

Dec. 10, 1963

L. BONO

3,113,537

MACHINE FOR SEWING ON DESIGNS INCLUDING BUTTONHOLES

Filed Nov. 22, 1960

4 Sheets-Sheet 1

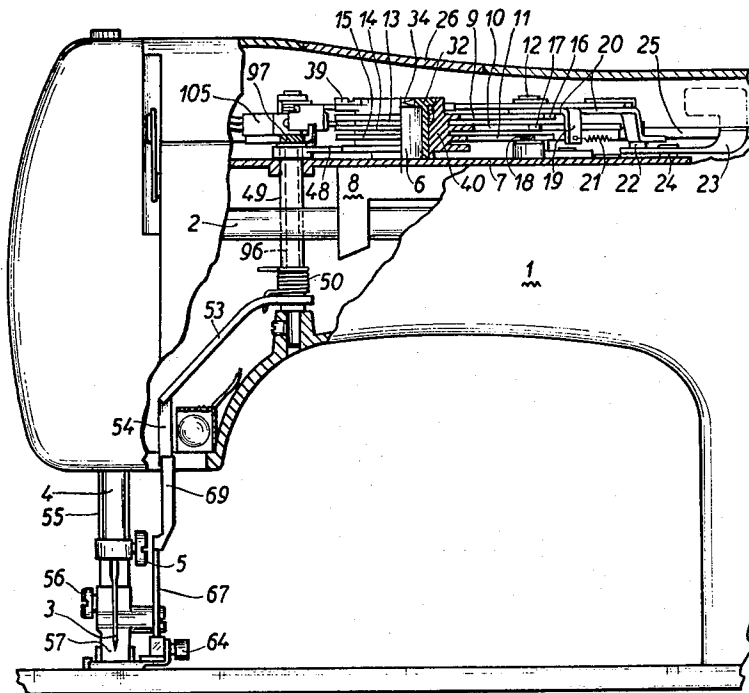


FIG. 1

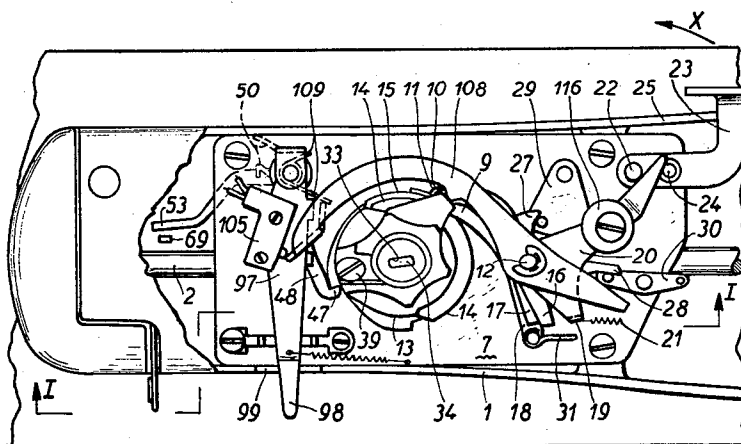


FIG. 2

Inventor

Luigi Bono

By Steven D. Miller & Mark
Attorneys

Dec. 10, 1963

L. BONO

3,113,537

MACHINE FOR SEWING ON DESIGNS INCLUDING BUTTONHOLES

Filed Nov. 22, 1960

4 Sheets-Sheet 2

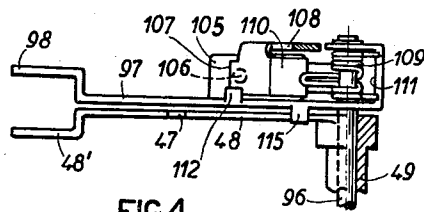


FIG. 4

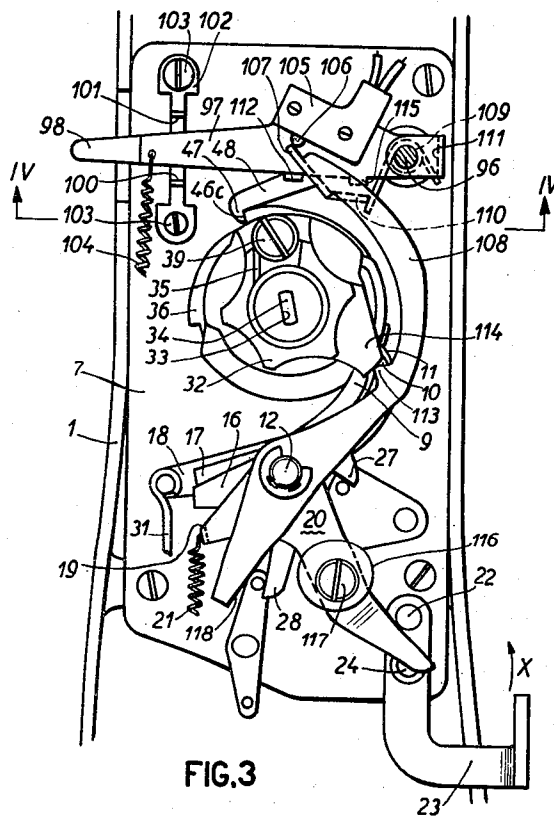


FIG. 3

Inventor
Luigi Bono
By Steven Davis Miller & Mosher
Attorneys

Dec. 10, 1963

L. BONO

3,113,537

MACHINE FOR SEWING ON DESIGNS INCLUDING BUTTONHOLES

