Feb. 1, 1944. F. A. LADD, JR 2,340,391

BUTTONHOLE SEWING MACHINE

Filed Dec. 5, 1940 3 Sheets-Sheet 1

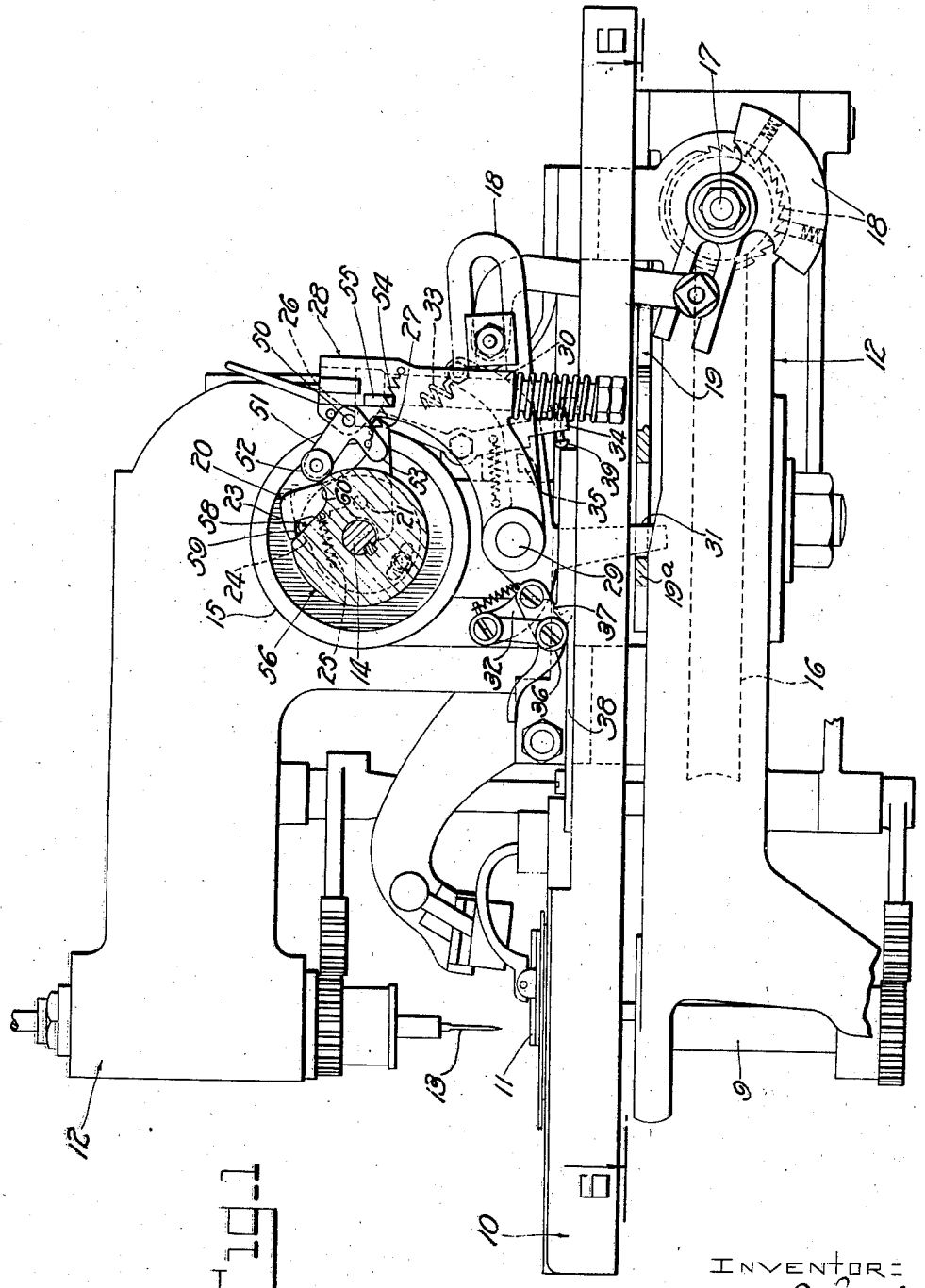


Fig. 1

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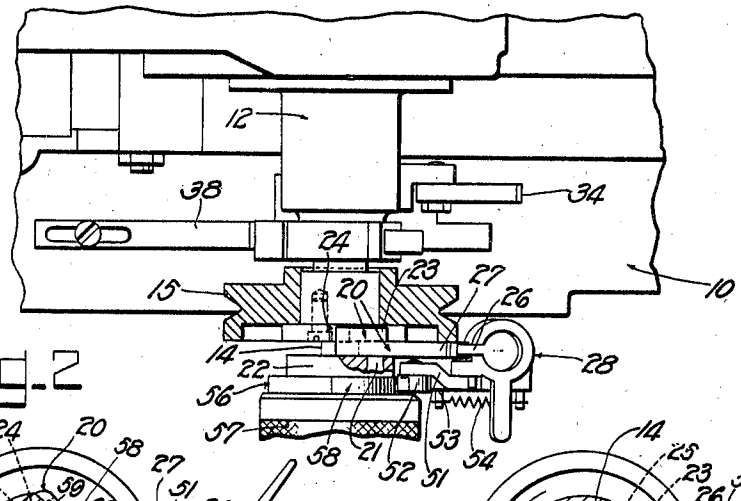


