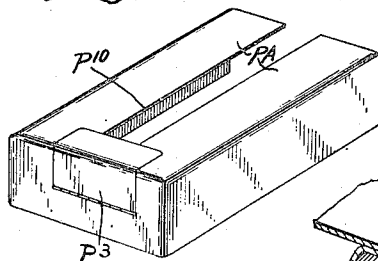
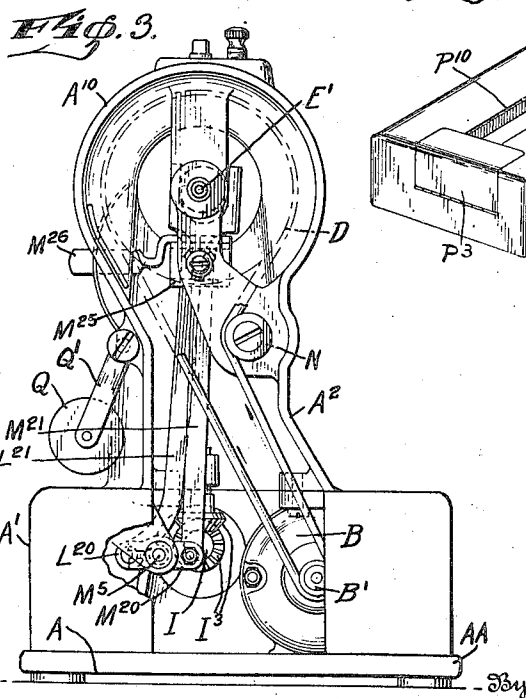
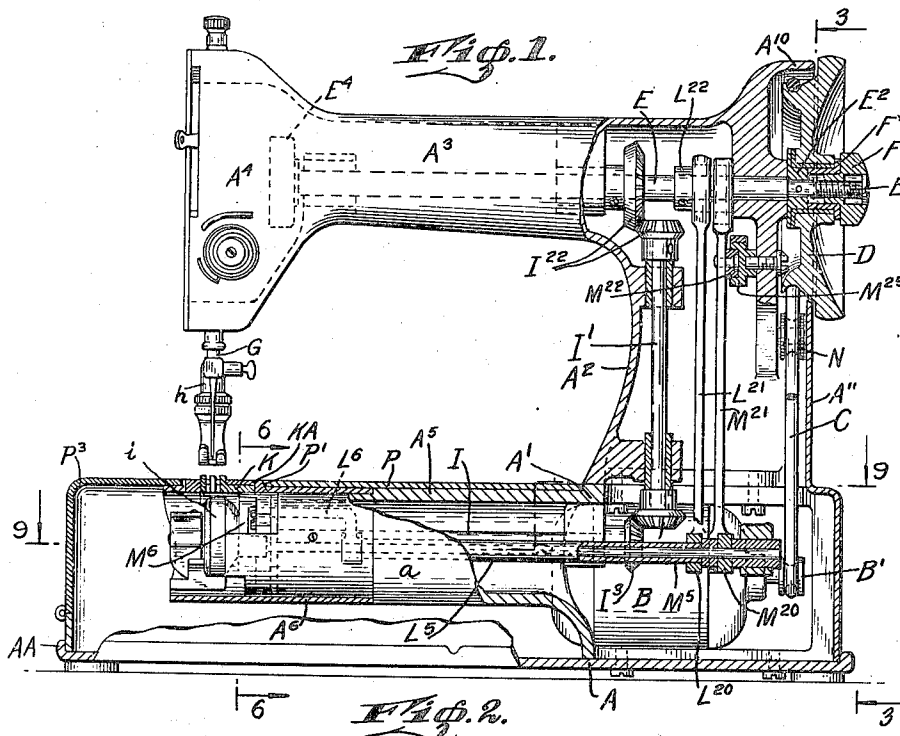


FIG. 5.