Filed Nov. 22, 1960

4 Sheets-Sheet 3

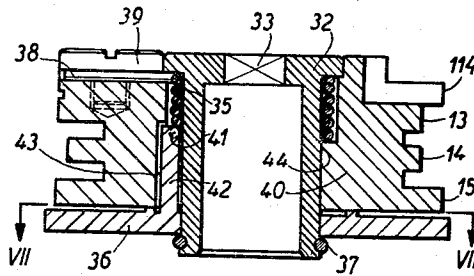


FIG. 6

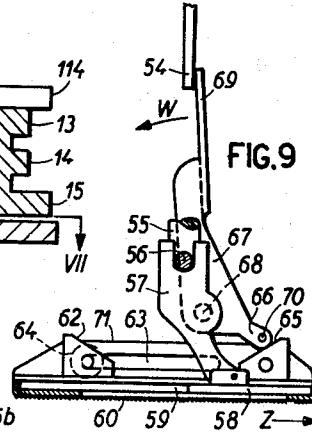


FIG. 9

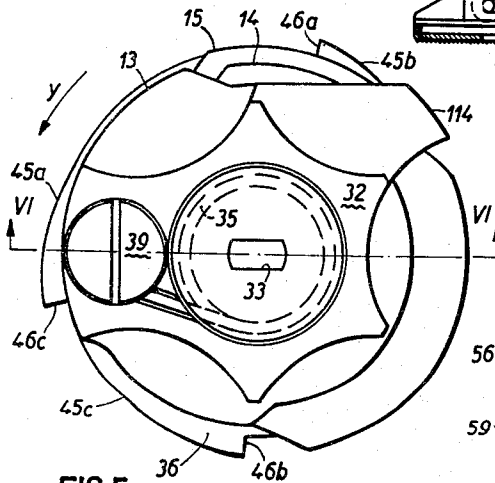


FIG. 5

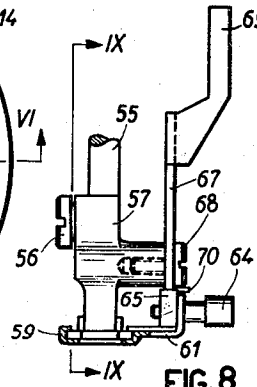


FIG. 8

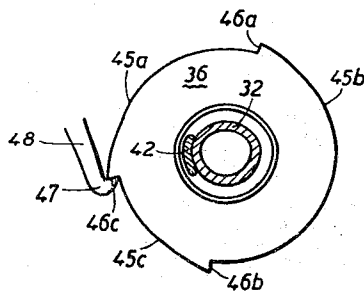


FIG. 7

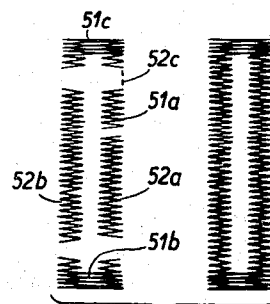
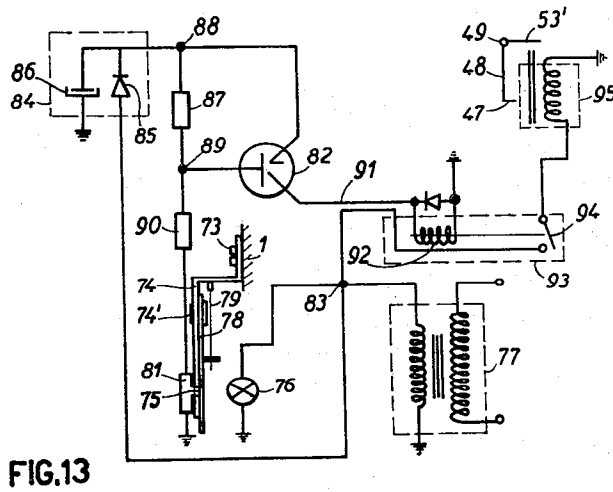
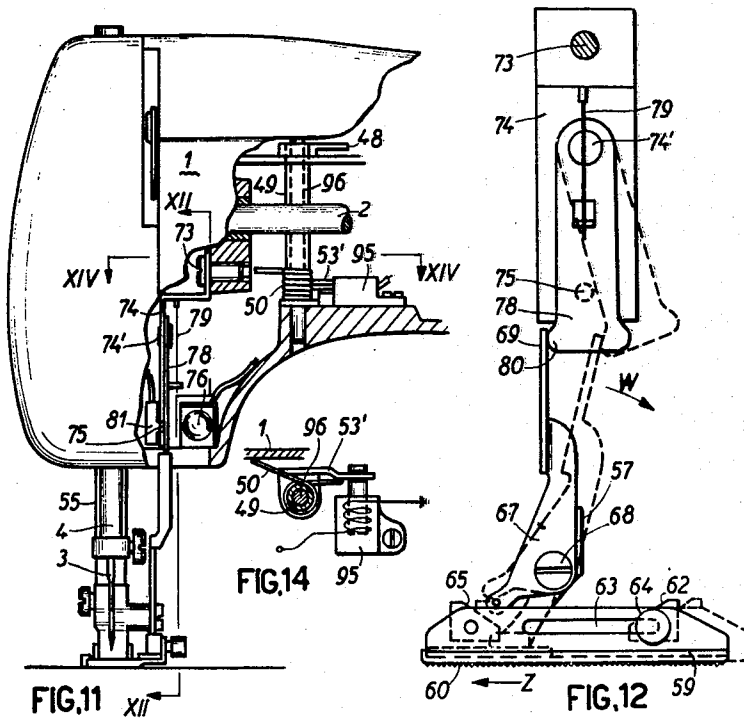


FIG. 10

Inventor
Luigi Bono
By *Stevens Davis Miller & Mosher*
Attorneys

3,113,537

4 Sheets-Sheet 4



Inventor
Luigi Bono
By Stevens Davis Miller & Mascher
Attorneys

1

3,113,537

**MACHINE FOR SEWING ON DESIGNS
INCLUDING BUTTONHOLES**Luigi Bono, Pavia, Italy, assignor to Necchi Societa
per Azioni, Pavia, Italy

Filed Nov. 22, 1960, Ser. No. 71,043

Claims priority, application Italy Mar. 28, 1960

5 Claims. (Cl. 112—158)

The present invention relates to a machine having 10
mechanism for sewing of designs and particularly for
sewing buttonholes.

The principal object of the invention is to provide a 15
control device which will control mechanism for moving
the needle laterally, so that the mean position and lateral
movement of the needle may be uniform under certain
conditions and may vary under other conditions, in ac-
cord with a program device providing a pattern of op-
eration for forming a design.