Fig. 2

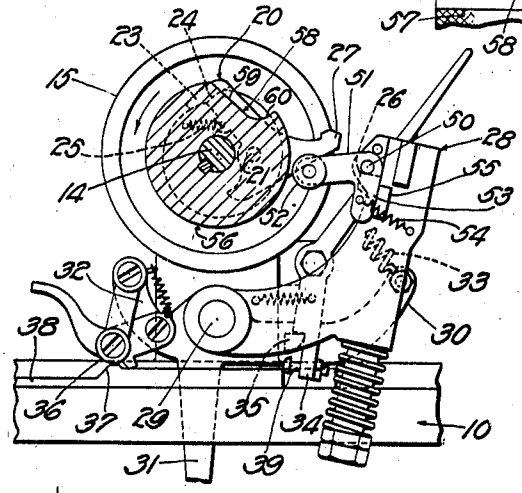


Fig. 3

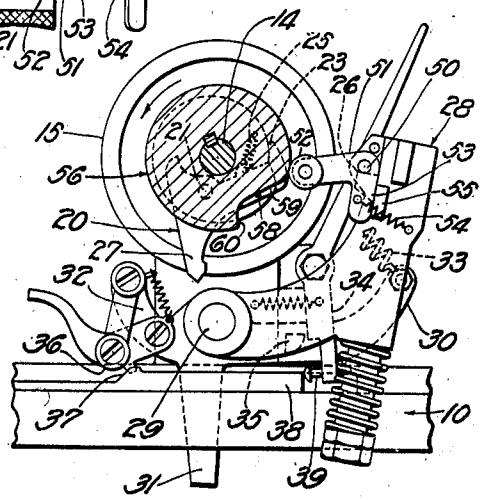


Fig. 4

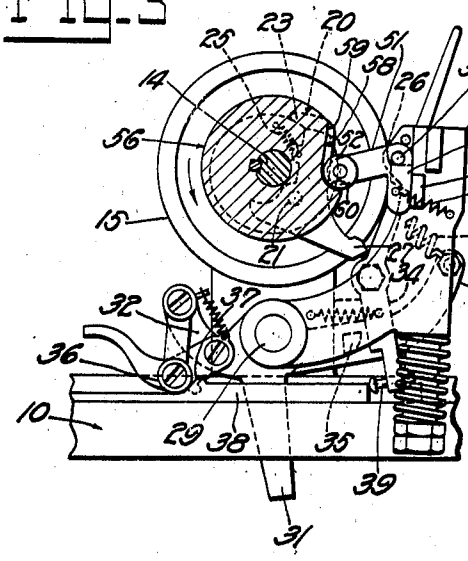


Fig. 5

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Filed Dec. 5, 1940 3 Sheets-Sheet 3

