

[54] **TUCKING APPARATUS FOR CURTAIN OR LIKE CLOTH**

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[52] U.S. Cl. **112/121.15; 112/144; 112/148**

[51] Int. Cl.² **D05B 21/00; D05B 35/08**

[58] Field of Search..... **112/121.15, 121.12, 2,**
112/144, 145, 146, 148, 120

[56] **References Cited**

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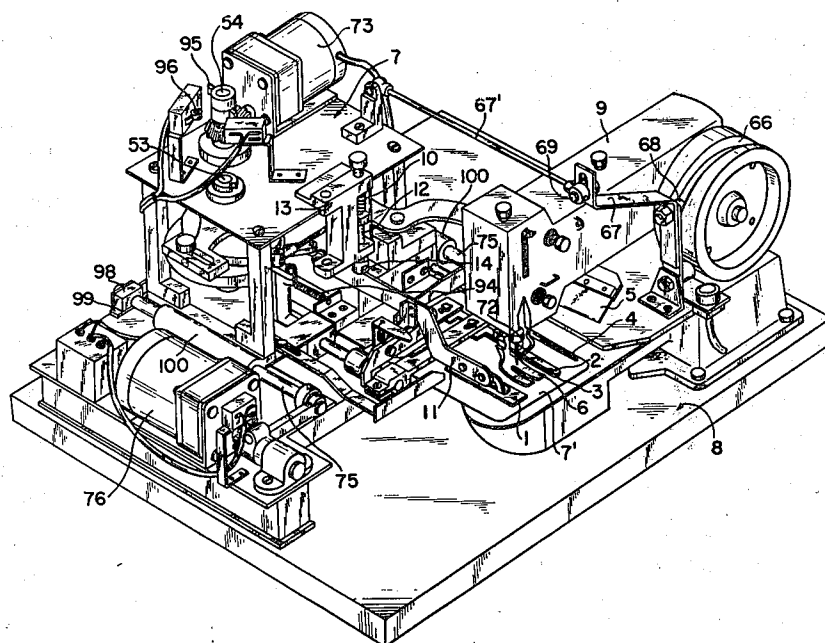
488,547	12/1892	Douglas	112/144
930,469	8/1909	Gibson	112/144 X
2,043,735	6/1936	Carroll et al.....	112/144

Primary Examiner—George H. Krizmanich
Attorney, Agent, or Firm—Posnack, Roberts & Cohen

[57] **ABSTRACT**

An apparatus for making a tucking curtain comprises a sewing machine with a presser foot, a slider slidably mounted on the base of the sewing machine and carrying a presser, a pair of upper and lower spatulas and a width setting bar located near under the arm head of the sewing machine. The curtain cloth is laid over the spatulas and the width setting bar, folded back around the bar and passed under the spatulas to form a loop and then sewed along its seam for the first run while held by the pressers. Then the upper spatula is raised apart from the lower to spread the looped cloth therebetween and simultaneously the tucking plate enters between the spaced spatulas to tuck in the looped cloth, whereupon the upper spatula is lowered and retracted together with the lower spatula and the width setting bar. The tucked-in edge is then sewed for the second run to complete the formation of a tuck in the cloth.

