United States Patent [19]

Hsiao

[11] **3,894,500**

[45] **July 15, 1975**

[54] **STOP MOTION MECHANISM FOR SEWING MACHINES**

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[73] Assignee: **Union Special Corporation,** Chicago, Ill.

[22] Filed: **Sept. 27, 1974**

[21] Appl. No.: **509,957**

[52] **U.S. Cl.** ..... **112/219 R;** 112/67

[51] **Int. Cl.** **D05b 69/26**

[58] **Field of Search** ..... 112/219 R, 219 A, 220, 112/221, 67, 87

[56] **References Cited**

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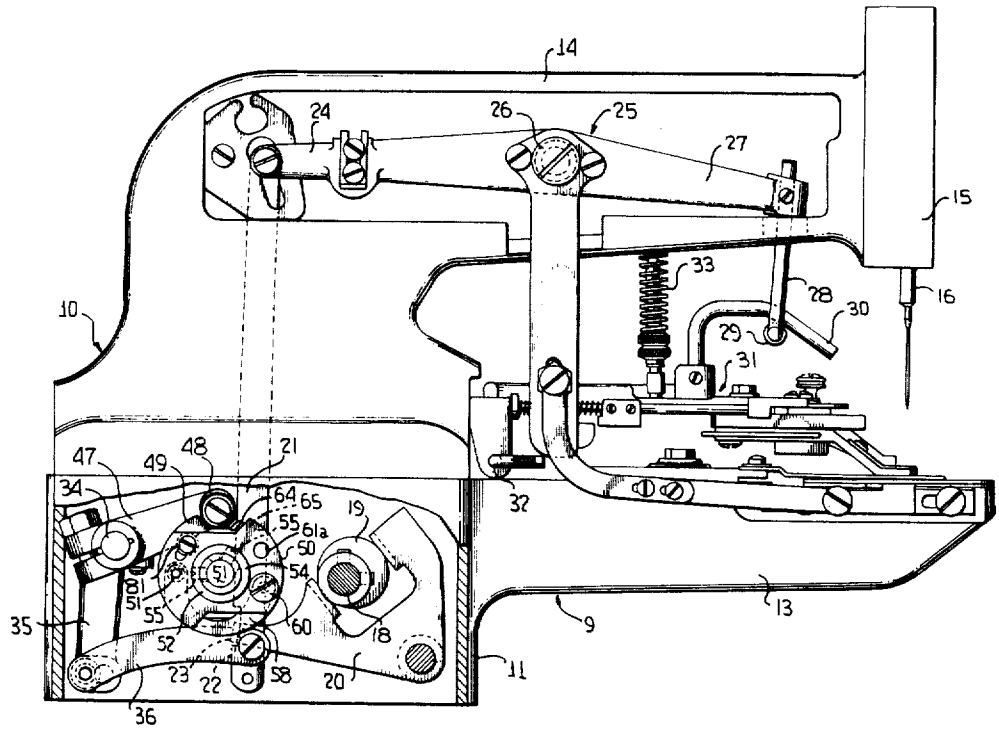
Primary Examiner—H. Hampton Hunter

Attorney, Agent, or Firm—Diller, Brown Ramik & Wight

[57] **ABSTRACT**

This disclosure relates to improvements in stop motion mechanisms of sewing machines. The improved stop motion mechanism permits the sewing machine drive shaft to coast for about 1½ revolutions before being abruptly stopped. This arrangement permits a material reduction in the speed of the drive shaft at the time it is stopped. The stop motion mechanism includes a pair of cams which are adjustable with respect to one another wherein the distance which the main shaft of the machine rotates between the time in which it is disconnected from the drive pulley and wherein it is abruptly stopped may be readily adjusted.