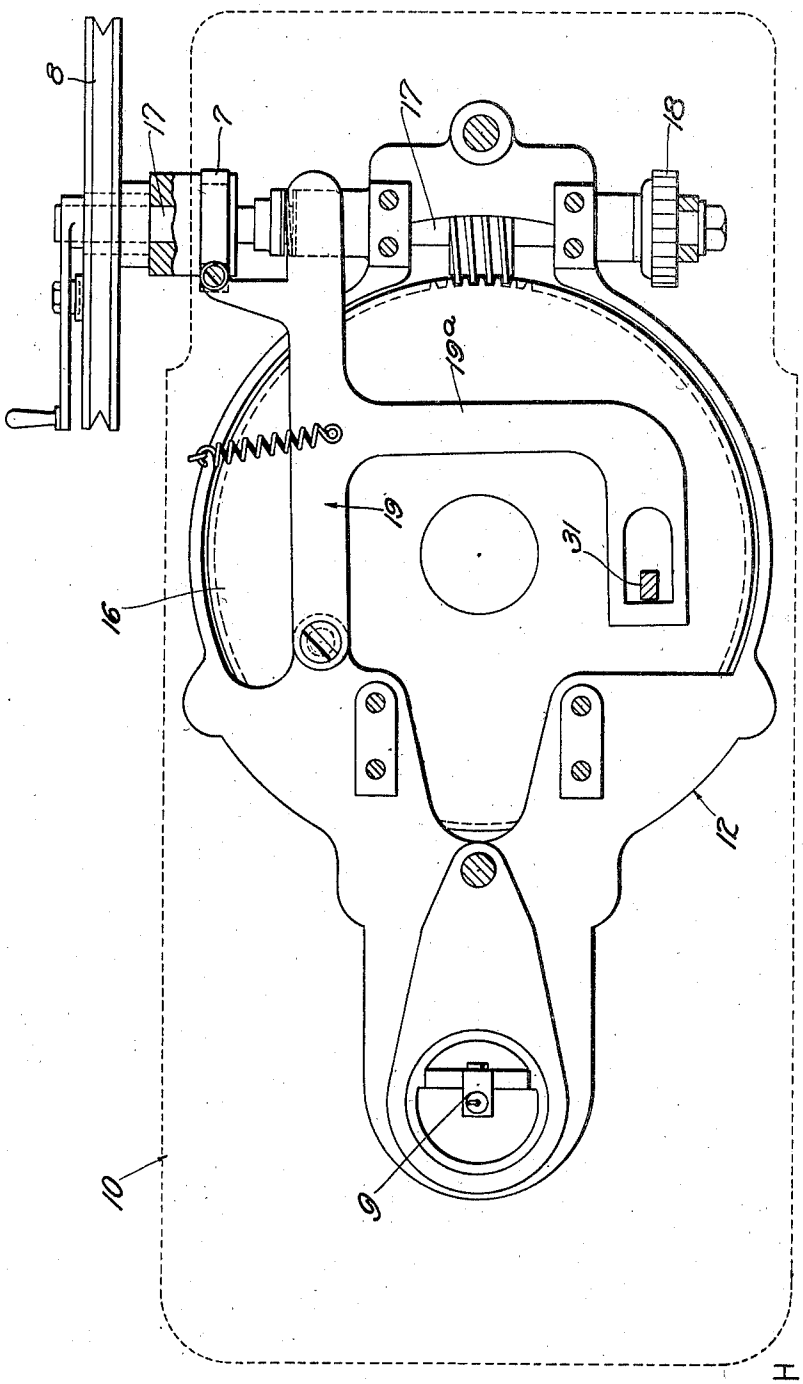


Fig. 5

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Patented Feb. 1, 1944

2,340,391

UNITED STATES PATENT OFFICE

2,340,391

BUTTONHOLE SEWING MACHINE

Frederick A. Ladd, Jr., Arlington, Mass., assignor to The Reece Button Hole Machine Company, Boston, Mass., a corporation of Maine

Application December 5, 1940, Serial No. 368,651

3 Claims. (Cl. 112—67)

This invention relates to stop mechanisms for buttonhole sewing machines and the like, and especially to machines and mechanisms of the type shown in United States Patents No. 367,063, July 23, 1887; No. 713,764, November 18, 1902; and No. 1,669,912, May 15, 1928.

A buttonhole sewing machine of the type shown in said patents includes stitching mechanism and workholding means having a relative movement lengthwise of the buttonhole, mechanism for producing such movement including rapid and slow feeding means adapted, respectively, to move the parts into and out of stitching position and to position the stitches around the buttonhole, and mechanism, controlled by said relative movement, for shifting from the rapid to the slow feed, and vice versa, and at substantially the same time starting and stopping the stitching mechanism. Said last named mechanism includes a rocker having a portion for controlling the feeding means (rapid and slow) and a portion for controlling driving and stopping mechanism for the stitching mechanism. Said driving and stopping mechanism comprises a stitching shaft having a loose driving pulley thereon, a clutch dog normally tending to connect said shaft and pulley, and a clutch disengaging member, carried by said last-named portion of said rocker, which is moved into a position to be engaged by said dog, thereby disconnecting said shaft and pulley and stopping the former, when the rocker is moved into the position to start the rapid feed.