6 Claims, 21 Drawing Figures



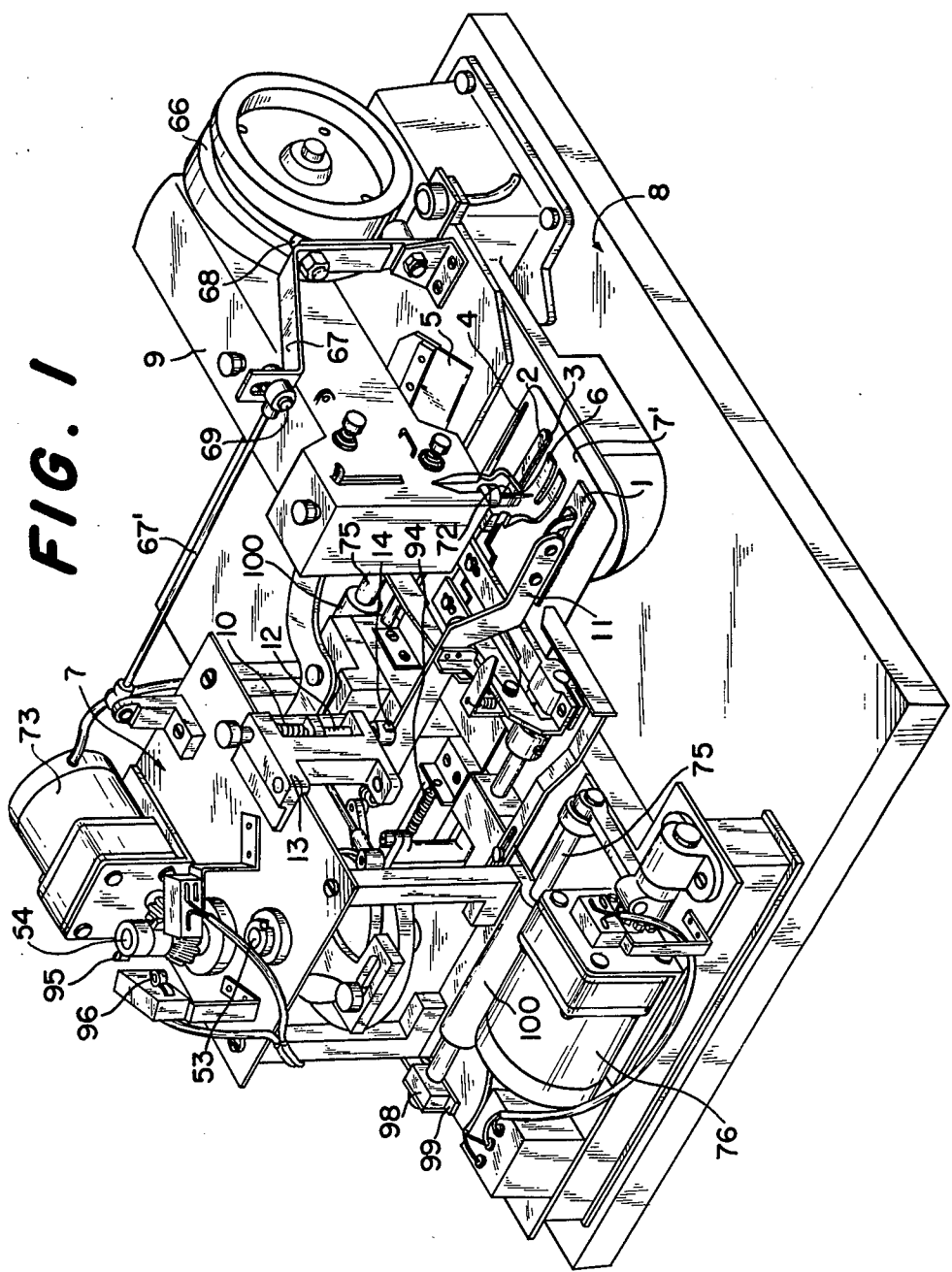
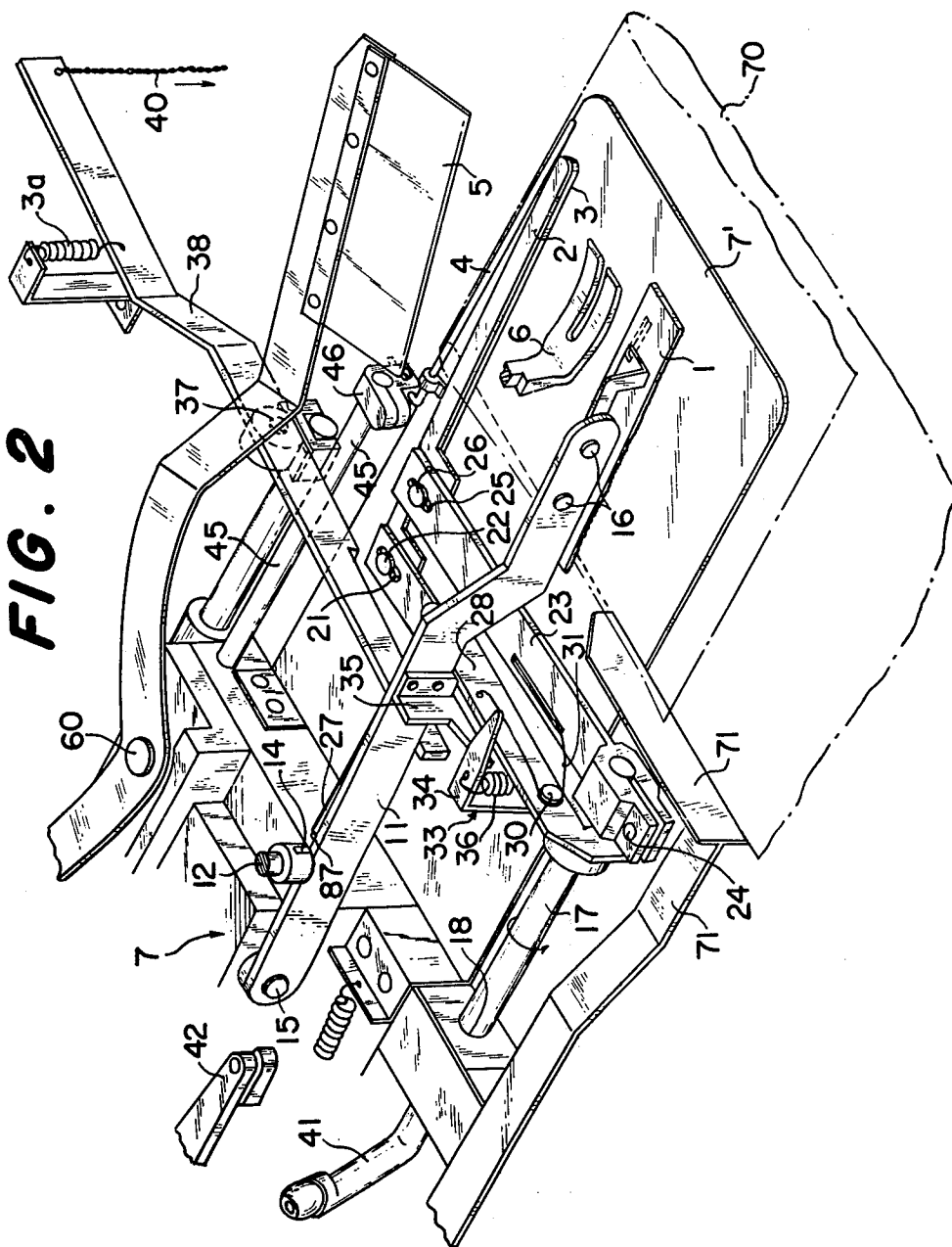