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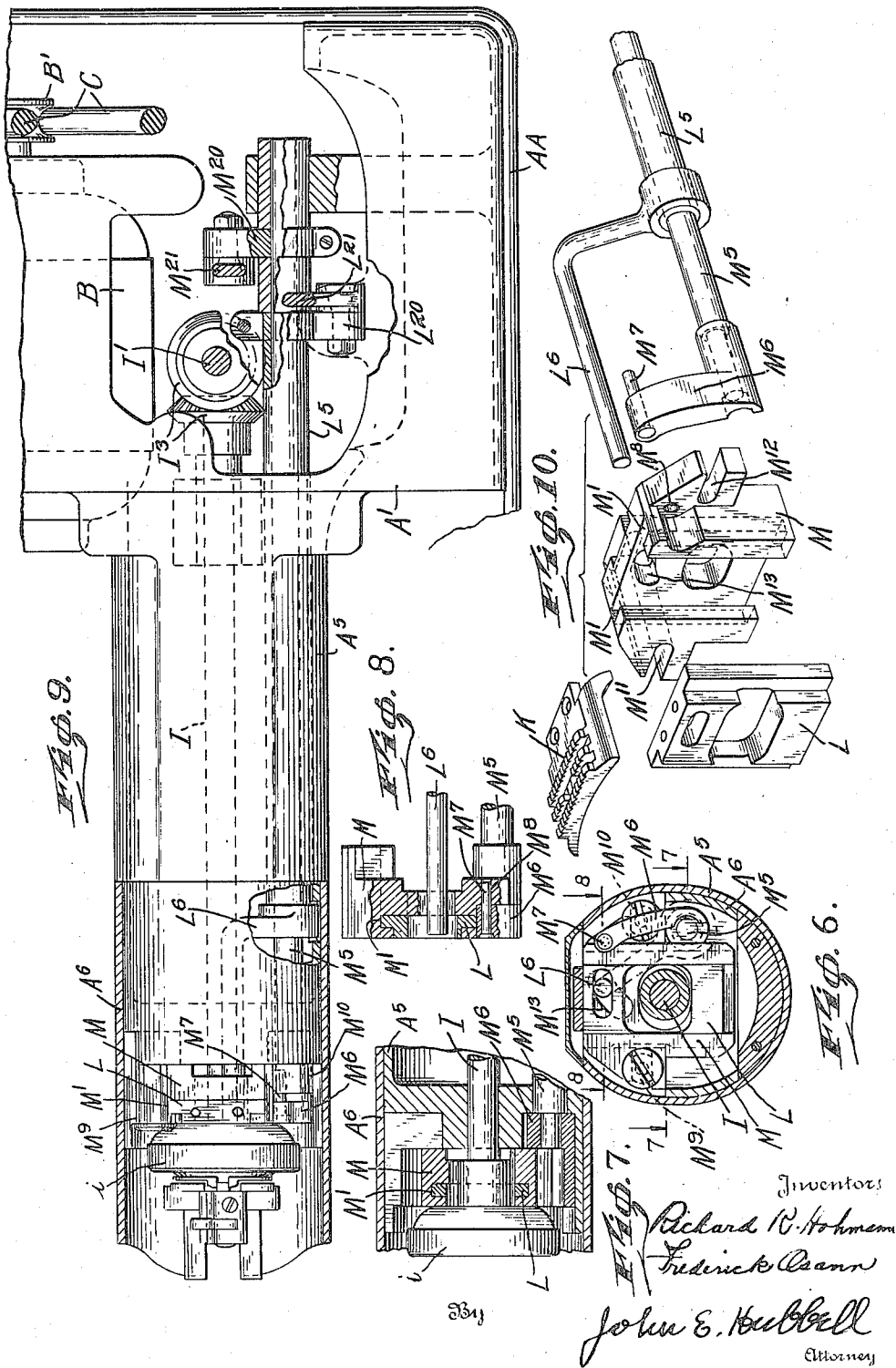
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UNITED STATES PATENT OFFICE

2,247,382

SEWING MACHINE FEED MECHANISM

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Original application December 29, 1939, Serial No. 311,486. Divided and this application July 31, 1940, Serial No. 348,928

2 Claims. (Cl. 112—215)

In our prior application Serial No. 311,486, filed December 29, 1939, of which this application is a division, we have disclosed a simple and effective sewing machine devised by us especially for interchangeable use as a darning machine and for ordinary sewing operations.

That machine is readily convertible from one to the other of two conditions, in one of which it is adapted for plain sewing and includes a flat work bed, which may be generally similar in form and disposition to the conventional work bed of a plain sewing machine, and in the other of which it is adapted for darning and is adapted to support stockings, or other work to be darned, on a cylinder arm generally like, though preferably somewhat smaller in cross section than, the work supporting cylinder arms of ordinary darning machines. In its preferred form, the machine is adapted, however, for either plain sewing or darning operations, on flat bed and cylinder arm supported work.