In such a machine it is, of course, desirable that, when the rapid feed is started at the completion of the stitching operation, the stitching mechanism be stopped with the needle withdrawn from the work. The mechanism described in Patent No. 367,063 was such as to cause stopping of the stitching mechanism with the stitching shaft in a definite angular position in which the needle is withdrawn from the work, but it was possible for the rocker to move into the clutch releasing position (i. e., into the position to start the rapid feed) when the needle was in the work, or at such a time that the clutch dog had just passed the clutch disengaging member, thereby permitting a further partial rotation of the stitching shaft, sufficient to cause the needle to make another stroke and therefore re-enter the work, after the rapid feed was started. To prevent this, the mechanism described in Patent No. 713,764 included a cam carried by the stitching shaft and engageable by the rocker, said cam being so shaped as to prevent movement of the rocker into position to start the rapid feed except when the needle was withdrawn from the work and said shaft was in such an angular position that the clutch dog was approaching, or was in a position to engage, the disengaging member and had not completely passed the same. Even in this mechanism, however, it was possible for the cam to be in such an angular position when engaged by the rocker as to permit the rocker to move into the clutch-releasing, rapid-feed position just as the clutch dog was passing the disengaging member, so that the clutch dog would wipe by the disengaging member and cause the latter to rebound and produce what is termed a "fly over." Accordingly, the mechanism described in Patent No. 1,669,912 included, in addition to the cam above referred to, a stop finger and a second cam on the stitching shaft for so controlling the stop finger as to cause the latter to hold the clutch disengaging member against movement into stopping position when the first-named cam was in the angular position which would permit a "fly over."

The present invention has for its general object to improve and simplify the mechanism described in Patent No. 1,669,912 and to this end contemplates the elimination of the stop finger and second cam of the mechanism of said patent while providing mechanism which will as effectively prevent the possibility of a "fly over."

The more particular objects of the invention, together with means whereby the latter may be carried into effect, will best be understood from the following description of a preferred embodiment thereof shown in the accompanying drawings, this, however, being illustrative merely, since the invention, as defined by the claims hereunto appended, may be otherwise embodied without departure from the spirit and scope thereof.

In said drawings:

Fig. 1 is a side elevation, partly broken away, of a buttonhole sewing machine embodying the invention.

Fig. 2 is a fragmentary top plan view, partly in section, of the stop mechanism and its controlling means.

Figs. 3, 4 and 5, are fragmentary side elevations, partly broken away, of said stop mechanism and controlling means, showing the parts in different positions.

Fig. 6 is a horizontal section taken substantially on the line 6—6, Fig. 1.

The invention is herein shown as embodied in a buttonhole sewing machine of the type illustrated in the above-mentioned Patent No. 1,669,912. Said machine comprises a bed frame

10 having work-holding means in the form of work clamps 11 and a stitch frame 12 carrying stitching mechanism including a needle 13 and cooperating under-thread handling devices generally indicated at 9 (Figs. 1 and 6), said stitch frame being longitudinally movable on the bed frame to move the stitching mechanism into and out of stitching position and to position the stitches along the edges of the button-hole. The stitching mechanism is operated from a stitching shaft 14 journalled in the stitch frame and having thereon a loose driving pulley 15 (Figs. 1 and 2) which is periodically clutched thereto drive the same. The movement of the stitching frame on the bed frame is derived from a main cam 16 carried by said stitching frame and driven by a worm on a shaft 17 journalled in said frame. During the stitching operation the shaft 17 is driven at relatively slow speed, to produce a relatively slow feeding movement, by ratchet mechanism, generally indicated at 18, operated from the stitchnig shaft 14, and at other times is driven at a relatively rapid speed, to produce a relatively rapid feeding movement, from a second driving pulley 8 (Fig. 6) through clutch mechanism 7 controlled by a lever 19. The parts and mechanisms thus far mentioned are all usual in machines of this general type and require no further description in detail.

The clutch herein shown for clutching the driving pulley 15 to the stitching shaft 14 is similar to those described in the above-mentioned patents. It comprises a clutch dog 20 pivotally mounted at 21 on a hub 22 keyed to the shaft 14 and which may be a portion of the hub of the usual hand wheel 57 (Fig. 2), said dog having a nose 23 adapted to engage a shoulder 24 formed on a disk carried by the pulley. The dog 20 is acted upon by a spring 25 which tends to hold it in its operative position with its nose 23 in engagement with the shoulder 24, and when the parts are so engaged the clutch is operative and the shaft 14 is driven by the pulley 15. The clutch is released at proper times by means of a clutch disengaging member 26 which, when moved into the path of movement of the tail 27 of the dog 20, is engaged by said tail, such engagement swinging the dog about its pivot, withdrawing the nose 23 from the shoulder 24, and positively stopping the shaft 14.