Another object of the invention is the provision of a 20
control device which will control mechanism for feeding
the material being sewn in both directions and mechanism
for moving the needle laterally, so that the mean posi-
tion and lateral movement of the needle may vary, the
control device comprising a program device embodying 25
a pattern of operation to control the several movements
so as to produce a design in the sewing, said program
device being retained against variation to maintain uni-
form operation and alternately rendered operative to
provide variation in the operations. A further object is 30
the provision of specific mechanism for the production
of buttonholes.

The invention will be described by reference to the
accompanying drawing which shows embodiments of
the invention by way of illustration.

FIG. 1 is an elevation of the machine, with part shown
in section on the line I—I of FIG. 2;

FIG. 2 is a plan view of the mechanism in FIG. 1,
with a portion of the casing omitted;

FIG. 3 shows a part of the mechanism of FIG. 2 on 40
a larger scale;

FIG. 4 is a cross-section on line IV—IV of FIG. 3;

FIG. 5 is a plan view of the cam group as shown in
FIG. 3 but on a larger scale;

FIG. 6 is a sectional view on line VI—VI of FIG. 5; 45

FIG. 7 is a section on line VII—VII of FIG. 6;

FIG. 8 shows a detail of FIG. 1 on a larger scale;

FIG. 9 is a view taken on line IX—IX of FIG. 8;

FIG. 10 illustrates the design of a buttonhole which 50
may be formed by the machine;

FIG. 11 is a fragmentary view of the machine, par-
tially in section, showing another embodiment of the
device;

FIG. 12 is a view taken on line XII—XII on a larger 55
scale;

FIG. 13 is a diagrammatic view of the electrical cir-
cuit of the embodiment in FIG. 11;

FIG. 14 is a sectional view on line XIV—XIV of 60
FIG. 11.

As shown in drawings, the sewing machine comprises
a frame 1 in which is arranged a driving shaft 2 which
operates mechanism to reciprocate the needle 3 fixed to
needle bar 4 by screw 5. The shaft 2 also drives a ver-
tical shaft 6 journaled in plate 7 by means of conven-
tional mechanism 8.

Adjacent shaft 6, the followers 9, 10, 11 are pivoted 65
on a vertical pin 12 fixed to plate 7 so that they may
engage cams 13, 14, 15 driven by shaft 6. These cams
have extensions or tail portions 16, 17, 18, respectively,
which lie in the path of downwardly turned end 19 of
lever 20, which is pivoted on pin 12. A spring 21 con-
nected to the end 19 urges lever 20 counterclockwise

2

(FIG. 3) so that its opposite end bears against stud 22
on lever 23. The lever 23 is mounted for rotation on
pin 24 fixed to plate 7, and extends outwardly through
slot 25 in the frame. The outer end is formed with a
finger piece so that the lever 23 may be manually rotated
as indicated by arrow x (FIG. 3) to rotate lever 20 and
engage its bent end 19 with the tail portions 16, 17, 18
of followers 9, 10, 11, so that the followers are moved
clear of the cams to allow the cams to be assembled and
disassembled through the door 26 in frame 1 (FIG. 1).

The cams 13, 14, 15 and followers 9, 10, 11 constitute
a program device and sensing means and are part of the
control means which controls, respectively, the displace-
ment of the sewing line or the mean position of the
needle, the adjustment of the zigzag or extent of lateral
movement of the needle and the variation in feed of the
fabric, including the direction of feed. Thus the pro-
jection 27 on follower 9 and the projection 28 on follower
10 act on levers 29, 30, respectively, to shift the mean
position of the needle and to change the extent of lateral
movement of the needle.

The tail 18 of follower 11 actuates rod 31 to vary the
feed of the fabric. This mechanism is known and is
illustrated in applicant's Italian Patent No. 524,634.

The cams 13, 14, 15, which constitute the program de-
vice in the present embodiment, are formed integrally
and are rotatably mounted on a bushing 32 fixedly
mounted on shaft 6 by the rectangular slot 33 engaging
the lug 34 on the end of shaft 6. The cams are imposi-
tively driven by the bushing through a coil spring 35 and
disk 36, the spring 35 having one end 38 fixed to the
set of cams by screw 39 and the other end 41 abutting
a key 42 on the disk 36, said key 42 being engaged with
slight angular play in axial groove 43 on the inner sur-
face of the cam group 40. The disk 36 is rotatably
mounted on said bushing and held thereon by the split
stop ring 37.

