Aug. 8, 1950 G. HILL ET AL 2,517,567

SEWING MACHINE CONTROL MECHANISM

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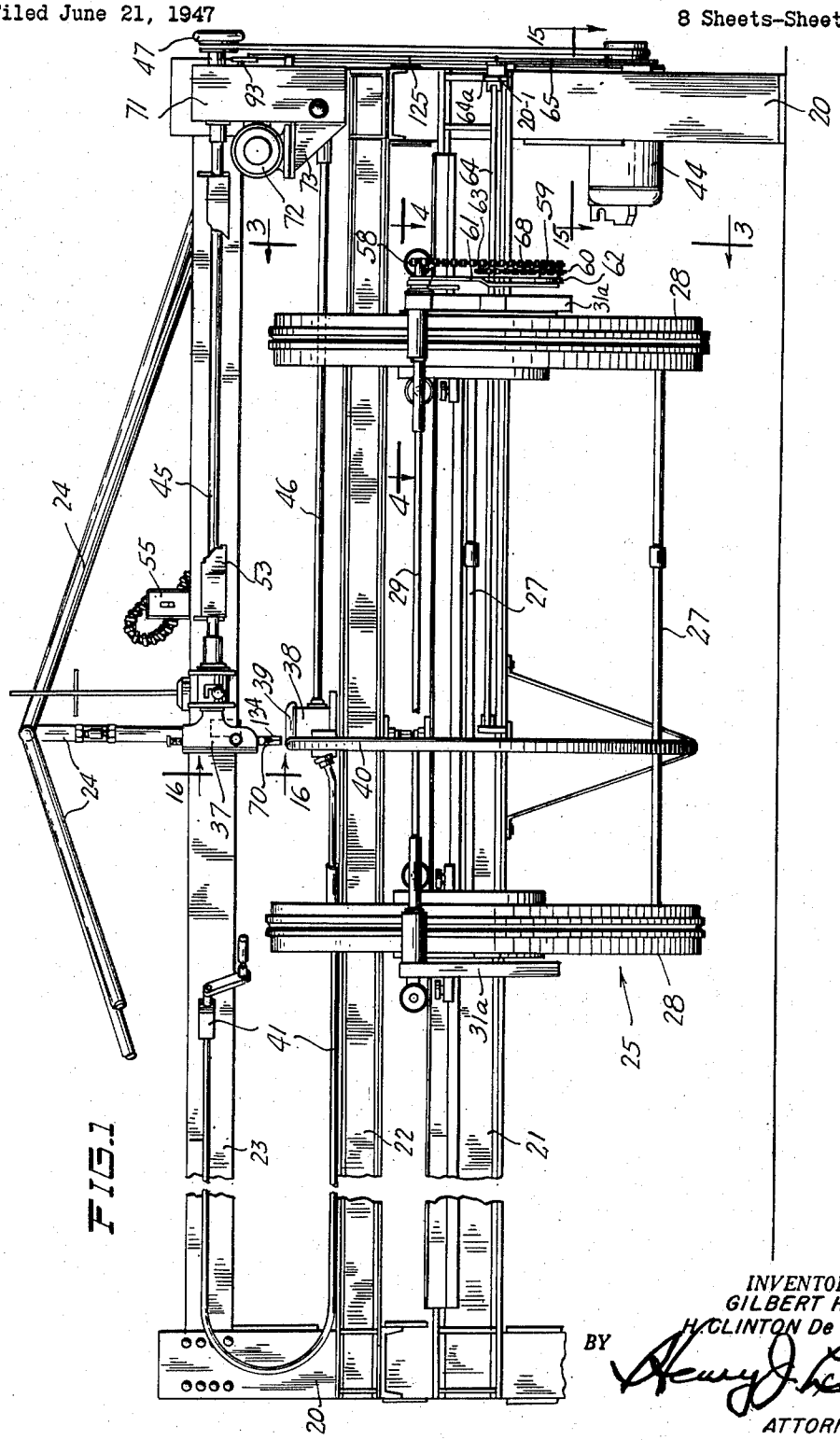


FIG. 1

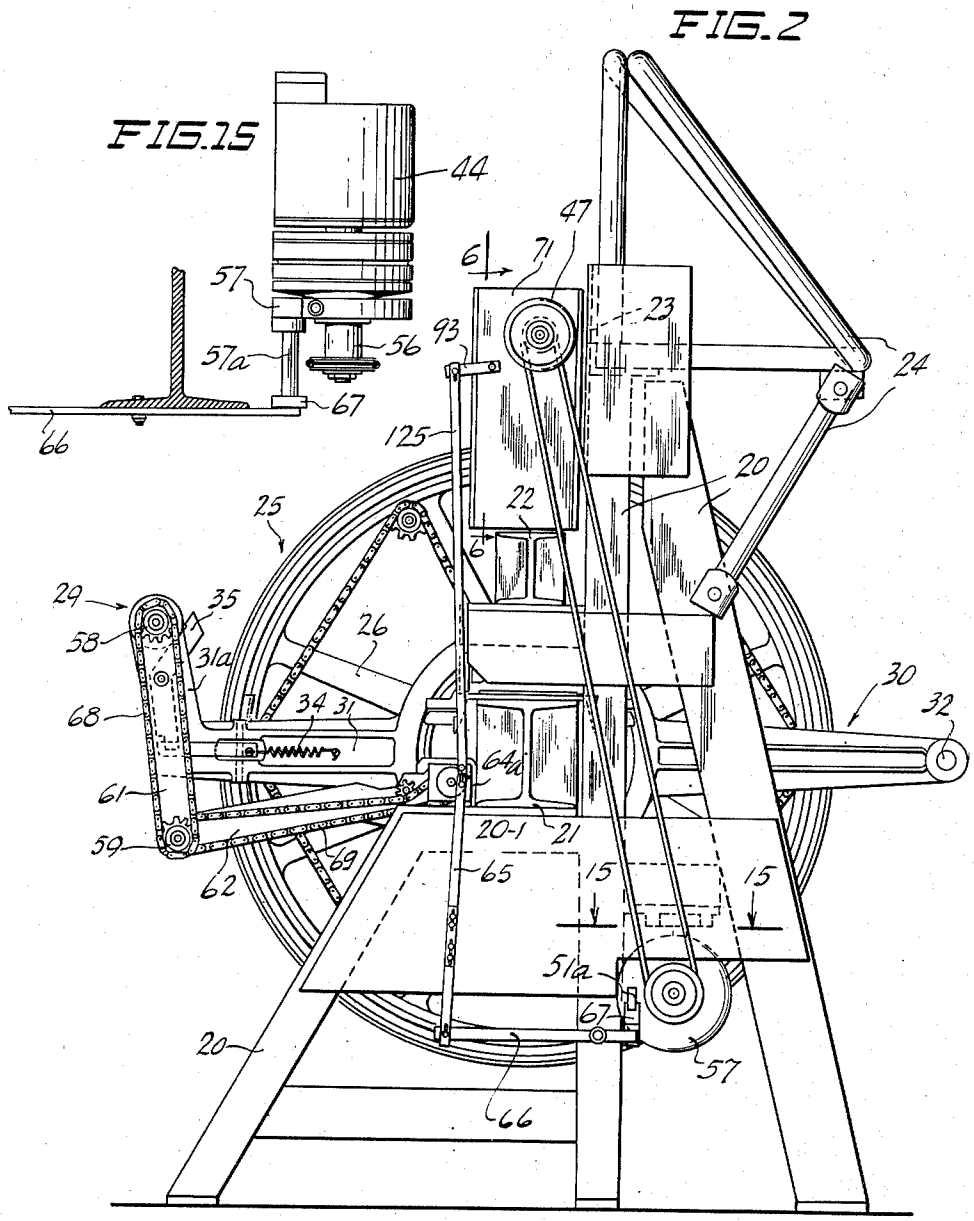
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SEWING MACHINE CONTROL MECHANISM

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FIG. 2



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SEWING MACHINE CONTROL MECHANISM