11 Claims, 6 Drawing Figures



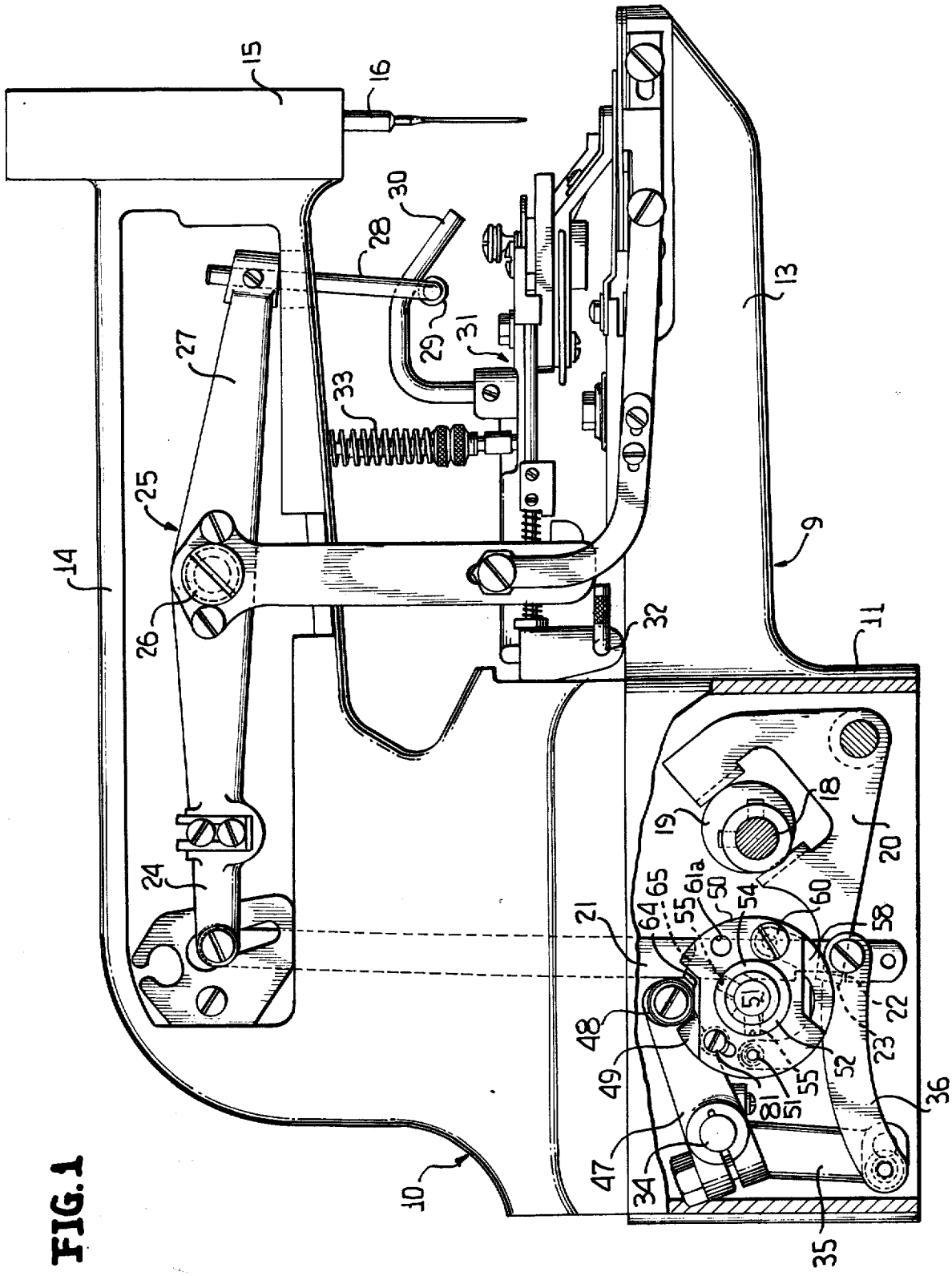

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FIG. 1

FIG.2

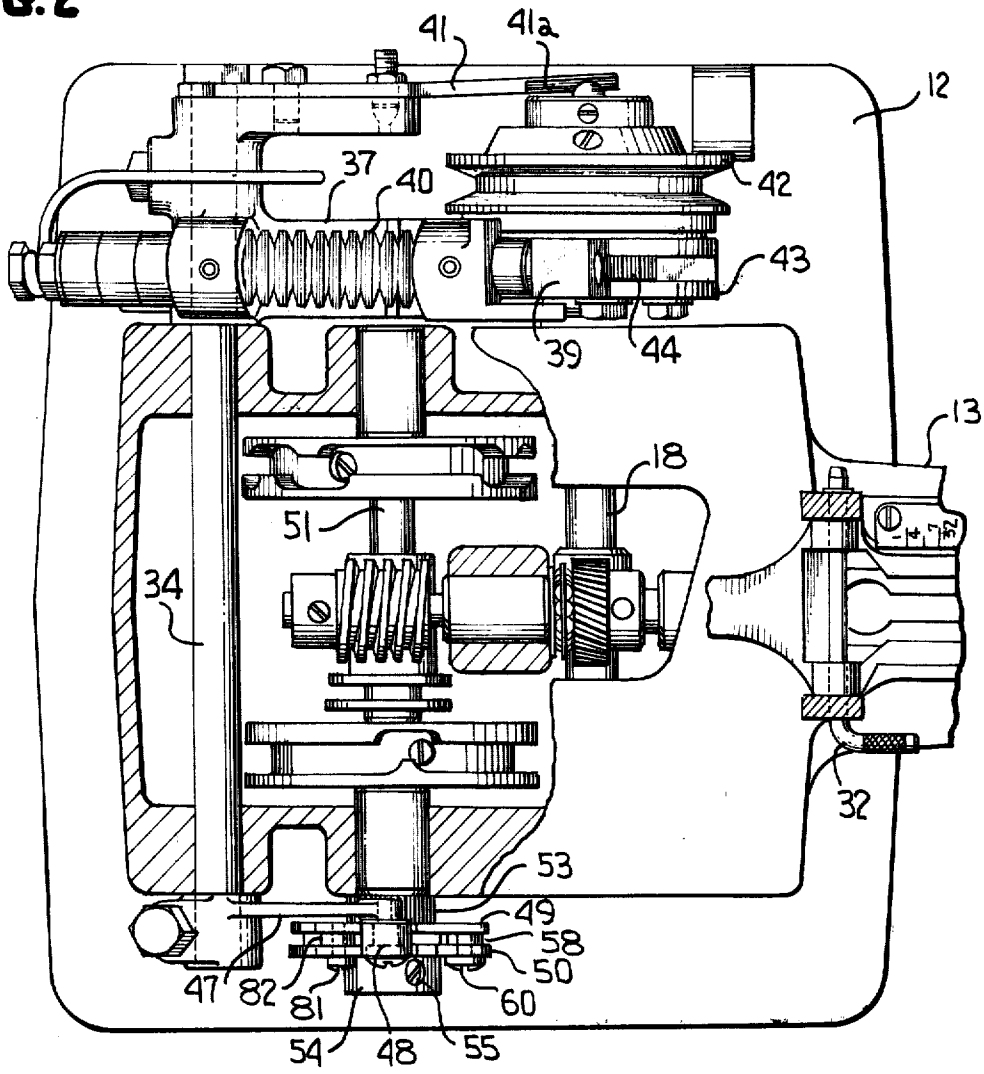

FIG.5

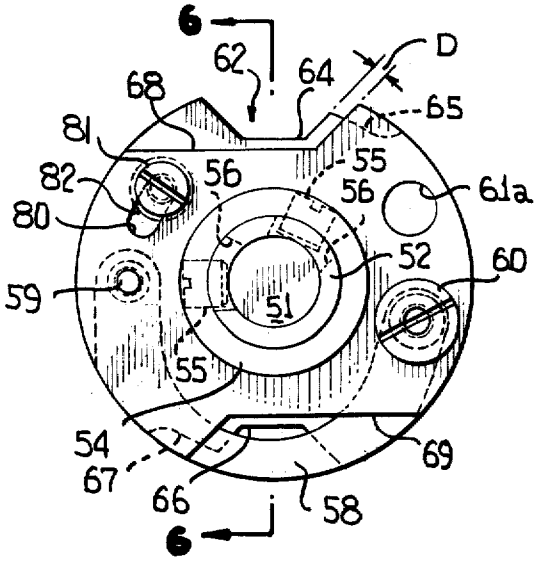

FIG.6

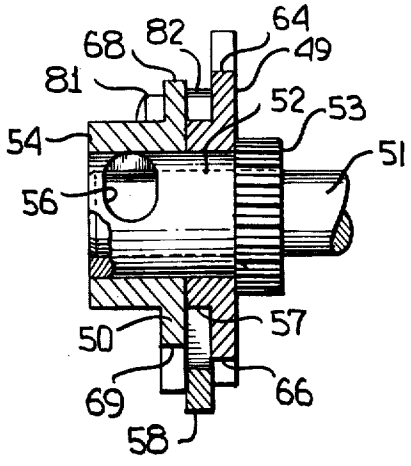

FIG.3

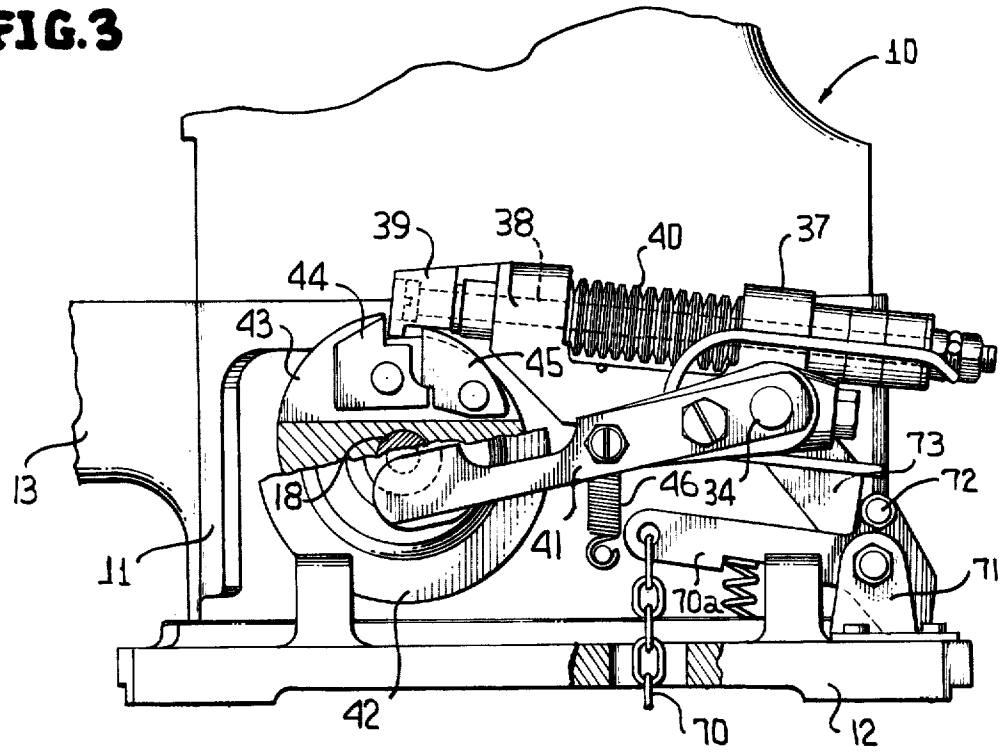
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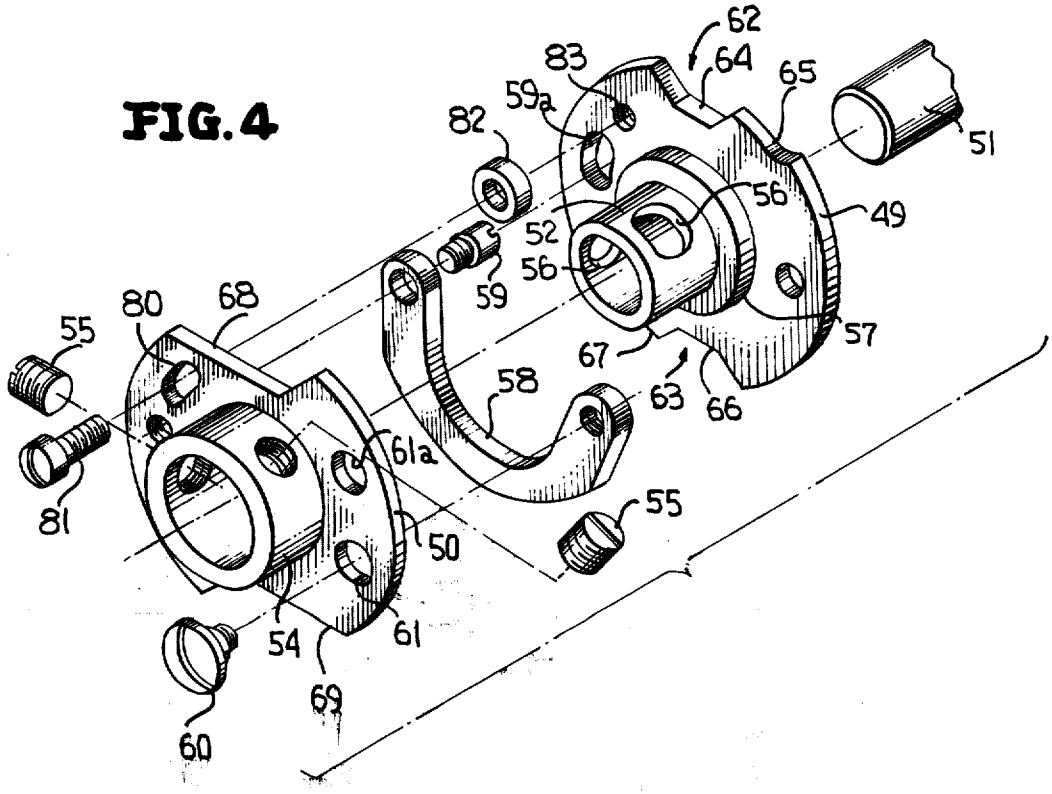
FIG.4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STOP MOTION MECHANISM FOR SEWING MACHINES

This invention relates in general to new and useful improvements in sewing machines, and more particularly to an improved stop motion mechanism for sewing machines.

It is well known to provide stop motions for sewing machines wherein the main drive shaft of the machine is first disengaged from the drive pulley, after which the machine is permitted to coast for a short period followed by the abrupt stopping of the machine. However, these prior stop motion mechanisms normally permitted only about one half revolution after clutch disengagement before the machine was stopped. The net result was that the shaft speed had not materially reduced at the time it was abruptly stopped.