The object of the invention claimed herein, is to provide a novel work feed mechanism, especially adapted for use in a sewing machine in which all of the underbed sewing instrumentalities including a hook shaft making at least two revolutions for each of the recurring stitch forming movements of the needle, are located in a hollow cylinder arm of relatively small cross section.

The various features of novelty which characterize our novel work feed mechanism are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, its advantages and specific objects attained with its use, reference should be had to the accompanying drawings and descriptive matter in which we have illustrated and described a preferred form of embodiment of the present invention.

Of the drawings:

Fig. 1 is an elevation, partly in section, of a sewing machine constituting a preferred embodiment of the present invention;

Fig. 2 is a perspective view of a removable flat work bed member shown in part in Fig. 5;

Fig. 3 is a section on the line 3—3 of Fig. 1 with parts broken away and removed;

Fig. 4 is a perspective view showing parts of the cylinder arm and flat work bed of Fig. 1 in section;

Fig. 5 is a view taken similarly to Fig. 4, illustrating the use of a flat work bed member of modified form;

Fig. 6 is a section on the line 6—6 of Fig. 1; Fig. 7 is a partial section on the broken line 7—7 of Fig. 6;

Fig. 8 is a partial section on the line 8—8 of Fig. 6;

Fig. 9 is a plan partly in section on the line 9—9 of Fig. 1; and

Fig. 10 is a composite perspective view showing different work feeding mechanism parts.

The housing structure, or framework of the sewing machine illustrated in the drawings, comprises a rectangular supporting bottom plate A, and a sewing machine framework proper which is screw connected to the bottom plate and includes a rectangular base or bed portion A', a standard A², and a horizontal cylinder arm comprising portions A⁵ and A⁶. The portion A⁵ is an integral tubular extension of the base portion A', and A⁶ is a tubular part detachably secured to the front end of the part A⁵ and forming an extension of the latter.

The machine comprises a driving motor B, mounted in the base portion A' and having a pulley B' on its shaft which is operatively connected by a belt C to a driving pulley D mounted on the adjacent end of the needle bar shaft E, which may be journaled in the arm A³ in any usual or suitable manner. In the preferred construction shown, the rear end E' of the needle bar shaft E is threaded, and supports a nut member F, which may be rotated about the shaft end E' to thereby clamp the hub portion of the pulley D between the head of the nut member F and the radially extending flange of a part E² carried by and secured to the shaft E and comprising a tubular hub portion forming an elongated bearing for the pulley D. When the nut F is backed off, the pulley E may be displaced axially of the shaft E, from its normal position, to thereby move the inner, belt groove portion of the pulley out of its normal position within the arm A³ so as to permit the belt C to be removed from and replaced on said pulley. A washer member F' specially shaped and disposed as described in said prior application, is interposed between the nut F and the hub of the pulley D.

At its head end, the machine comprises means including a crank disc E⁴ carried by the shaft E for actuating a needle bar G, mounted in the head A⁴ in any usual or suitable manner for vertical reciprocatory movement. At its head end, the machine is also provided with a presser bar h, and in our said prior application we disclose and claim novel actuating means for lift-

ing said presser bar during each upstroke of the needle bar G, when the machine is in condition for darning use, but said actuating means need not be illustrated or described herein. Our sewing machine also includes tension and thread

takeup provisions which may be of conventional type and hence do not require description herein. The sewing machine mechanism shown, is of the rotary hook type, and comprises a hook shaft I, which is suitably journaled in the frame part A' and its cylinder arm extension A⁵, and which carries a loop taker or hook element i adjacent the front of the machine. The hook shaft I is rotated by the needle bar shaft E through a vertical shaft I' journaled in the standard A² and having its upper end connected to the shaft E by bevel gears I²² and having its lower end connected to the hook shaft I through bevel gears I³. Desirably, and as shown, the gears are so proportioned that the shaft I will rotate with double the angular velocity of the shaft E.

The sewing machine includes work feeding means comprising a feed dog K adapted to extend up into and to move horizontally in the slot of a throat or needle plate part KA, of conventional flat form and supported by the cylinder arm part A⁶. The work feeding means also comprises mechanism within the hollow cylindrical arm of the sewing machine for giving the feed dog its feeding movements. Said mechanism comprises a cross head member L mounted in a guideway M' in a second cross head M for vertical movement relative to the latter. The feed dog K is normally secured to the upper end of the member L by screws. The feed dog support L is given up and down movements by the angular oscillation of a shaft L⁵, which carries an arm including a portion L⁶ parallel to, but laterally displaced from the shaft L⁵, and entering a horizontal slot formed in the upper portion of the member L.