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FIG. 5

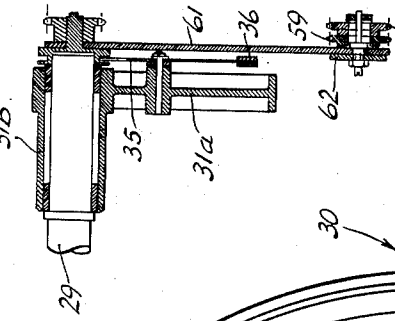


FIG. 3

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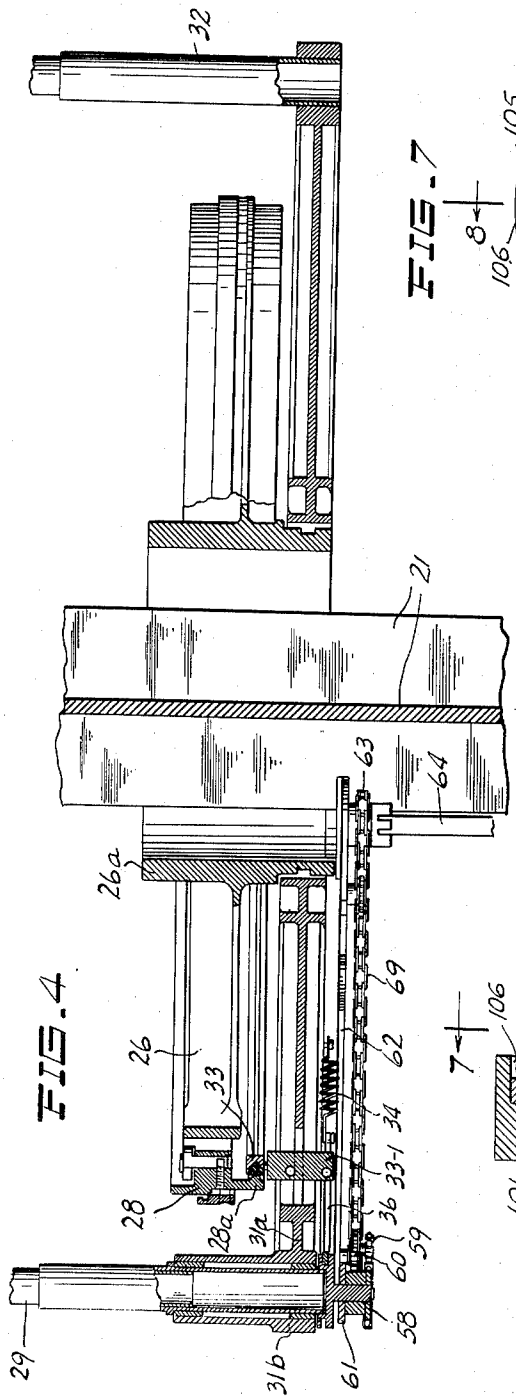


FIG. 4

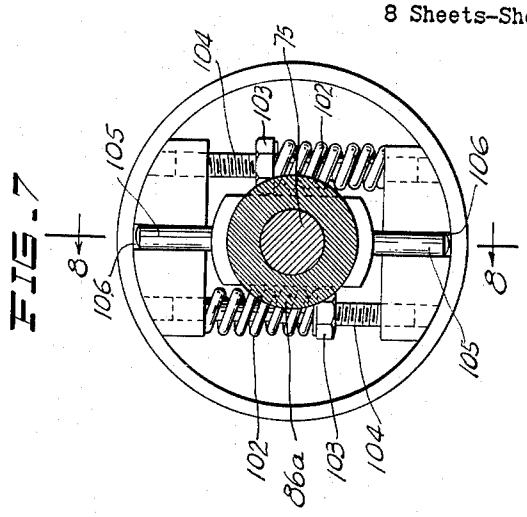


FIG. 7

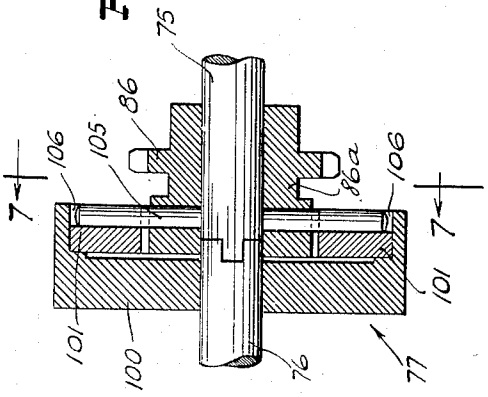


FIG. 8

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SEWING MACHINE CONTROL MECHANISM

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FIG. 6

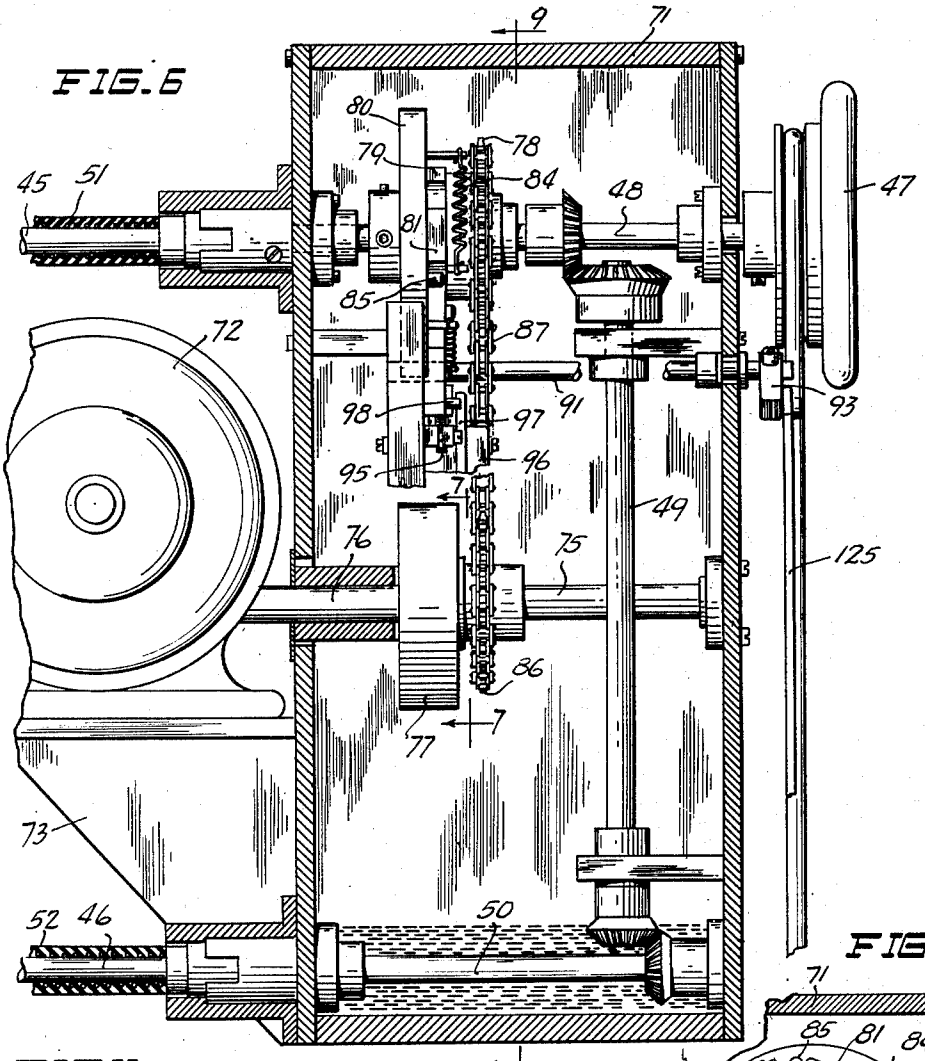


FIG. 10

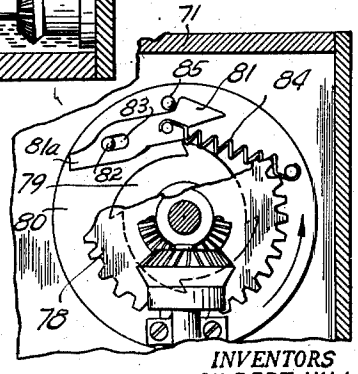
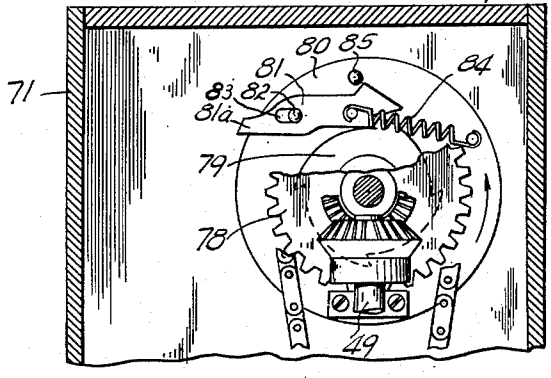