In accordance with this invention, it is proposed to provide an improved stop motion mechanism which includes two separate control cams which are adjustable relative to each other and which are so related to the remainder of the stop motion mechanism wherein the main drive shaft is permitted to coast between one and one and one-half revolutions before the main drive shaft is abruptly stopped. Further, by providing two cams for controlling the operation of the stop motion mechanism and by making the cams adjustable relative to one another, an adjustment can be made to increase or decrease the coasting time of the drive shaft. This adjustment permits one to compensate for the slight differences in the manufacture and assembling of each machine.

The greater speed reduction provided by the increased coasting time of the stop motion mechanism of this invention has the following advantages:

1. Less wear on the parts involved in stopping the machine.
2. The noise at the time the machine is stopped is reduced.
3. There is less overthrow in the machine.
4. Double cycling of the machine is prevented.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claims and the several views illustrated in the accompanying drawings:

IN THE DRAWINGS

FIG. **1** is a side elevational view, with parts broken away and shown in section, of a sewing machine incorporating the stop motion mechanism of this invention.

FIG. **2** is a fragmentary plan view of the base portion of the machine with parts broken away and shown in section and shows the operating means of the stop motion mechanism.

FIG. **3** is a fragmetnary elevational view of the other side of the machine from FIG. **1** with parts broken away and shown in section and shows further details of the stop motion mechanism.

FIG. **4** is an enlarged exploded perspective view of the stop motion cam assembly.

FIG. **5** is an enlarged front elevational view of the assembled stop motion cam discs.

FIG. **6** is a fragmentary sectional view taken along the line **6—6** of FIG. **1** and shows further the details of the cam discs.

Before referring to the drawings, it is pointed out that the type of sewing machines for which the improved stop motion was developed are known as group stitch machines or cyclic machines. Typical of these machines are those disclosed in U.S. Pat. Nos. 2,511,367 and 2,609,773, granted to George W. Nelson and No. 3,509,838, granted to Richard E. Bowin. Besides button sewing machines, this group of machines also included tacking machines of the type disclosed in U.S. Pat. No. 3,749,041 also granted to Richard E. Bowin.

Referring now to the drawings in detail, it will be seen that the machine is generally identified by the numeral **9** and includes a vertical standard **10** having a base portion **11** and a sub-base **12.** Extending horizontally from the base portion **11** is a work supporting arm **13** which is adapted to carry a conventional looper and thread cutter (not shown). Above the arm **13** and extending horizontally from the upper end of the vertical standard **10** is an overhanging arm **14** which has at its outer end a head portion **15.** A needle bar **16,** which carries a needle **17,** is mounted for vertical reciprocatory movement in the head portion **15.**

A main shaft **18** is rotatably mounted in the base **11** and it is to be understood that conventional driving means are provided from the main shaft for operating the needles and looper for performing the desired stitching operation, such as attaching a button to a workpiece. Inasmuch as these driving means are in no way part of this invention, no attempt has been made to illustrate the same or to further disclose the details thereof here.

As is clearly shown in FIG. **1,** the main shaft **18** carries an eccentric **19** which is adapted to rock a member **20** back and forth through a suitable arc upon each revolution of the main shaft **18.** During a stitching cycle of the machine, the rocking of member of **20** is an idle rocking and performs no function. However, upon completion of a stitching cycle, the lower end of a link **21** is shifted towards the left into the position shown in FIG. **1** so that its shoulder **22** is in the path of a laterally extending portion **23** of the member **20.** At this time the rocking of member **20** by the eccentric **19** will cause a downward movement of the link **21.**

The upper end of link **21** is pivotally connected to one arm **24** of a button clamp lifting lever **25** which is pivotally mounted by a stud **26** in the overhanging arm **14.** The forwardly extending arm **27** of the lever **25** carries a downwardly extending rod **28,** the lower end of which extends laterally and carries a roller **29.** The roller **29** is adapted to cooperate with the undersurface of a hook-shaped rod **30** secured to a button clamping mechanism **31.** The button clamping mechanism is of the same type as that disclosed in aforementioned U.S. Pat. Nos. 2,511,367; 2,609,773 and 3,509,838. It is pivotally mounted on the frame of the machine by a rod **32.** The clamping member **31** is normally urged downward during a stitching cycle by a spring **33.** When the rod **28** is lifted upwardly and in turn lifts the rod **30,** the clamping mechanism **31** will pivot about the rod **32** and lift the button retaining portion thereof away from the work supporting arm **13.**