As shown, the shaft L⁵ is tubular and surrounds an oscillating shaft M⁵ which carries at its front end a crank arm M⁶ supporting a pin M⁷ parallel to and laterally displaced from the shaft M⁵. The pin M⁷ enters a suitably formed opening M⁸ in the member M, which is mounted in the framework of the machine for horizontal to and fro movement in a direction transverse to the needle bar shaft and to the shafts M⁵ and L⁵. The mounting provisions illustrated comprise stationary guide pin parts M⁹ and M¹⁰, respectively received in slots M¹¹ and M¹², formed in the opposite sides of the member M. Through the arm M⁶ and pin M⁷, the oscillatory movements of the shaft M⁵ thus give horizontal movements to the member M, and thereby to the member L and to the feed dog K carried by the latter. Through the pin L⁶ the oscillatory movements of the tubular shaft L⁵ give vertical movements to the member L in the guideway M' of the member M. As shown, the pin L⁶ extends through a slot M¹³ in the upper portion of the member M, so shaped and disposed as to accommodate the oscillatory movements of the pin L⁶. Each of the members L and M is formed with an opening for the passage of the hook shaft E large enough to accommodate the movements of the parts L and M relative to that shaft.

The shaft M⁵ is oscillated to give the feed dog K its horizontal feeding movements, through a crank arm M²⁰ secured to the rear end of the shaft M⁵ and an actuating lever M²¹ pivotally connected to the arm M²⁰. The lever M²¹ has an upper end straddling a cam carried by the

shaft E. A roller M²² pivotally connected to the lever M²¹ is received in the guideway in a member M²⁵ which is pivotally connected to the standard A² and is provided with a stitch adjusting arm M²⁶ extending through a slot in the side of the standard A², so that the member M²⁵ may be adjusted angularly in one direction away from a position in which the guideway extends horizontally, into positions in which it is inclined upwardly away from the horizontal position, and in the other direction into other positions in which it is inclined downwardly away from the horizontal.

With the guideway in the member M²⁵ horizontally disposed, the oscillatory movements given by the shaft E to the upper end of the lever M²¹ will impart no oscillatory movement to the lower end of the lever M²¹ or to the shaft M⁵. When the free end of the arm M²⁶ is moved downward to incline the guideway downwardly from the horizontal, the feed dog K will be given feeding movements in the normal direction, i. e., away from the user of an extent varying with the inclination of the guideway to the horizontal. When the free end of the lever is raised, and the guideway is inclined upwardly away from the horizontal, the oscillatory movements given to the upper end of the lever M²¹ will impart back feed movements to the feed dog K, of a magnitude depending on the inclination of the guideway to the horizontal.

The shaft L⁵ is given oscillatory movements and the feed dog K thereby given up and down movements through an arm L²⁰ secured to the rear end of the tubular shaft L⁵ and pivotally connected to the lower end of a link L²¹ which, on its upper end, carries an eccentric strap L²² surrounding an eccentric on the shaft E.

The means including the angularly adjustable guide member through which the movements imparted by the shaft E to the upper end of the lever M²¹ give the feed dog K feeding movements in the normal direction, or in the reverse direction, or hold the feed dog against horizontal movement, are of a known type. The feed mechanism illustrated and described, is believed to be novel in its general organization, however, and is especially adapted for use as shown with the bulk of the feeding mechanism located within a cylinder arm of small cross section.

As shown in Fig. 3, the shaft of the motor B is parallel to the needle bar shaft E and hook shaft I, but is laterally displaced from the latter. To accommodate this displacement without requiring the standard A² to have an unconventional and undesirable form, an idler pulley N, normally engaged by the rear run of the belt, is so located as to deflect the lower portion of that belt run into or near parallelism with the belt front run which extends in a direction inclined to the vertical from the pulley B' to the pulley D. In the normal operating position, the upper portion of the belt groove in the pulley D is within and closely encircled by a cylindrical portion A¹⁰ of the framework. An opening formed in the standard A² and base member A', at the right hand end of the machine, as seen in Fig. 1, is normally closed by a cover plate or member A¹¹, which may be removed to give access to the portion of the belt and other mechanism within the hollow standard.