FIG. 11



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FIG. 9

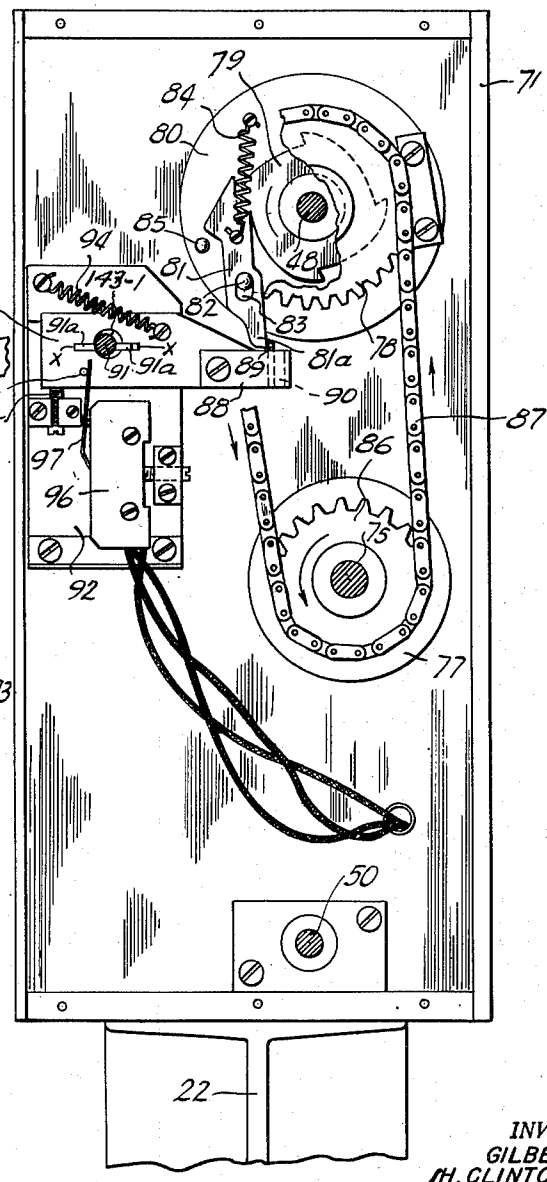
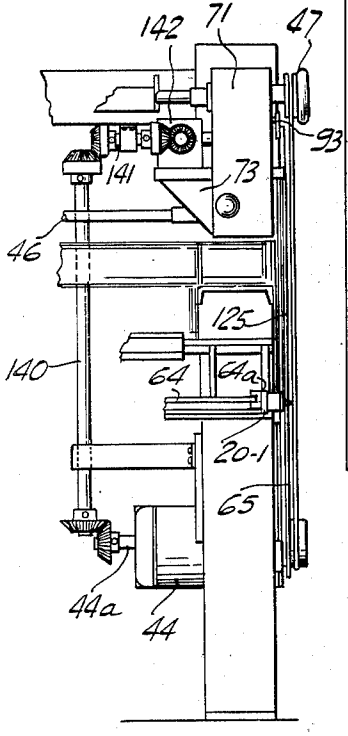


FIG. 21



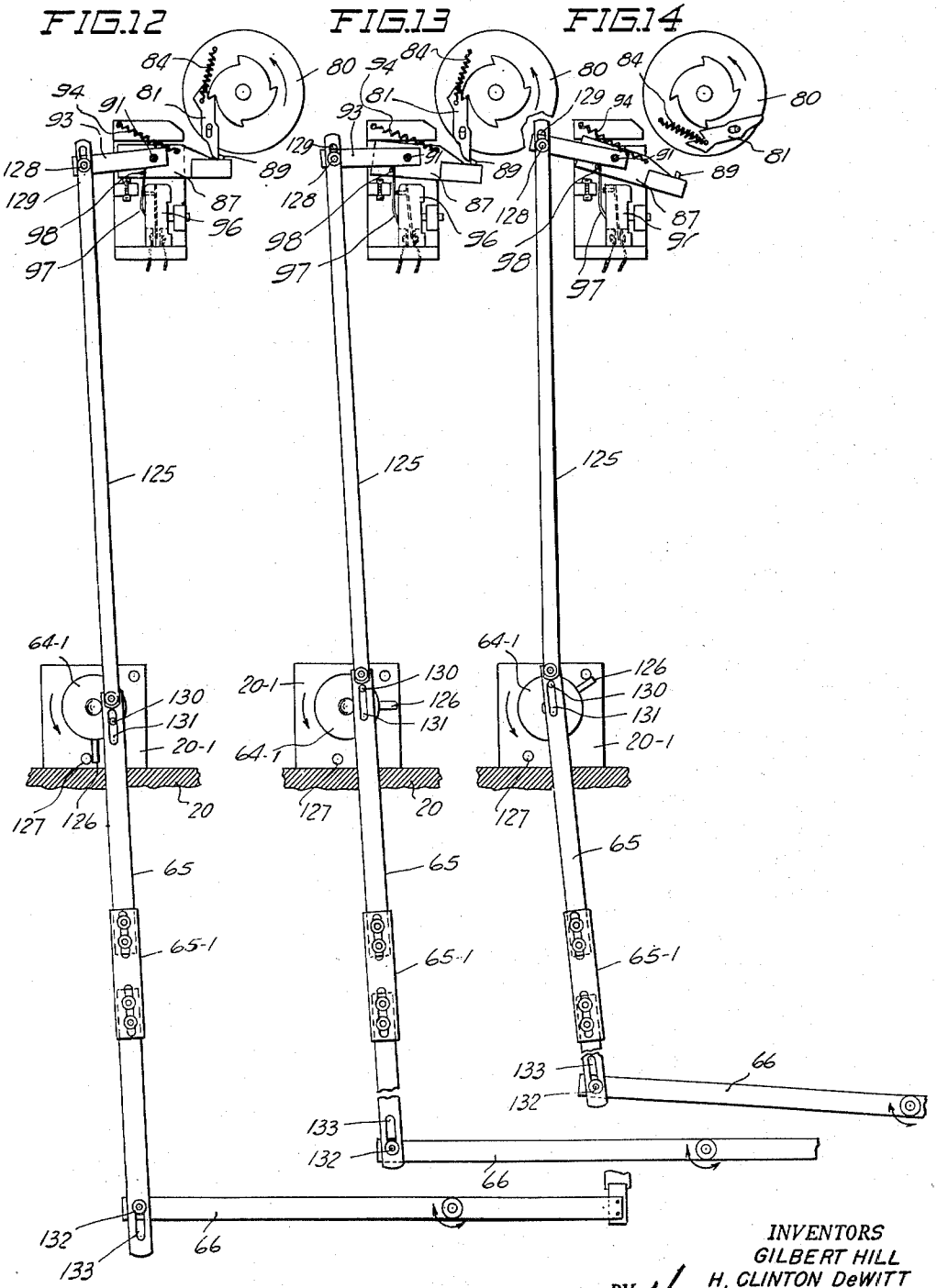
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SEWING MACHINE CONTROL MECHANISM