During a stitching cycle, the lower end of link **21** is normally retained in a position to the right of that shown in FIG. **1** so that the shoulder **22** thereof will be out of the path of the laterally extending portion **23** of the member **20.** However, when the machine is at rest, these parts are in the positions illustrated in FIG. **1.**

Upon starting of the machine, the lower end of link **21** will be moved towards the right (FIG. **1**). This is accomplished by the operator's action on a foot treadle or knee press (neither shown) which will cause a counter-clockwise rocking movement of a stop motion rock shaft **34** to which is secured an arm **35**. The lower end of the arm **35** is pivotally connected to a link **36**, the other end of which is pivotally connected to the lower end of the link **21**. Just prior to the completion of the selected number of stitches and the automatic stopping of the machine, the rock shaft **34** will be rocked in a clockwise direction (FIG. **1**) to return the link **21** to the position shown in FIG. **1** and thus place the shoulder **22** in the path of the laterally extending portion **23** of the rock member **20**. Accordingly, upon the next revolution of the main shaft **18**, the eccentric **19**, in rocking the rock member **20**, will cause the laterally offset portion **23** to contact the shoulder **22** of the link **21** and urge the link **21** downwardly. This, as mentioned above, will result in the counter-clockwise rocking of the lever **25** or cause the roller **29**, carried by the rod **28**, to engage the rod **30** and lift the rod **30** along with the button clamping mechanism **31**. At this time the machine will be automatically stopped.

In accordance with this invention, the machine is provided with a stop motion mechanism which represents an improvement on that of the previously mentioned Nelson and Bowin patents. As is clearly shown in FIGS. **2** and **3**, there is provided on one side of the machine a stop motion plunger lever **37** which is fixedly secured to the stop motion rock shaft **34**. The plunger lever **37** carries a plunger rod **38** which, in turn, carries a stop motion plunger **39** at its left end (FIG. **3**). A number of spring washers **40**, which are carried by the plunger rod **38**, bias the stop motion plunger **39** towards the left, as seen in FIG. **3**. The plunger lever also carries a lever **41**, the free end of which is provided with a camming surface **41***a* (FIG. **2**) operable to operate a conventional friction clutch which serves to connect the main shaft **18** with a power driven pulley **42**. The friction clutch includes a clutch disc which is fastened to a stop motion disc **43** which, in turn, is fastened to the main shaft **18**. The disc **43** is provided with a pawl **44** and a latch **45** (FIG. **3**) which cooperate with the stop plunger **39** in stopping the machine. The plunger **39** is biased towards the stop motion disc **43** by a spring **46** connected at one end to the plunger lever **37** and its other end to the frame of the machine.

On the other end of the rock shaft **34** from the stop motion plunger lever **37**, there is secured a lever **47** which carries a cam follower **48**, as is best seen in FIGS. **1** and **2**. The cam follower **48** is positioned to engage edges of cam discs **49** and **50** mounted on a cam shaft **51**. Disc **49** is fixedly mounted, by a pressed fit, on a hub **52** of a gear **53**. The disc **50** loosely fits on the hub **52** and is provided with a hub **54**. The discs **49** and **50** are secured to the cam shaft **51** by screws **55** passing through threaded openings in the hub **54** and elongated openings **56** in the hub **52**.

A hub **57**, which is part of the disc **49**, provides for the proper spacing between the discs **49** and **50**. An adjustable shoe **58** is located between the discs **49**, **50** and is pivotally mounted at one end to disc **50** by a screw **59**. An elongated circumferentially extending hole **59***a* in the cam disc **49** provides clearance and easy access to the shoulder screw **59**. At its other end, the shoe **58** is secured in one of two positions by a shoulder screw **60** selectively passing through one of two holes **61**,**61***a* in the cam disc **50**.

The cam disc **49** has two peripheral notches **62** and **63** with the notch **62** being defined by steps **64** and **65**, and the notch **63** being defined by steps **66** and **67**. As is readily apparent from FIGS. **4** and **5**, the notches **62** and **63** are identical and are **180** degrees out of phase with the steps **64** and **66** being somewhat deeper than the steps **65** and **67**.

The disc **50** is also provided with two identical, diametrically opposed cutouts or notches **68** and **69** of a different shape than the notches **62** and **63**. The notches **68** and **69** are generally in line with the notches **62** and **63** when the discs **49** and **50** are mounted in position on the cam shaft **51**. The diameters of the discs **49** and **50** are equal and in such a relation to the position of the lever **47** that when the cam follower **48** rides on the edges of the discs, the rock shaft **34** is positioned to hold the plunger **39** out of contact with the stop motion disc **43**.