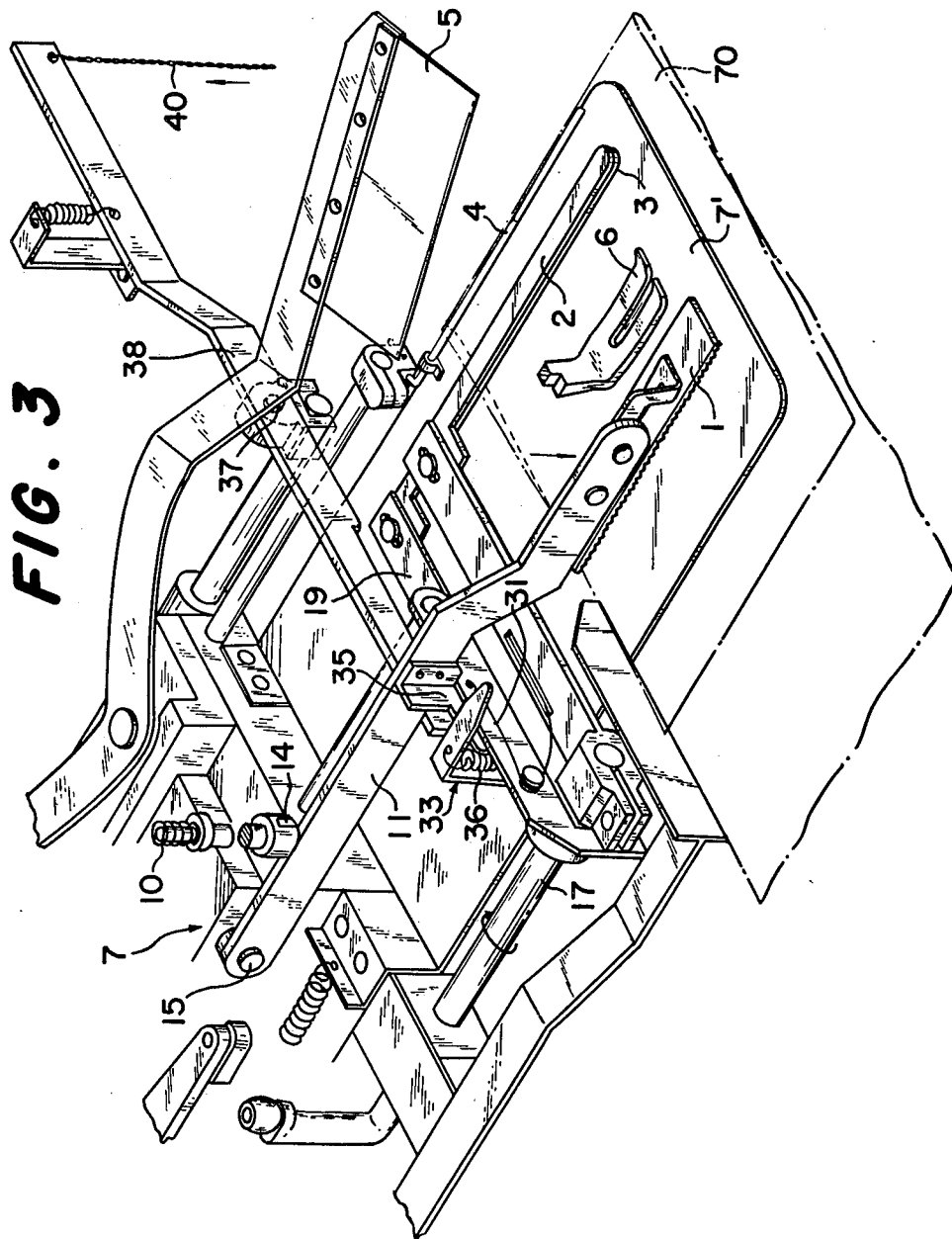