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FIG.12 FIG.13 FIG.14



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SEWING MACHINE CONTROL MECHANISM

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FIG. 16

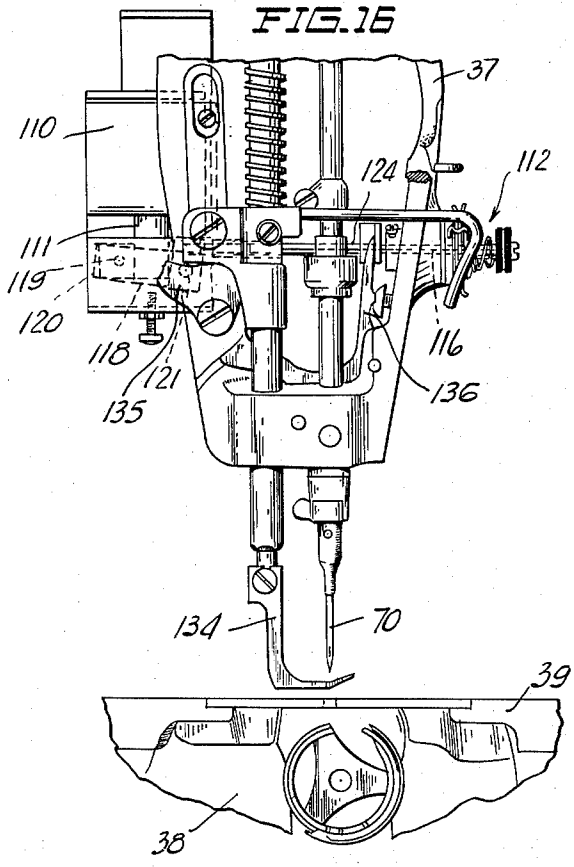


FIG. 20

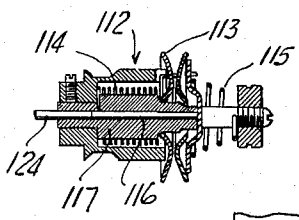


FIG. 17

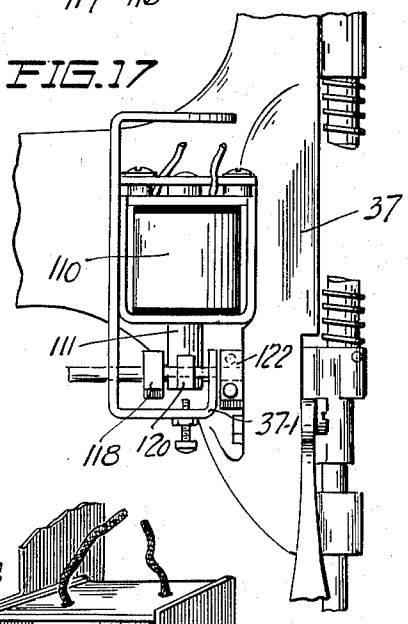


FIG. 18

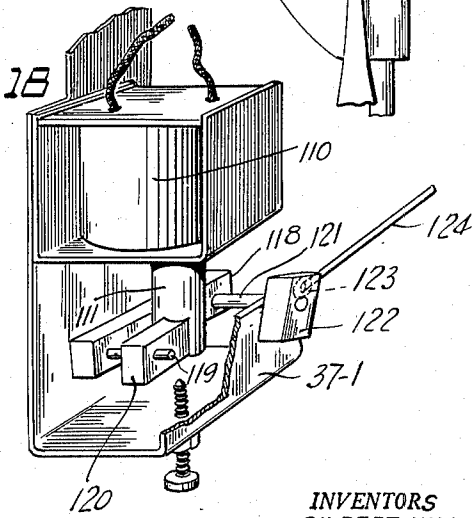
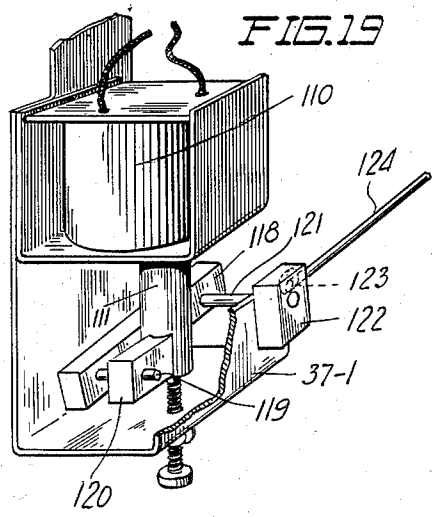


FIG. 19



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Patented Aug. 8, 1950 2,517,567

UNITED STATES PATENT OFFICE

2,517,567

SEWING MACHINE CONTROL MECHANISM

Gilbert Hill, Ridgefield, and Henry Clinton De Witt, New Providence, N. J., assignors to Carlin Comforts, Inc., New York, N. Y., a corporation of New York

Application June 21, 1947, Serial No. 756,144

20 Claims. (Cl. 112—219)

1

This invention relates to sewing machine control mechanisms, and especially to control mechanisms for sewing machines of industrial type adapted to operate on work of considerable length and breadth, such as quilts and comforters, which often require stitching along irregular paths in order to trace out intricate designs.

The invention constitutes an improvement on the sewing machines disclosed and claimed in U. S. Patents #1,937,491, #1,946,868, and #2,377,951, issued November 28, 1933, February 13, 1934, and June 12, 1945, respectively, to Walter H. May, though in major part the improvement is applicable to a variety of types of sewing machines, as will be apparent to those skilled in the art.

In the aforementioned patented sewing machines of Walter H. May an open framework of cylindrical or drum-like configuration is provided as a movable mount or holder for the work to be operated upon by the sewing mechanism. Such mount or work-holder is rotatable about its longitudinal axis, and is slidable back and forth axially, thereby permitting substantially universal movement of the work relative to the sewing head and other parts of the sewing mechanism. It is adjustable lengthwise, enabling it to receive a variety of sizes of quilts, comforters, or like work of unusual size not readily accommodated by ordinary sewing machines. Such work is held securely by the cylindrical work-holder while an operator manipulates a control handle to properly rotate the work-holder backwardly and forwardly and move it longitudinally from side to side for guiding and feeding the work into the sewing mechanism along whatever irregular and intricate paths may be required. A foot pedal is provided, enabling the operator to control the speed of the electrically driven sewing mechanism while manipulating the control handle. The sewing mechanism proper is, for the most part, of conventional construction.

Sewing machines embodying conventional sewing mechanisms suffer from the fact that, when the sewing mechanism is stopped following any operative run thereof, the needle may come to rest at any position within its reciprocative cycle. Thus it may and frequently does come to rest in a downward position, making it impossible to remove or alter the position of the fabric being sewn, without damaging the same by the needle or even breaking the needle, until the needle is raised to its highest position by suitable manipulation of the sewing mechanism. Furthermore, before the fabric being sewn can be removed

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from the machine or its position altered therein, the tension normally maintained on the sewing thread during the sewing operation must be relieved. This is conventionally accomplished by suitable lever action occurring coincidentally with the lifting by the operator of the presser foot.

Pursuant to the present invention means are provided whereby the needle is automatically raised clear of the work being operated upon (thereby insuring the completion of a full stitch and disengagement of the needle from the sewing hook) and the tension on the sewing thread is automatically relieved whenever the sewing mechanism is brought to a stop. Thus, the work being operated upon may be freely moved at any time the sewing mechanism proper is stopped, without danger of injuring either the work or the machine.

This is a great advantage for sewing machines in general, but is especially advantageous in connection with the special May machine outlined above, since the cylindrical work-holder, balanced as it is for convenient manipulation, is particularly susceptible to inadvertent movement. An important feature of the present invention in this connection is the provision for complete control of the machine by means of the aforementioned control handle, the foot pedal mentioned heretofore being eliminated.

Accordingly, it is an object of the invention to provide for automatically bringing the needle of a sewing machine to rest free and clear of the work being operated upon, whenever the sewing mechanism is brought to a stop.