With the shoe **58** in the position illustrated in FIGS. **3** and **5**, the shoe **58** blocks or covers notch **63** so that the machine will go through a full cycle or stitch **16** stitches before stopping. This will allow a four hole button to be sewn. If it is desired to sew a two hole button, for example, the shoe will be raised and secured to the disc with the screw **60** passing through hole **61***a*. With the shoe in this position, the notch **63** will be opened and the machine will be stopped after every eight stitching cycles.

With the machine in its normal or stopped position, the stop motion plunger lever **37** and the cam discs **49** and **50** are in the positions shown in FIGS. **1** and **3**. To start a stitching operation, the operator depresses a foot treadle (not shown) which is connected by a chain **70** to a lever **70***a* pivotally mounted in the sub-base **12** of the machine by means of a bracket **71**. The lever **70***a* pivots in a counter-clockwise direction and stud **72** carried thereby contacts a downwardly extending arm **73** of the plunger lever **37** to pivot the plunger lever in a clockwise direction and remove the plunger **39** thereof from engagement with the stop motion disc **43**. At the same time, the camming surface of the lever **41** acts on the pulley **42** to engage the clutch and thus connect the power driven pulley **42** to the main drive shaft **18** to effect rotation of the drive shaft **18**.

With reference to FIG. **1**, the lever **47** will be pivoted in a counterclockwise direction to remove the cam follower **48** from the lower step **64** of the notch **62** in the cam disc **49**. The machine now begins the sewing cycle with the cam follower riding on the edges of the cam discs **49** and **50**. The cam shaft **51** is driven in a clockwise direction by suitable gearing in the base of the machine so that the cam discs **49** and **50** rotate at a ratio of one revolution to every **16** revolutions of the main drive shaft **18**.

The machine continues to be driven by the pulley **42** until the notch **62** of the cam disc **49** approaches the cam follower **48**. At this time the cam follower **48** drops from the edge of the cam discs **49**, **50** onto step **65** of cam disc **49**. This slight drop rotates the rock shaft **34** in a clockwise direction. As is seen in FIG. **3**, the stop motion plunger lever **37** is rocked slightly in a counterclockwise direction moving the plunger **39** towards the stop motion disc **43**. The lever **41** is rocked enough to cause its camming surface to disengage the pulley **42** from the clutch and main drive shaft **18** of the

machine. At this time the machine has about 1 to 1½ revolutions remaining in its sewing cycle. The machine, being disengaged from the pulley **42**, will merely coast until it is stopped. The position of the plunger **39** at this time is still far enough away from the stop motion disc **43** to allow the pawl **44** and latch **45** to pass the plunger **39** in a clockwise direction.

Referring once again to FIG. **1**, it will be seen that the continued rotation of the cam discs **49** and **50** will cause the cam follower **48** to drop from the step **65** to the bottom step **64** of the notch **62**. This also causes the plunger lever **37** and the plunger **39** to drop to their final stopping positions. At this time, the stop motion disc **43** has about one-half revolution remaining before the pawl **44** and the latch **45** cooperate with the plunger **39** to stop the machine. Also, at this time, as previously described, the button clamp mechanism **31** is lifted away from the work supporting arm **13**, allowing the operator to remove the sewn button and insert a new button for the next sewing cycle.

An advantageous feature of the invention lies not only in the increased coasting time of the machine at the end of a sewing cycle, but also that this coasting time can be adjusted. This can be accomplished by adjusting cam disc **50** in relation to cam disc **49**. The cam disc **50** is provided with an elongated circumferential slot **80**, as is shown in FIGS. **4** and **5**. A screw **81** passes through the slot **80**, through a spacing collar **82** and into a threaded bore **83** in the cam disc **49**. The screw **81** serves to clamp the cam disc **50** to the cam disc **49** in its adjusted position. The screws **55** also serve to clamp the cam discs **49** and **50** together in addition to securing the cam discs to the cam shaft **51**.

In order to adjust the position of the cam discs **49** and **50** in relation to the cam shaft **51**, only the screws **55** must be loosened. The screw **81** remains in a tightened condition to keep the relationship between the cam discs **49** and **50** from changing. To adjust the relationship between the cam discs **49** and **50**, the screw **81**, along with the screws **55**, must be loosened. By adjusting the cam disc **50** with respect to the cam disc **49**, the distance D (FIG. **5**) can be selectively increased and decreased.

At this time it is pointed out that, as illustrated in FIG. **5**, the cam disc **50** is shown in its extreme counterclockwise position. The distance D, in this view, is at its lowest or most decreased setting. In an actual machine, the cam **50** would be about in the center of the adjustment range. In the following discussion of the adjustment of the relative positions of the cam discs **49** and **50**, it is to be assumed that the cam disc **50** is in the center position.