The periphery of the disk 36 is formed with radial
abutments or steps 46a, 46b, 46c spaced by continuous
segments 45a, 45b, 45c (FIG. 7). These abutments or
steps may be engaged by the tooth 47 of a pawl 48 which
is pivoted on the frame by a shaft 49 and held against
the disk 36 by spring 50 (FIG. 1).

The bushing 32 rotating counterclockwise, as shown by
arrow y in FIG. 5, is frictionally gripped by spring 35
and rotates cam set 40 and disk 36. When one of the
steps 46a, 46b, 46c abuts tooth 47 of pawl 48, the disk
is arrested and in turn through key 42 prevents rotation
of the cam group 40. The disk and cams may be re-
leased by disengaging pawl 48, and the pawl will then
ride on an intermediate segment to the next step.

For the making of a buttonhole, as an example, the
cams may be shaped and phased with relation to the
abutments on disk 36 in the manner shown and herein
described. When the pawl 48 rides on segment 45a of
disk 36, the followers 9, 10, 11 contact the cams 13, 14,
15 to control the mechanism to displace the sewing line
or mean position of the needle, to regulate the zigzag or
lateral movement of the needle, and to vary the feed
of the fabric so as to form a buttonhole as shown in
FIG. 10. When the pawl 48 engages step 46a, the disk
36 and cam group 40 are stopped in such a position that
the program device and sensing means remain in a uni-
form condition; that is, the cams are stationary so as to
cause a uniform operation, here shown as the row of
stitching at 52a, the length of which will depend on the
duration of the engagement of the step by the pawl 48.

Upon release, the tooth 47 of pawl 48 will ride on
segment 45b, while the cams control making of section
51b. In this operation, the program device or cams
produce a variable condition to vary the mean position
of the needle and the length of stitch, and also a reversal

in the direction of feed of the fabric. Similarly, the cam group 40 is stopped by step 46b to produce the uniform stitching 52b and then, as pawl 48 moves along segment 45c, the buttonhole section 51c is formed. On the last operation, the pawl 48 engages step 46c to make the stitches 52c, and as cam 15 stops feed of the fabric, the machine is stopped.

The pawl 48 may be released from the steps of disk 36 manually, by means of an extension 48' accessible on the exterior of the machine. The pawl may also be released automatically under control of the feed of the material being sewn through operation of lever 53 (FIG. 1) connected to shaft 49 and arranged with its end 54 adjacent presser bar 55.

For this purpose the presser bar 55 carries a support 57 fastened by screw 56, the support having a base 58 on which is slidable a slide 59. This slide is serrated on its bottom surface so that it can be displaced by the fabric. On slide 59, a bracket 61 has an inclined stop or end cam 62 which may be adjusted along the slide by slot 63 and screw 64. The other end of the slide has a fixed, inclined stop or end cam 65. The slot may be graduated to determine the position of the movable end cam.

Between these end cams on slide 59, the end 66 of elbow lever 67 is located. This lever 67 is pivoted on the support 57 on presser bar 55 by screw 68. The other end 69 of lever 67 is rotated in the direction of arrow w (FIG. 9) when the end 66 engages one of the end cams 62, 65, and engages end 54 of lever 53 to disengage pawl 48 from a step on disk 36. A pin 70 on lever 67 rides on the edge 71 of the bracket 61 to prevent reverse movement of lever 67.

To start the buttonhole, with the pawl 48 engaging step 46c on disk 36, the slide 59 is pushed in the direction of arrow z (FIG. 9) to engage end cam 62 with end 66 of lever 67 and rotate lever 53 to release pawl 48 from step 46c. The machine is started and the cam group controls the formation of buttonhole section 51a. At the same time, as the tooth 47 of pawl 48 rides on segment 45a, the slide 59 moves with the fabric relative to the presser bar, and the lever moves off cam 62 as pin 70 rides on edge 71 of bracket 61. As soon as the tooth 47 engages step 46a, the cam group 40 stops and the uniform section 52a is formed.