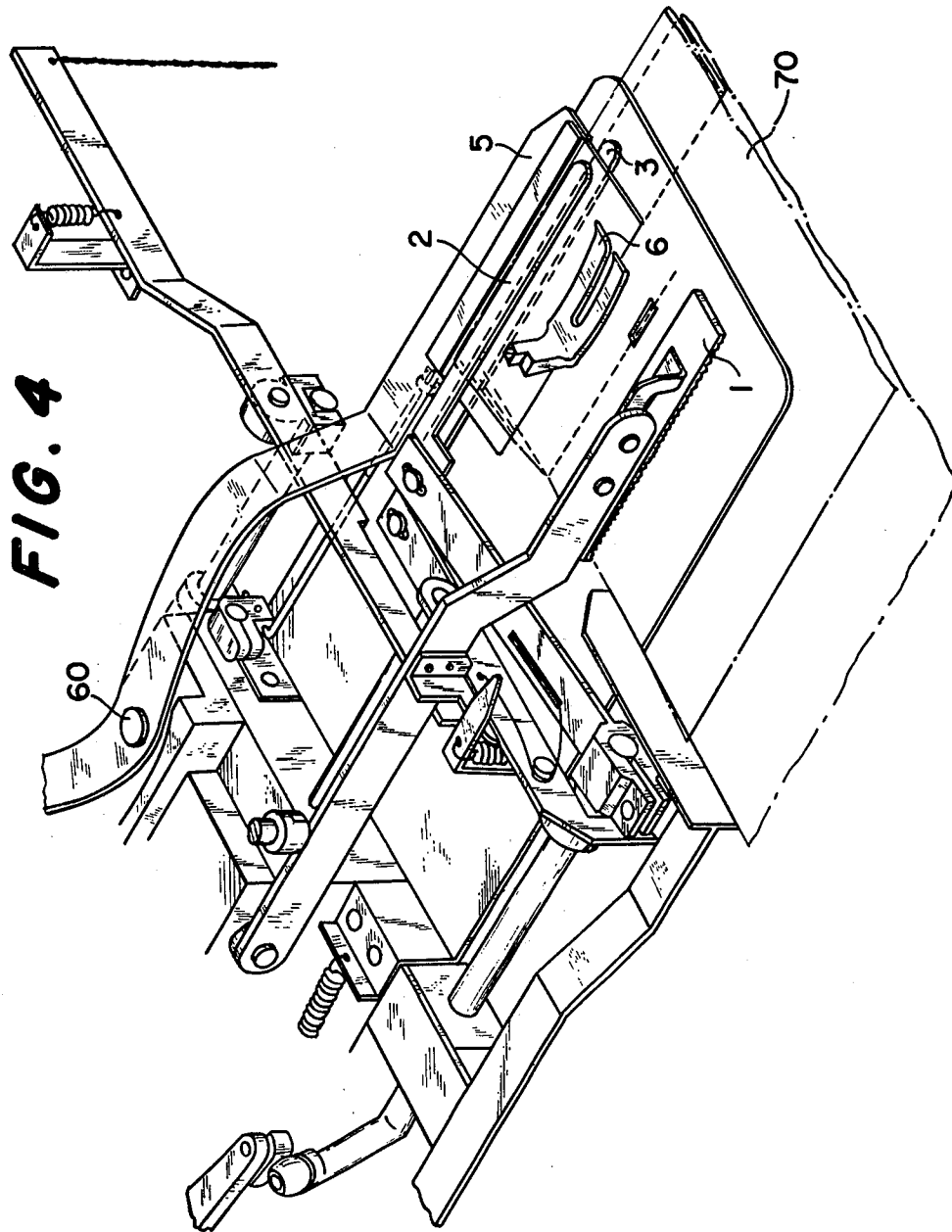