It is an object to provide for the completion of a full stitch whenever the needle is brought to rest, so the needle is free of the sewing hook when at rest.

It is an object to provide for automatically relieving the sewing thread of tension whenever the sewing mechanism is brought to a stop.

It is an object to provide for the above in a sewing machine equipped with a cylindrical work-holder adapted for substantially universal movement relative to the sewing mechanism proper, the control being exercised through the handle by which the work-holder is manipulated.

It is a further object to accomplish the above by relatively simple, positive-acting mechanism not likely to get out of order.

These and other objects and features of the invention will be fully dealt with in the following detailed description of the presently preferred specific embodiment illustrated in the accom-

panying drawings by way of example of the generic concepts here disclosed and claimed.

In the drawings:

Fig. 1 illustrates in front elevation a machine for sewing intricate designs in quilts and comforts, being of the general type disclosed in the aforementioned U. S. patents of Walter H. May, but constructed in accordance with the present invention;

Fig. 2 is a side elevation looking from the right, this view being drawn to a slightly enlarged scale;

Fig. 3 is a fragmentary vertical section taken on the line 3—3, Fig. 1, showing portions of the control handle mechanism in elevation, the view being drawn to a considerably enlarged scale;

Fig. 4 is a fragmentary horizontal section taken on the line 4—4, Fig. 1;

Fig. 5 is a fragmentary vertical section taken on the line 5—5, Fig. 3;

Fig. 6 is a greatly enlarged fragmentary vertical section taken on the line 6—6, Fig. 2;

Fig. 7 is a somewhat enlarged fragmentary vertical section taken on the line 7—7, Fig. 6, illustrating the friction clutch in front elevation;

Fig. 8 is a section on line 8—8, Fig. 7;

Fig. 9 is a section taken on the line 9—9, Fig. 6, showing important parts of the needle-raising mechanism in elevation, the position being that assumed when the sewing mechanism is at rest;

Fig. 10 is a fragmentary view corresponding to the upper portion of Fig. 9, but illustrating the position of the parts during sewing operations;

Fig. 11 is a similar view illustrating the position of the parts after deceleration of the sewing head drive shaft to a speed substantially equal to the speed of the auxiliary motor;

Fig. 12 is a diagrammatic view corresponding generally to Fig. 9 where the sewing mechanism is at rest, the view being fragmentary and drawn to a somewhat reduced scale, and including a showing of portions of the interconnecting linkage;

Fig. 13 is a similar view showing the relative positions of the several parts at a stage intermediate the "off" and the "on" positions of the control handle;

Fig. 14 is a similar view showing the relative positions at the stage of disengagement of the sewing mechanism from the main driving motor where the control handle is at "on" position;

Fig. 15 is a somewhat enlarged fragmentary horizontal section taken on the lines 15—15, Figs. 1 and 2;

Fig. 16 is an enlarged fragmentary vertical section taken on the line 16—16, Fig. 1, showing the sewing head in detail with cover plate removed and needle in raised position, the tension discs being positioned to relieve the sewing thread of tension;

Fig. 17 is a fragmentary side elevation of the structure appearing in Fig. 16, the view being taken from the left;

Fig. 18 is an enlarged detail drawn in perspective and illustrating operating components of the thread tensioning and releasing mechanism of the immediately preceding figures, the parts being shown in their tension release positions;

Fig. 19 is a view corresponding to that of Fig. 18, but illustrating the several parts in their thread tensioning positions;

Fig. 20 is a longitudinal detail section through the conventional thread-tensioning portion of Fig. 16 as it appears in the operating position of Fig. 19; and

Fig. 21 is a fragmentary elevation illustrating a modification wherein the auxiliary motor is replaced by a drive connection with the main motor.

Referring to the drawings: The machine as here illustrated embodies a rigid supporting framework, comprising a pair of mutually spaced end standards 20, to which are firmly secured a main longitudinal I-beam 21, a secondary longitudinal I-beam 22, and a longitudinal angle beam 23. A truss-like arrangement 24 of structural members serves as reinforcing and balancing means to prevent vibration of the machine during operation.

A cylindrical or drum-like work-holder framework which provides a carriage for receiving and retaining the work to be operated on is indicated generally 25, and here comprises mutually spaced circular spiders 26 connected longitudinally by rods 27 which are telescopic so the carriage is rendered capable of accommodating quilts and comforts of different sizes. As in the aforementioned patents of Walter H. May, especially the latest one, No. 2,377,951, outer work-receiving rings 28, Fig. 4, rotatably mounted on the rims of respective spiders 26 to move in synchronism with each other, provide the rotatable part of the cylindrical work-holder carriage 25. The circular spiders 26 are not themselves rotatable, but are suitably mounted on the trackway provided by main longitudinal beam 21, see Fig. 3, for free sidewise movement in either direction longitudinally of the machine. Thus the work, securely mounted on such work-holder carriage 25, is freely movable substantially universally relative to other parts of the machine.

The movement of work-holder carriage 25 is controlled, as in the said prior patents, by means of a control handle 29 which is a rod—of telescopic construction for purposes of carriage size adjustment — extending longitudinally at the front of the machine so as to be constantly in the hands of the operator who is watching and guiding the progress of the sewing operation. Such control handle forms part of a counterbalanced rocker frame rotatably mounted about the same longitudinal axis as the work-holder carriage 25. The rocker frome is indicated generally 30, and comprises a pair of mutually spaced and oppositely disposed transverse rocker arms, indicated 31, respectively, which are suitably journaled at their mid-portions for rotative movement about the hubs 26*a* of respective spiders 26, see Fig. 3, and which have upstanding bracket extensions 31*a* at their forward ends, serving to rotatably receive and carry control handle 29, and their rear ends interconnected by a rod 32.

The rocker frame 30 is normally freely rotatable in either direction with respect to the work-holder carriage 25, and is so balanced as to normally rest in a horizontal position. When the operator of the machine desires to rotate the work in either direction relative to the sewing mechanism, he first pushes the control handle 29 inwardly toward the machine for the purpose of actuating suitable grab mechanism to temporarily connect such control handle with the work-retaining rings 28 of the work-holder carriage 25. The grab mechanism here comprises a pair of grab shoes 33, Figs. 3 and 4, operably carried by respective blocks 33—1 pivoted to the forward portions of the respective rocker arms 31, and normally held out of gripping engagement with annular grab rail portions 28*a* of the respective work-retaining rings by means of respective

springs 34. Respective bell cranks 35 pivoted to the upstanding bracket extensions 32 of the rocker frame 30 transmit the backward movement of control handle 29, when the same is pushed by the operator as aforesaid, to the pivoted blocks 33—1 through respective levers 36, thereby forcing such grab shoes 33 into frictional engagement with their respective grab rails 28a. Thus all sectors of the work may be selectively brought under the immediate control of the operator.

The sewing mechanism of the machine comprises a sewing head 37, Fig. 1, which in certain essential operating respects is of conventional construction. It is mounted substantially centrally of the machine on a suitable bracket extending from the secondary beam 23. The sewing mechanism further comprises conventional loop-taking means 38, which includes a sewing hook and a properly housed bobbin. Such loop-taking means is mounted on secondary beam 22 directly below the sewing head. It carries a bed plate 39, which is supplemented by a work-tensioning hoop 40 expansible and retractible circumferentially by suitable manually operable means 41 generally similar to that set forth in aforementioned Patent No. 2,377,951 of Walter H. May, and, therefore, not dealt with here in detail.

An electric motor 44 serves to drive sewing head 37 and loop-taking means 38 through respective drive shafts 45 and 46, Figs. 1 and 6, the drive pulley of electric motor 44 being belted to driven pulley 47, which is fixed to a countershaft 48 rigidly coupled to sewing head drive shaft 45. A suitable synchronizing gear drive, including a suitable countershaft 49, Fig. 6, connects countershaft 48 with a second countershaft 50 rigidly coupled to drive shaft 46 of loop-taking means 38.