When the slide 59 reaches the end of its travel, the cam 65 rotates lever 67 to release pawl 48 from step 46a, and the program device controls the formation of the section 51b and also the reversal of feed of the fabric. The slide then moves cam 65 away from lever 67, the tooth 47 of pawl 48 rides on segment 45b of disk 36 until the next abutment 46b, and the program device then, through the sensing means or followers, controls the making of the uniform section 52b. As the final operation on the buttonhole, the cam 62 engages lever 67 to release pawl 48 from step 46b, and the program device and sensing means control the formation of buttonhole section 51c, the feed of the fabric again being reversed. After the pawl engages the step 46c, the machine continues to make the section 52c until the machine stops.

An automatic stop is also provided to stop the machine at the end of a sewing cycle, after a complete revolution of cams 13, 14, 15. A shaft 96 passes through hollow shaft 49 to form a journal and provides a pivot for lever 97 formed with an end portion 98 protruding through a slot 99 in frame 1. The two shoulders 100, 101 (FIG. 3) on plate 102, fastened to plate 7 by screws 103, limit the movement of lever 97, which is held against shoulder 100 by spring 104.

A microswitch 105 actuated by pushbutton 106 is mounted on lever 97, so that the end 107 of a lever 108 pivoted on pin 12 may engage the button 106 to open the switch and stop the machine. A spring 109 on pin 96 acts on lug 110 on lever 108 and lug 111 of

lever 97 to move lever 108 into contact with stop 112 of lever 97 and out of contact with pushbutton 106. Lever 108 is formed with a projection 113 engageable by a cam 114 on the cam group 40 to rotate lever 108 into contact with pushbutton 106 when tooth 47 of pawl 48 engages step 46c and the cams control the making of closing stitch 52c. The machine will not stop instantly on opening switch 105, but the inertia of the machine may result in more than one closing stitch 52c.

To start the machine, the lever 48 is moved from engagement with step 46c, either by its handle portion 48' or by moving slide 59, and then the end 98 of lever 97 is moved toward the stop 101 to move microswitch 105 away from end 107 of lever 108 to close the switch. After its initial operations, the machine will move the cam 114 from lever 108, and the latter is rotated by spring 109 into contact with lug 112 on lever 97, the latter now being allowed to return into contact with shoulder 100.

A bent tongue 115 on lever 97 overlies the edge of lever 48, so that lever 48 may be actuated by moving end 98 of lever 97. For releasing all engagement with the cams in assembly or disassembly, the lever 20 carries an adjustable abutment 116 fastened by screw 117, which may engage lever 108 to move it clear of the cam group 40. Thus, when lever 23 is moved in the direction x (FIG. 3) to clear followers 9, 10, 11, it also moves lever 108 out of engagement with the cam group and also into engagement with switch 105 to open the switch and to move lever 97 and pawl 48 so that pawl 48 is out of engagement with disk 36. All elements are now disengaged from the cams on operation of lever 23, so that the groups of cams may be replaced.

An electrically actuated system to operate pawl 48 automatically is shown in FIGS. 11, 12, 13. In this case, the machine is provided with a light 76 to illuminate the sewing area. The actuating means comprises a photosensitive element 81, excited by the light under control of lever 67 and actuating a switch 93 to close a circuit to solenoid 95 which disengages pawl 48.

In this system, a plate 74 fastened to the frame by screw 73 is formed with a hole 75, which is exposed to light 76 and is closed by a shutter 78 pivoted at 74' and held in closure position by spring 79. The end 80 of shutter 78 is engageable by lever 67 operated by slide 59 to open the hole 75 to admit light.