The clutch disengaging member 26 is carried by an arm 28 constituting a part of a four-armed rocker comprising a shaft 29 journalled in the stitch frame 12 and to which said arm is secured, said shaft having fast thereon three other arms 30, 31 and 32. The arm 31 engages an angular arm 19a on the lever 19, and when the rocker is in the position shown in Figs. 1 and 5 the member 26 is in the path of movement of the tail 27 of the dog 20, and the rapid feed mechanism is engaged and operative; but when said rocker is in the position shown in Figs. 3 and 4, the member 26 is out of the path of movement of the tail 27, the shaft 14 is clutched to the pulley 15, and the rapid feed mechanism is inoperative.

The arm 30 is acted upon by a spring 33 which tends to move the rocker into the position shown in Figs. 1 and 5 to disconnect the stitching clutch and throw in the rapid feed, said rocker being held in the position shown in Fig. 3 by a latch 34 pivoted to the stitch frame and adapted to engage a projection 35 on the arm 30. So long as the latch 34 engages the projection 35, the stitching clutch is engaged and the rapid feed mechanism is inoperative. The arm 32 carries a roller 36 which cooperates with a raised portion 37 of a cam bar 38 secured to the bed frame 10. When the stitch frame moves rearwardly, or toward the right as shown in the drawings, from the position shown in Fig. 1 into that shown in Fig. 3, engagement of the roller 36 with the portion 37 of the cam bar 38 causes the rocker to be moved into the position shown in Fig. 3, to cause engagement of the stitching clutch and disengagement of the rapid feed mechanism, said rocker being retained in this position by engagement of the latch 34 with the projection 35. When said stitch frame moves forwardly, or toward the left in the drawings, into the position shown in Fig. 4, engagement of an abutment screw 39 carried by the latch 34 with the end of the cam bar 38 causes said latch to be disengaged from the projection 35, thereby placing the rocker under the influence of the spring 33.

Pivoted at 50 to the arm 28 is a bell crank one arm 51 of which carries at its extremity a roller 52 and the other arm 53 of which is connected with the arm 28 by a spring 54 which tends normally to hold said bell crank in the position shown in Figs. 3 to 5 with the arm 53 in engagement with a stop lug 55 carried by said arm 28. Secured to the stitching shaft 14 is a cam 56 which, like the hub 22, may be, and preferably is formed as a part of the hub of the hand wheel 57. The cam 56 is formed with a peripheral surface in position to be engaged by the roller 52. Said peripheral surface includes a raised, substantially concentric portion interrupted by a depressed portion or notch 58. The shape of the notch 58 is such as to provide (in the direction of rotation, as indicated by the arrows on Figs. 3 to 5) a descending portion 59 terminating in a relatively abrupt shoulder 60. When the roller 52 engages the concentric portion of the cam 56, as shown in Fig. 4, the rocker is held in the position in which the stitching clutch is engaged and the rapid feed mechanism inoperative, but when said roller enters the notch 58, as shown in Fig. 5, said rocker is in the position with the clutch disengaging member 26 in the path of movement of the tail 27 of the dog 20 and with the rapid feed mechanism operative. The notch 58 is angularly or circumferentially advanced with respect to the dog 20; that is to say, its position, with respect to said dog and to the roller 52 (when the arm 51 is in the position shown in Figs. 3 to 5) and clutch disengaging member 26, is such that when said roller is in said notch, the tail 27 of said dog is approaching the position to engage the member 26, as shown in Fig. 5, but has not quite reached said position.