As illustrated in Fig. 6 the main drive shafts 45 and 46, both of which are of extended length, may be encased by respective continuous bearing sleeves 51 and 52 of flexible material, such as commercial flexible shafting, or by the usual rigid shafting. A bracket 53, Fig. 1, supports the drive shaft 45, while a standard (not shown) supports the drive shaft 46.

A manually actuated electric switch 55, Fig. 1, controlling the electric supply circuit to electric motor 44 is disposed in proximity to the sewing head 37, so the operator may energize and deenergize the machine without leaving the control handle 29.

Actuation of the sewing mechanism to carry out any given guided sewing operation under positive manual control of the operator is accomplished by the operator through the control handle 29 by which he exercises said positive manual guiding of the sewing operation. For this purpose the power output shaft of electric motor 44 is coupled to the drive pulley shaft 56 thereof, see Fig. 15, by means of a conventional variable-speed clutch and brake arrangement, indicated generally 57, operable from control handle 29 by suitable connecting mechanism. The entire variable speed drive unit, including motor, may be purchased from the Singer Manufacturing Co.

Control handle 29 is rotatably mounted at its opposite ends in respective sleeve portions 31b, see Figs. 4 and 5, which extend horizontally from the upper ends of respective upstanding bracket extensions 31a of the rocker frame 30, and the aforementioned connecting mechanism includes a sprocket 58 fixed to that end of the control handle which is nearest the motor 44. Such connecting mechanism comprises, further, a pair of sprockets 59 and 60, see Figs. 1, 2, and 3, rotatably supported at the pivotal juncture of linkage arms 61 and 62, a sprocket 63 fixed to a rectangular countershaft 64 at the pivotal connection of linkage arm 62 with the hub of the particular spider 26 concerned, see especially Figs. 3 and 4, a link arrangement 65 eccentrically pivoted to end piece 64a of countershaft 64, which is journaled in a standard 20—1, see especially Figs. 1 and 2, a connecting link 66 pivoted to the particular end standard 20 concerned, and a second connecting link 67 suitably connected to the actuating arm 57a of the variable speed arrangement 57, see especially Figs. 2 and 11. Sprocket 58 drives sprocket 59 by means of a sprocket chain 68; sprocket 60 drives sprocket 63, and therewith countershaft 64, by means of a sprocket chain 69; and countershaft 64 operates the actuating arm 57a of the variable speed arrangement by means of the above-described connecting linkage.

Rotation of control handle 29 from the "off" position illustrated, at which clutch and brake arrangement 57 completely disengages the sewing drive mechanism from drive motor 44, effects engagement of such clutch and brake arrangement 57 with drive motor 44, and, as the rotation progresses accelerates the speed of operation of the sewing mechanism from a minimum to a maximum. Reverse rotation decelerates until the control handle is again at its "off" position.

The mechanism for automatically bringing the sewing needle 70 of the sewing head 37, see Fig. 1, to rest at predetermined position, preferably that high point in its oscillatory path at which the final stitch has been fully tightened, when the sewing mechanism is disengaged from the main driving motor 44, is associated with the sewing head countershaft 48 largely within a housing 71. This housing rests on the secondary beam 22 at the motor end of the machine, and is suitably secured to the supporting framework.

The aforesaid automatically operable mechanism includes a constant speed electric motor 72 independent of but auxiliary to the main drive motor 44. Such auxiliary motor 72 is mounted outside the housing 71 on a bracket support 73, and serves to drive through a suitable gear reducer (not illustrated) an auxiliary countershaft 75 at a relatively lower speed than the normal operating speeds of the sewing mechanism, preferably at approximately 110 R. P. M. as compared with from 2000 to 3000 R. P. M. of the sewing head drive. The power output shaft 76 of such motor and gear reducer is coupled to auxiliary countershaft 75 by means of a friction clutch 77 hereinafter described in detail.

Auxiliary countershaft 75 is journaled in the housing 71 below and substantially parallel with sewing head countershaft 48, and is arranged to drive the latter whenever the rotative speed thereof falls below a minimum speed.

To this end governor means are provided, the same taking the form of a pawl and ratchet arrangement embodying a ratchet 79, see especially Fig. 9, affixed to the hub of a sprocket wheel 78 which is mounted for free rotation on sewing head countershaft 48 as an axis. A disc 80 is fixed to said countershaft 48 for rotation therewith in immediate adjacency to the ratchet 79, and a pawl 81 is carried by disc 80 on a stud 82 protruding from the appropriate face of disc 80, see Figs. 9, 10 and 11. The stud 82 is received by a relatively short slot 83 through the body of pawl 81 adjacent one end thereof. The opposite

toothed end of the pawl is normally held in engagement with ratchet hub 79 by a spring 84, but is made heavier than the slotted end, so that, when the sewing head countershaft 48 and therefore the disc 80 carried by it is rotated at a speed substantially greater than the said minimum, the pawl is disengaged from the ratchet hub against the urge of spring 84 by reason of centrifugal force acting on the relatively heavy toothed end of such pawl. A pin 85, protruding like stud 82 from disc 80, serves as an outward limit stop for the pawl 81 when in disengaged position, as just explained, by the action of centrifugal force. In this disengaged position of the pawl, the disc 80 rotates entirely free of the sprocket-ratchet combination 78 and 79, see Fig. 10. This is the condition that exists during normal operation of the machine where the sewing mechanism is actually sewing the work fed to it by the operator.

It should be noted that, during this time, auxiliary motor 72 is driving auxiliary countershaft 75 through friction clutch 77. A sprocket wheel 86, fixed on the auxiliary countershaft 75 for rotation therewith, drives sprocket wheel 78 and the ratchet 79 by means of an interconnecting sprocket chain 87 at the aforesaid minimum speed, which is determined by the drive ratio between the two sprocket wheels 86 and 78.

When the operator rotates the control handle 29 to the "off" position, thereby disengaging the drive mechanism of the machine from the main motor 44, as afore-explained, the speed of sewing head drive shaft 45 and its countershaft 48 quickly drops below that of the auxiliary countershaft 75, as does the speed of disc 80 below that of ratchet 79. Accordingly pawl 81, no longer maintained erect by centrifugal force, drops inwardly toward the center of disc 80 and is pulled backwardly by spring 84 so that its toothed end engages positively with ratchet hub 79, see Fig. 11. Disc 80 and the entire sewing mechanism are therefore driven positively by auxiliary motor 72.

It will be noted that the slotted end of pawl 81 terminates in a finger 81*a*, which, when the toothed end of said pawl is in engagement with the ratchet hub 79 as just described, extends farther outwardly from the center of disc 80 than otherwise. As so positioned such pawl finger 81*a* is adapted to engage switch-actuating and stop mechanism.

The latter mechanism comprises an intermediately pivoted carriage 143 having at one end a shock-absorbing stop portion, which normally extends into the path of rotation of the pawl finger 81*a* in the above-described pawl-engaged position thereof. Such stop portion includes a shroud 88 holding an upwardly-projecting strike plate 89 backed by a rubber pad 90. Carriage 143 is mounted on a rockshaft 91 which extends transversely of the housing 71, being journaled therein and in a supporting bracket 92. Rockshaft 91 projects outwardly of the housing 71, and has an actuating arm 93 fixed thereto.

Carriage 143 is arranged for limited movement transversely of the axis of rockshaft 91, and for this purpose receives the rockshaft in a somewhat enlarged bore 143—1, Fig. 9, having narrow extensions, *x*, *x*. Fins 91*a*, 91*a* from rockshaft 91 have a sliding fit in such narrow slot extensions *x*, *x*, and serve to support carriage 143 so that it has freedom for limited forward and backward sliding movement.