FIG. 2







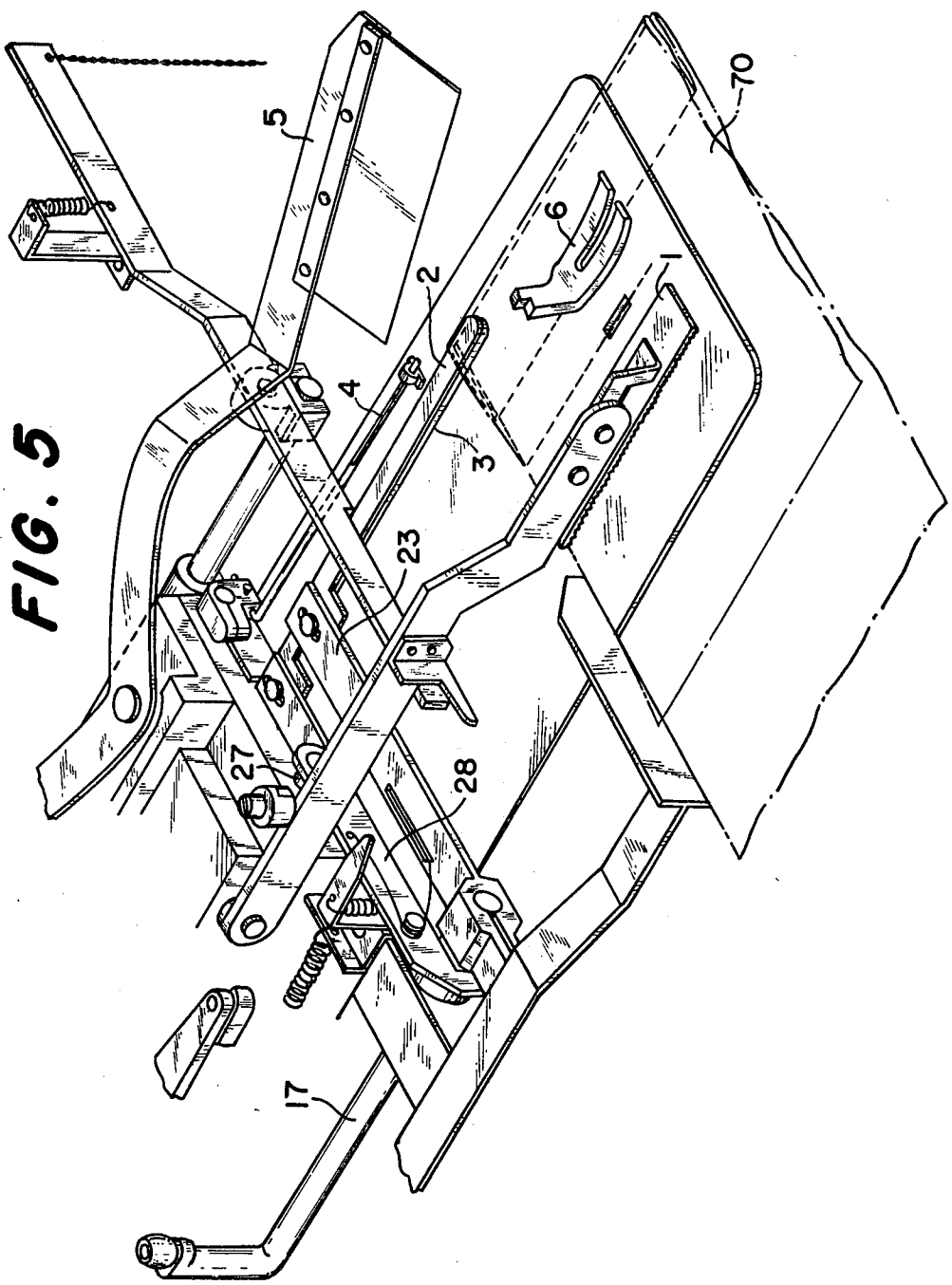


FIG. 8

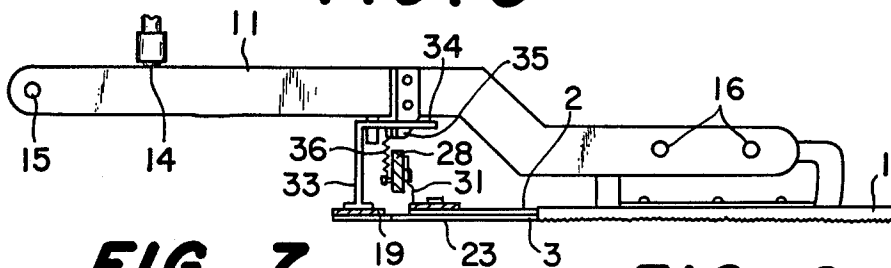


FIG. 7

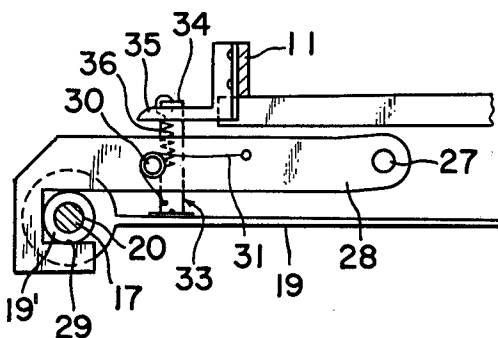