By rotating the cam disc **50** in a clockwise direction, the distance D will be increased, and by rotating the cam disc **50** in the opposite direction, the distance D will be decreased. Increasing the distance D will allow the cam follower to drop down to the step **65** sooner, thereby increasing the coasting time of the machine at the end of the machine at the end of the sewing cycle. This will cause the speed of the machine to be decreased further, from that of the previous setting, at the time the machine is stopped. In like manner, in rotating the cam disc **50** in the opposite direciton relative to the cam disc **49**, the coasting time of the machine will be decreased and the speed of the machine, at the time it is stopped, will be increased from that of the previous setting.

In the illustrated arrangement, the coasting time of the machine at the end of a sewing cycle can be adjusted from 1 to 1½ revolutions. In rotating the cam disc **50**, the shoe **58** will also be rotated. If the shoe **58** must be replaced, the elongated hole **59***a* will provide access to the screw **59** in any position to which the cam disc **50** has been rotated relative to the cam disc **49**. It will, of course, be necessary to remove the cam discs **49** and **50** from the cam shaft **51** in order to replace the shoe **58**.

It will be readily apparent from the foregoing that by adjusting the relative positions of the cam discs **49** and **50**, the coasting time of the machine can be readily adjusted to compensate for differences in manufactured parts and in assembling the machines. Thus, if after assembly one machine was found to have higher frictional forces than another machine, then this machine would be adjusted for a shorter coasting time than the machine having low frictional forces. Further, it will be apparent that when replacing worn parts, the coasting time may have to be readjusted.

Although only a preferred embodiment of the invention has been specifically illustrated and described herein, it is to be understood that minor variations may be made in the stop motion mechanism without departing from the spirit and scope of the invention, as defined by the appended claims.

I claim:

1. A stop motion mechanism for a sewing machine of the type including a main drive shaft, a drive pulley, a clutch for selectively coupling the main drive shaft to the drive pulley for being driven thereby, a stop motion disc carried by the main drive shaft, first lever means for controlling actuation of the clutch, second lever means for interlocking with the stop motion disc for stopping and preventing rotation of the main drive shaft, the improvement residing in rock means for rocking said first and second lever means in unison, said rock means including a cam shaft driven from said main drive shaft at a reduced ratio, a cam carried by said cam shaft for rotation therewith, said cam having a primary surface and adjacent first and second radial steps, a rock lever connected to said first and second lever means for rocking the same and a cam follower carried by said rock lever for riding on said cam primary surface and for sequential engagement with said steps, and said steps being radially spaced from said primary surface distances wherein when said follower engages said first step said first and second levers are rocked a distance sufficient to disengage the clutch and insufficient to engage the stop motion disc and when said cam follower engages said second step said first and second levers are rocked a distance to stoppingly engage the stop motion disc.

2. The stop motion mechanism of claim **1** wherein said first step is circumferentially elongated, and control means for supporting said cam follower along a selected portion of said first step to vary the effective length of said first step to vary the interval between clutch release and main drive shaft stoppage.

3. The stop motion mechanism of claim **2** wherein said control means is in the form of a second cam having a control step positioned intermediate the ends of said first step.

4. The stop motion mechanism of claim **3** together with means mounting said second cam relative to the first mentioned cam for selective angular rotational po-

sitioning, and means for locking said cams together in selected angular rotated positions.

5. The stop motion mechanism of claim 4 wherein said cams have concentric telescoped hubs forming part of said mounting means.

6. The stop mechanism of claim 4 wherein said cams have concentric telescoped hubs forming part of said mounting means and screw means carried by an outer one of said hubs passing through an inner one of said hubs securing one of said cams to said cam shaft.

7. The stop motion mechanism of claim 3 wherein each cam has plural sets of said steps, and blocking means associated with at least certain of said sets of steps for selectively rendering the associated set of steps inoperative.

8. The stop motion mechanism of claim 7 wherein said blocking means is in the form of a shoe positioned between said cams.

9. The stop motion mechanism of claim 7 wherein said blocking means is in the form of a shoe positioned between said cams, means pivotally mounting one end of said shoe, and means for selectively positioning a second end of said shoe relative to said cams to selectively render said shoe operative and inoperative.

10. The stop motion mechanism of claim 1 wherein said cam has plural sets of said steps, and blocking means associated with at least certain of said sets of steps for selectively rendering the associated set of steps inoperative.

11. The stop motion mechanism of claim 1 wherein said main drive shaft and said cam shaft are in parallel relation, and said first and second lever means and said rock lever are carried by a third shaft disposed parallel to said main drive shaft and said cam shaft.

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