As the stitch frame 12 moves forwardly (or toward the left as shown in the drawings) toward the close of the stitching operation, the abutment screw 39 engages the end of the cam bar 38, as shown in Fig. 3, and, as the forward movement continues, the latch 34 is disengaged from the lug 35, as shown in Fig. 4, thereby putting the rocker under the influence of the spring 33 which tends to turn it in a counter-clockwise direction as shown in the drawings. If, at this time, the notch 58 is not opposite the roller 52, said roller engages the concentric portion of the cam 56, as shown in Fig. 4, thereby checking movement of the rocker under the influence of the spring 33, and preventing sufficient movement of said rocker to start the rapid feed. When the stitching

shaft 14 reaches an angular position to bring the notch 58 opposite the roller, said roller enters said notch, thereby permitting the spring 33 to move the rocker into the position shown in Fig. 5 to start the rapid feed and bring the clutch disengaging member 26 into the path of movement of the tail 27. At this time said tail, while approaching said disengaging member, has not yet reached the same, so that the stitching shaft is not immediately stopped, and, as its rotation continues, engagement of the shoulder 60 at the end of the notch 58 with the roller 52 causes the arm 51 to be turned into the position shown in Fig. 1, so that, after said notch has passed said roller, the clutch disengaging member remains in the path of movement of the tail 27, and, when the shaft reaches the position shown in Fig. 1, the dog 20 is disengaged from the shoulder 24 and the shaft stopped. At the beginning of the next stitching operation, when the rocker is turned into the position shown in Fig. 3, the arm 51 and roller 52 are restored to the position shown in the latter figure by the spring 54.

It will be understood that the stitch-forming cycle is such that, as the stitching shaft reaches about the angular position shown in Fig. 4 and approaches that shown in Fig. 5, the needle is withdrawn from the work, and that said needle remains out of the work at least until the shaft reaches the position shown in Fig. 1, in which latter position it is stopped. Consequently, although the rapid feed is started during the movement of the shaft from the position shown in Fig. 4 into that shown in Fig. 5, and before the disengagement of the stitching clutch and stopping of the stitching shaft, this is not objectionable since the needle is out of the work at least from this time until the shaft is stopped.

Inasmuch as the angularly advanced position of the notch 58, or low portion of the cam 56, with respect to that of the clutch dog is such as to permit movement of the rocker into the clutch-disengaging, rapid-feed position only when the tail of the clutch dog is approaching the position to engage the clutch disengaging member, and just prior to reaching the latter position, the cam 56 being otherwise so shaped as to prevent movement of said rocker into the clutch-disengaging, rapid-feed position when said tail has either just passed or is just passing the disengaging member, all possibility of the performance of another stitch-forming cycle, involving a re-entry of the needle into the work, after starting the rapid feed, as well as of a "fly over," is effectually prevented. This angular positioning of the low portion of the cam to cause movement of the rocker into clutch-disengaging position only at the time stated, without subsequently moving said rocker out of said position prior to the arrival of the shaft at stopping position, is permitted by the pivoting of the arm 51 carrying the roller 52, whereby said arm is normally held by the spring 54 in the operative or projected position shown in Figs. 3 to 5, but is moved into the inoperative or retracted position shown in Fig. 1 by engagement of the roller 52 with the end of the notch 58, thereby permitting the clutch-disengaging member to remain in clutch-disengaging position after having once been moved thereinto.

I claim:

1. In a sewing machine, in combination, stitching mechanism, a shaft for operating the same, means including a clutch for driving said shaft, said clutch including a dog carried by said shaft, a clutch disengaging member movable into the path of movement of said dog, a cam on said shaft having a raised portion interrupted by a notch and an arm carried by said member and provided with a roller engaging said cam, said notch being angularly advanced with respect to said dog, and said arm being normally held in an operative projected position but being movable into an inoperative retracted position by engagement of said roller by the end of said notch.

2. In a sewing machine, in combination, stitching mechanism, a shaft for operating the same, means including a clutch for driving said shaft, said clutch including a dog carried by said shaft, a clutch disengaging member movable into the path of movement of said dog, a cam on said shaft having a raised portion interrupted by a notch, a lever pivoted to said member and provided with a roller engaging said cam, and a spring for normally holding said lever with said roller in a projected position, said notch being angularly advanced with respect to said dog, and said lever being moved against the tension of said spring to cause said roller to assume a retracted position by engagement of said roller by the end of said notch.

3. In a sewing machine, in combination, stitching mechanism, a shaft for operating the same, means including a clutch for driving said shaft, said clutch including a dog carried by said shaft, a clutch disengaging member movable into the path of movement of said dog, a cam on said shaft having high and low portions and a shoulder joining said portions, and an element yieldably carried by said member, engaging said cam, and adapted to prevent movement of said member into the path of movement of said dog when in engagement with said high portion but to permit such movement when in engagement with said low portion, said cam being so angularly positioned with respect to said dog, disengaging member, and element that a high portion thereof is engaged by said element when said dog is opposite said member, and said element being yielded by said shoulder into a position to permit said member to remain in the path of movement of said dog until the latter engages said member.

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