As shown in Fig. 1, the sewing machine includes a removable work bed member P, in the form of a metal box minus its bottom wall and open at its end which, when the part is in use

as shown in Fig. 1, is adjacent, and bears against, the sewing machine frame part A'. The member P is formed with an opening P' in its top wall to receive the throat plate member KA, and is formed with an adjacent opening partly in the top wall and partly in the closed end of the member and normally closed by a hinged cover member P³. The latter, when moved into open position, permits access to the bobbin case extending into the loop taker, for insertion and removal of bobbins. As shown, the base plate A is formed with an uprising marginal flange AA in telescopic engagement with the lower portion of the bed plate part P, whereby the latter is anchored in position. With the part P in place, the machine as a whole, has the general appearance and operative capacity of an ordinary flat bed sewing machine. With the bed member P removed, the work support is of the cylinder arm form heretofore used in darning stockings and other work. As shown in Figs. 1 and 4, the tubular cylinder arm may advantageously be generally elliptical in cross section but with its top portion flattened to provide a flat seat for the engaging top wall portion of the member P.

In lieu of the flat work bed part P shown in Figs. 1 and 4, I may make use of the work bed part PA shown in Figs. 2 and 5, and differing from the part P, in that it is formed with a longitudinal slot P¹⁰ in its top wall adapted to receive the flattened top wall portion of the cylinder arm A⁵⁰, which to this end may differ in shape from the cylinder arm first described, in that its top wall portion is in the form of a flat rib shaped to fit into the slot P¹⁰.

As shown, a bobbin winder wheel Q, carried by an arm Q' pivotally connected to the standard A², is adapted to be turned from its idle position, shown in Fig. 3 into the position in which the wheel Q extends through a slot formed for the purpose in the standard A², and frictionally engages the pulley D, which, during the bobbin winding operation is normally free to turn on the needle shaft E.

The general operation of the sewing machine illustrated and described, will be readily apparent to those skilled in the art. With either of the bed plate parts P and PA in place, the member M²⁵ may be adjusted through its arm M²⁶ into position to effect the work feeding movements of the feed dog K, desired in the operation of the machine as an ordinary plain sewing machine, or into position to render the feed mechanism inoperative to facilitate the operation of the machine as a darning machine.

While in accordance with the provisions of the statutes, we have illustrated and described the best form of embodiment of the invention now known to us, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit of the invention as set forth in

the appended claims and that in some cases certain features of our invention may be used to advantage without a corresponding use of other features.

Having now described our invention, what we claim as new and desire to secure by Letters Patent, is:

1. A sewing machine adapted for interchangeable use in plain sewing and darning operations and comprising in combination, a hollow cylinder arm work support, stitch forming mechanism including means external to said arm for giving recurring stitch forming movements to a needle and a hook shaft within and parallel to said cylinder arm and connected to said means to make a plurality of revolutions for each of the recurring stitch forming movements of the needle, a rotating hook within said arm and mounted on said hook shaft and work feeding mechanism mounted in said arm and comprising a tubular feed shaft parallel to said hook shaft and laterally displaced from the axis of said hook shaft by a distance less than the radius of said hook, a second feed shaft extending through said tubular shaft, and a feed dog given up and down movements by the angular movements of one, and given horizontal movements by the angular movements of the other of the two feed shafts, said angular movements being in synchronism with the stitch forming movements of the needle.

2. A sewing machine adapted for interchangeable use in plain sewing and darning operations and comprising in combination, a hollow cylinder arm work support, stitch forming mechanism including means external to said arm for giving recurring stitch forming movements to a needle and a hook shaft within and parallel to said cylinder arm and connected to said means to make a plurality of revolutions for each of the recurring stitch forming movements of the needle, and work feeding mechanism mounted in said arm and comprising a member having vertical movements and a member having horizontal movements, one of said members being mounted in said support for its said movements and being formed with a guideway in which the other member is mounted for its said movements, each of said members being cut away to permit the passage of, and extending about said hook shaft, means for giving one of said members its said movements comprising a hollow oscillating shaft parallel to and laterally displaced from the hook shaft and mounted in said hollow arm support and operatively connected to the last mentioned member, and means for giving the other member its said movements comprising an oscillating shaft extending through said tubular shaft and operatively connected to the last mentioned member.

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