Opposite hole 81, a photoresistor 81 may receive light when the opening is unobstructed. This photoresistor is in a circuit comprising from terminal 83 of transformer 77, rectifier circuit 84 having a rectifier 85 and capacitor 86, resistor 87 across terminals 88 and 89 of a transistor 82, and photoresistor 81 protected by resistor 90. Exposure of the photoresistor 81 to the light 76 develops a potential difference across terminals 88, 89 and produces a current in the circuit 91 of the transistor to energize winding 92 of relay 93 to close switch 94 to the circuit of solenoid 95. This solenoid operates lever 53' to rotate pawl 48 out of engagement with a step in disk 36. The operation of the machine under control of the electrical system is the same as in the first embodiment described above.

I claim:

1. A sewing machine having a driving mechanism, a needle actuated by said driving mechanism, means operated by said driving mechanism for moving said needle laterally of the sewing path, and control means for controlling the means for moving said needle laterally to vary the lateral movement of said needle, said control means including a program device actuated by said driving mechanism having successive variable and uniform control conditions, sensing means responsive to said program device for controlling said means for moving said needle laterally, said program device in said variable control condition effecting action of said sensing means to control said lateral movement in accord with a pattern

5

inherent in said control device, and in said uniform condition being ineffective to change said lateral movement, and means operable to change said program device from one condition to the other, said last-named means being responsive to movement of the material to change said program device from one condition to another.

2. A sewing machine having a driving mechanism, a needle actuated by said driving mechanism, means operated by said driving mechanism for moving said needle laterally of the sewing path, and control means for controlling the means for moving said needle laterally to vary the lateral movement of said needle, said control means including a program device having cam means operated by said driving mechanism, means actuated by the cam means of said program device for varying the extent of said lateral movement, stop means to arrest movement of said cam means in successive positions, and release means to release said stop means and restore operation of said cam means, so as to produce uniform lateral movement during arrest of said cam means, and variable lateral movement during motion of said cam means, machine control mechanism operative to stop the machine, and said control means including an element fixed to said cam means to actuate said machine control mechanism, said element being operative concomitantly with the arrest of movement of said cam means.

3. The machine in claim 2, in which said machine control mechanism includes a machine control member operative to start said machine, and said release means actuates said machine control member to start the machine when the machine is stopped.

4. A sewing machine having a driving mechanism, a needle actuated by said driving mechanism, means operated by said driving mechanism for moving said needle laterally of the sewing path, and control means for controlling the means for moving said needle laterally to vary the lateral movement of said needle, said control means including a program device comprising cam means operated by said driving mechanism, a stepped member fixed to said cam means, a stop member engageable with the steps on said stepped member to arrest operation of said cams, follower means engageable by said cam means for controlling the lateral movement of said needle, re-

6

lease means for disengaging said stop member from a step on said stepped member to release said cam means for operation, a machine control means movable by said release means, actuating means movable to engage said machine control means to operate said machine control means to stop the machine, a member fixed to said cam means for moving said actuating means to stop the machine, said release means on movement to release said cams moving said machine control means from engagement by said actuating means so that said machine control means will be effective to start the machine.

5. In combination, a machine having driving mechanism, cam means operated by said driving mechanism, machine control means operable to start and stop said machine, actuating means movable to operate said machine control means to stop said machine, an abutment member movable in fixed relation to said cam means and having abutment means, a stop member movable to engage said abutment means to arrest operation of said cam means, an element movable in fixed relation to said cam means for moving said actuating means to stop said machine, said stop member engaging said abutment means concomitantly with the movement of said actuating means so that the machine is stopped with the stop member engaging said abutment means, and release means for moving said stop member to release said cams for operation and for moving said machine control means to start said machine.

References Cited in the file of this patent

UNITED STATES PATENTS

592,510	Parkes	Oct. 26, 1897
1,033,721	Miller	July 23, 1912
2,475,432	Marihart	July 5, 1949
2,764,895	Bono	Oct. 2, 1956
2,924,107	Fresard et al.	Feb. 9, 1960
2,966,869	Fischer	Jan. 3, 1961
2,979,002	Casas-Robert et al.	Apr. 11, 1961
3,001,491	Engel	Sept. 26, 1961

FOREIGN PATENTS

830,501	Great Britain	Mar. 16, 1960
577,094	Italy	May 22, 1958