A spring 94 normally biases the carriage away from the pawl-carrying disc 80, holding it against a stop-screw 95 adjustably secured in standard 92 to limit downward movement of the carriage. As so biased, carriage 143 is held so that the rockshaft 91 is located at that end of the enlarged bore 143—1 which lies nearest the stop portion of the carriage, thereby affording a very limited, resiliently retarded movement of the carriage, in the direction of strike, to the opposite position illustrated in Fig. 9. This provision for limited, resiliently retarded movement, together with the shock-absorbing action of the rubber pad 90, affords abrupt stopping of the sewing mechanism without injury to the machine when the finger 81*a* of the pawl engages strike plate 89.

Accordingly it is seen that, following disengagement of the main driving motor 44 from the main drive mechanism by the operator's rotating of the control handle 29 to its "off" position, the auxiliary motor 72 takes over automatically and continues to positively operate the sewing mechanism through any incompleted portion of a full needle oscillation. That is to say, with the strike plate disposed so as to positively halt the sewing mechanism at the highest point attained by the needle in an oscillation thereof, the auxiliary motor 72 will always carry on the movement of the sewing mechanism until the strike plate stops it at that desired predetermined needle position.

The auxiliary motor 72 is energized by a local electric circuit controlled by a single pole, double-throw electric switch 96 whose switch-actuating arm 97 is resiliently pressed against a pin 98 projecting from the carriage 143. When the carriage is in its normal spring-biased position, switch 96 is closed to energize auxiliary motor 72. Upon such movement of carriage 143 as is permitted by the enlarged bore 143—1 when pawl finger 81*a* strikes strike plate 89, the switch-actuating arm 97 is moved by pin 98 to open the auxiliary-motor-energizing circuit controlled by switch 96 and thereby to de-energize auxiliary motor 72.

Friction clutch 77 coupling drive shaft 76 of auxiliary motor 72 to auxiliary countershaft 75 is provided to limit to a safe value the torque produced by the sudden deceleration of such auxiliary motor 72. It comprises coacting clutch members, see Figs. 7 and 8, one of which is a cupped disc 100 fixed to the drive shaft 76. The other clutch members are grouped about the countershaft 75 and fitted within cupped disc 100. They comprise a pair of opposing friction shoes 101 forced radially outwardly of the rotative axis and against the internal circumferential surface of cupped disc 100 by means of a pair of springs 102 whose tension is adjustable by means of respective nuts 103 threaded on respective studs 104. A pin 105 extends diametrically through hub 86*a* of sprocket 86 and through countershaft 75, its end portions fitting into receiving slots 106 of the respective friction shoes 101 for the purpose of loosely coupling such friction shoes to countershaft 75 for rotation therewith. Adjustment of nuts 103 may be made as desired for establishing the operating characteristics of the clutch.

Electric switch 96 also controls a local electric circuit governing the action of the thread-tension release mechanism of the invention, maintaining such circuit open when the aforementioned auxiliary motor circuit is closed and vice versa.

Such thread-tension release mechanism is illustrated in Figs. 16, 17, 18, 19, and 20 in connection with the conventional sewing head 37

and loop-taking means 38. It comprises a solenoid 110 having a plunger 111 operatively connected to a conventional thread-tension device indicated generally 112. The latter embodies customary tension discs 113 held in tension position, see Fig. 20, by the springs 114 and 115 during sewing operation of the machine, and further, a tension release pin 116 slidable within a sleeve 117.

For transmitting the movement of solenoid plunger 111 to tension-release pin 116 a floating lever bar 118 has one end pivoted to solenoid plunger 111 by means of a pivot stud 119 extending rigidly from an arm 120 fixed to the solenoid plunger, see Figs. 18 and 19. The opposite end of such lever bar 118 is fixed to a shaft 121, which passes through and is journaled by a casing wall of a bracket 37—1. Fixed to the opposite end of shaft 121, within a recess of the sewing head, is an actuating arm 122, and extending into a receiving slot 123 of such arm 122 is one end of an actuating pin 124. Such actuating pin extends into sleeve 117 of the thread-tension device 112, and works against tension release pin 116, serving to push it forwardly when the solenoid is energized and solenoid plunger 111 raised, see Fig. 18, and thereby presses against the outer tension disc 113 thus extending the distance between said tension discs 113 against the urge of springs 114 and 115, to release the tension on the thread in the customary manner.

It should be noted that the operation of the above-described tension-release mechanism for the sewing thread is entirely automatic. Upon stopping of the sewing needle 70 at the predetermined rest position, the thread tension is automatically released. This is brought about by reason of the fact that the pivoted stop carriage 143 is caused to actuate switch 96 to close the local electric circuit governing solenoid 110, thereby energizing the solenoid, whenever the sewing mechanism is brought to a stop in the aforedescribed manner.

Renewed tensioning of the thread is effected at the commencement of a subsequent sewing operation by reason of the action of control handle 29 on the stop carriage 143 and of the latter's action on switch 96.

Following any cessation of work by the operator of the machine, sewing operation is resumed by the rotating of the control handle 29 counterclockwise from the "off" position of Figs. 1, 2, and 3. Such rotation of the control handle acts on the variable clutch means 57, through sprocket chains 58 and 69, the rectangular countershaft 64, and linkage 65, 66, and 67, to connect the sewing head driving mechanism with the main motor 44. It also acts through additional interconnected linkage to move stop carriage 143 to disengage its strike plate 89 from the finger 81*a* of pawl 81 prior to commencement of operation of the sewing mechanism.

Such additional linkage comprises a link 125, Fig. 2, connected at one of its ends to the stop carriage actuating arm 93 and at the opposite end to the end piece 64*a* of countershaft 64, eccentrically, in common with link 65, see especially Fig. 12.

The linkage is arranged to provide a slight time delay between disengagement of strike plate 89 from pawl 81 and engagement of the sewing head drive mechanism with the main motor 44. To this end the pivoted connections of link 125 with actuating arm 93, and with link 65 through end piece 64—1, as well as the pivotal connection of link 65 with lever 66 are of pin and slot type.

In the "off" position of Fig. 12, established by an arm 126 which extends from end piece 64—1 and rests against limit stop pin 127 projecting from the face of standard 20—1, the pin 128 of actuating arm 93 is disposed approximately at the lower end of slot 129 of link 125, and the pin 130 of end piece 64—1 is disposed at the upper end of slot 131 of link 65. The pin 132 of lever 66 is disposed at the upper end of slot 133 of link 65. Accordingly, when the operator turns control handle 29 and therewith end piece 64—1 counterclockwise from "off" position toward "on" position as indicated by the appended arrow, actuating arm 93 is moved upwardly to dip the stop portion of carriage 87 downwardly so stop plate 89 clears pawl 81, see Fig. 13. During this time pin 132 rides freely in its slot 133 until it reaches the lower end thereof. As turning of control handle 29 toward "on" position continues, link 65 acting through its pin 132 actuates lever 66 to engage the sewing drive mechanism with main motor 44, see Fig. 14. By this time stop plate 89 is well out of the rotative path of pawl 81, and the disc 80 may rotate freely. The action of the linkage is just the reverse when control handle is turned clockwise from the "on" position of Fig. 14 back to the "off" position of Fig. 12.

It is advantageous that link 65 be provided with a section 65—1 arranged to permit length adjustment, thereby enabling the linkage to be adjusted to accord with other operative parts of the machine.

A manually operated presser foot 134, Fig. 1, is provided in the customary manner, with the exception that manual operation thereof by the handle 135, Fig. 16, and attached actuating arm 136, effects conventional tensioning and tension release of the thread only as an auxiliary to the normally automatically acting means of the invention, afore-described. Pursuant to the invention the tension of the sewing thread is relieved automatically without raising the presser foot.

Reverting for a moment to the auxiliary power drive previously described, the gear reducer mentioned as associated with the auxiliary motor 72 is preferably a self-locking type so the pull of the springs 84 and 94, as effective on drive shaft 48, will not cause unwarranted rotation of such drive shaft and consequent ill-timed disengagement of pawl 81 from its stop 89.

If desired, the main motor 44 may perform the functions of the auxiliary motor 72. In such an instance auxiliary countershaft 75 will be connected, through clutch 77, to a suitable take-off drive from main motor 44, it being understood that, with the arrangement illustrated, the main motor 44 continues to turn while the sewing mechanism is disengaged therefrom and at rest. As illustrated in Fig. 21, the take-off drive of this form of auxiliary power drive embodies a jack shaft 140 driven by an elongated portion 44*a* of the drive shaft of main drive motor 44, and a secondary jack shaft 141 geared to a gear reducer 142 of the self-locking type above mentioned. Within the gear reducer or at any other suitable location there is provided a solenoid-operated clutch arrangement (not illustrated) which is engageable and disengageable under the electrical control of switch 96, the control arrangement being such that the take-off drive will be ineffective during such times as in the prior embodiment when the auxiliary motor 72 would be shut off.

It should be realized that while the control mechanism of the invention is illustrated and described in novel combination with a power sewing machine embodying a work-holder and a control handle for guiding the work-holder relative to the sewing mechanism, specifically the previously patented May type of power sewing machine, the several sub-combinations involved in the larger inventive combination may be used in power sewing machines generally. Furthermore, such sub-combinations may be usefully employed in a variety of types of machines where the result sought is the halting of an oscillating or other cyclically moving part at a predetermined position within its movement cycle following the shutting off of power to the machine.

Whereas this invention is here illustrated and described with respect to a preferred specific construction, it should be understood that various changes may be made in such specific construction and various other constructions may be developed on the basis of the teachings hereof by those skilled in the art without departing from the generic scope of the invention as defined by the following claims.

We claim:

1. In a power sewing machine embodying sewing mechanism, power drive means therefor, a work-holder, and a control handle for manually guiding the work-holder relative to the sewing mechanism, the combination of auxiliary power drive means normally disconnected from said sewing mechanism; a governor arranged to operably connect said auxiliary power drive means with said sewing mechanism when the main power drive means decelerates below a given minimum speed; stop means associated in predetermined relationship with said governor and adapted to be engaged by the latter for halting the sewing mechanism at a predetermined position following drive connection with said auxiliary power drive means, thereby predetermining the rest positions of the sewing needle and cooperative sewing hook; means operably interconnected with said control handle for disengaging said stop means from said governor means upon given manipulation of said control handle; and means also operably interconnected with said control handle for controlling the operation of the main power drive means.

2. The combination recited in claim 1 wherein the governor comprises a pawl and ratchet combination including resilient means normally holding the pawl in engagement with the ratchet, the pawl being mounted on a shaft of the power drive means for rotation therewith and the ratchet being interconnected with the auxiliary power drive means for rotation therewith, the pawl being weighted to disengage from the ratchet under the influence of centrifugal force at and above a given minimum speed of rotation of the said drive shaft on which it is mounted.

3. The combination recited in claim 2 wherein the pawl embodies a finger which projects for engagement with the stop means when the pawl is in engagement with the ratchet.

4. The combination recited in claim 3 wherein the stop means embodies a cushioned stop member for absorbing the shock of sudden stopping of the sewing mechanism.

5. The combination recited in claim 4 wherein the stop means comprises a pivoted carriage carrying the stop member at one end portion thereof, and wherein the disengaging means comprises a lever operable at the opposite end portion thereof.

6. The combination recited in claim 5 wherein the pivoted carriage is mounted for slight longitudinal movement backwardly and forwardly and is resiliently biased backwardly from the path of action of the pawl finger.

7. The combination recited in claim 6 wherein the disengaging means further comprises linkage connected to the lever and connected with the control handle so the stop member may be disengaged from the pawl finger by operation of the control handle.

8. The combination recited in claim 7 wherein the control means for the main power drive comprises linkage interconnected with the linkage operating the stop means, said linkage embodying time delay means effective to delay actuation of the main power drive until after disengagement of the stop means.

9. The combination recited in claim 8 wherein the work-holder is of substantially cylindrical formation and mounted substantially horizontally for rotation backwardly and forwardly and for longitudinal movement from side to side; wherein the control handle is in the form of a rod extending substantially coextensively longitudinally with said work-holder at the front thereof and arranged to be manipulated by an operator for moving said work-holder as required by the particular sewing operation concerned, said rod being rotatable; and wherein drive means connect said rod with the control linkage so that rotation of the rod effects control of the sewing mechanism.

10. The combination recited in claim 9 wherein means under control of the stop means is provided for operating the thread tensioning device of the sewing mechanism.

11. The combination recited in claim 10 wherein the auxiliary power drive means embodies an electric motor energized by a local electric power circuit; and wherein an electric switch maintains said circuit closed during operation of the machine but is arranged to be opened by stop-engaged movement of the stop carriage.

12. The combination recited in claim 11 wherein the operating means for the thread tensioning device comprises a solenoid and energizing electric circuit therefor; and wherein the electric switch closes the said solenoid circuit on the throw which opens the auxiliary motor circuit.

13. In a power sewing machine having main power means, a power-driven sewing needle and sewing hook, the combination of a cylindrical work-holder adapted to retain on its circumferential surface an article to be sewn, said work-holder being rotatable about its longitudinal axis as a center and slidable longitudinally to move the work relative to the sewing needle; normally balanced handle means for guiding, under manual control, said work-holder relative to said sewing needle; and auxiliary power means for automatically raising the sewing needle to a high point free and clear of its cooperative sewing hook upon the halting of any sewing operation.

14. The combination recited in claim 13 wherein there is additionally provided means cooperating with said needle raising means for automatically relieving the thread of tension upon the halting of any sewing operation.

15. In a power sewing machine embodying sewing mechanism including a sewing needle and cooperative sewing hook, a main power drive means; auxiliary power drive means normally disconnected from said sewing mechanism; a governor arranged to operably connect said auxiliary power drive means with said sewing

mechanism when the main power drive means decelerates below a given minimum speed; stop means associated in predetermined relationship with said governor and adapted to be engaged by the latter for halting the sewing mechanism at a predetermined position following drive connection with said auxiliary power drive means, thereby predetermining the rest positions of the sewing needle and cooperative sewing hook; means for disengaging said stop means from said governor means; and means operably interconnected therewith for controlling the operation of the main power drive means.

16. In a power sewing machine embodying sewing mechanism including a sewing needle and cooperative sewing hook, a drive motor; a drive arrangement adapted to transmit motion from the drive motor to the sewing mechanism; means for engaging and disengaging said drive motor relative to said drive arrangement; an auxiliary drive motor; a governor associated with said drive arrangement; a secondary drive arrangement interconnecting the auxiliary motor with said governor, the latter being arranged to cut in said auxiliary drive motor to said drive arrangement when the speed of the latter decreases below a predetermined minimum; stop means arranged for engagement by a part of said governor following cut-in of said auxiliary motor; a switch operated by said stop means for shutting off said auxiliary motor; and means for disengaging said stop means from said governor following the shutting off of said auxiliary motor.

17. In a power driven machine having a driven element arranged for repetitive movement along a cyclic path, main power drive means adapted to transmit motion to said driven element; auxiliary power drive means also adapted to transmit motion to said driven element; a governor associated with said main power drive means, said governor having engaging means arranged to be effective at a given deceleration of said main power drive means; engageable means associated with said auxiliary power drive means for drive-imparting engagement with said engaging means when the latter becomes effective; and stop means disposed in predetermined position and adapted to engage said engaging means when the latter becomes effective, thereby halting said driven element in a predetermined position within its said cyclic path.

18. The combination recited in claim 17 wherein an electric switch is associated with the stop means, and wherein electrically actuated means are arranged to effect actuation of the auxiliary power drive means, said switch being arranged to control actuation of said auxiliary power drive means.

19. The combination recited in claim 17 wherein the engaging means comprises a slotted, pin-limited pawl, and the engageable means comprises a ratchet wheel, said pawl being carried by said main power drive means.

20. The combination recited in claim 17 wherein the engaging means comprises a slotted, pin-limited pawl having a projecting stop-engaging finger, and the engageable means comprises a ratchet wheel, said engaging means being disengaged by centrifugal action.

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