FIG. 9

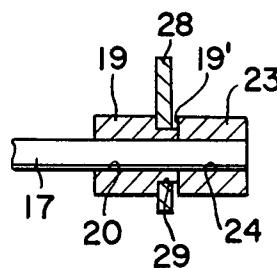
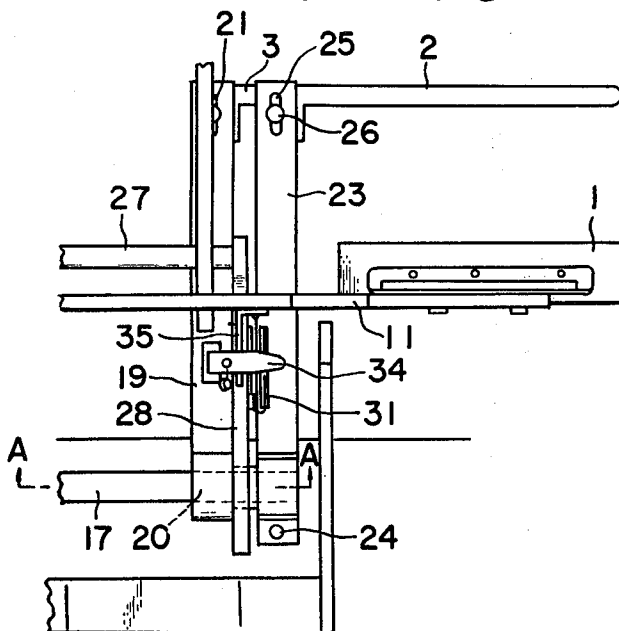


FIG. 6



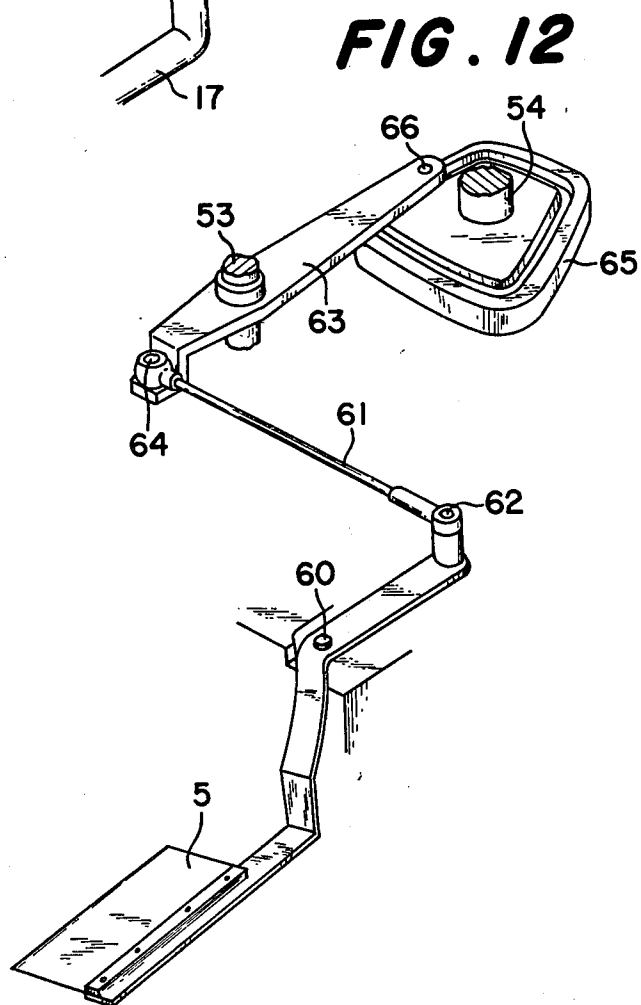
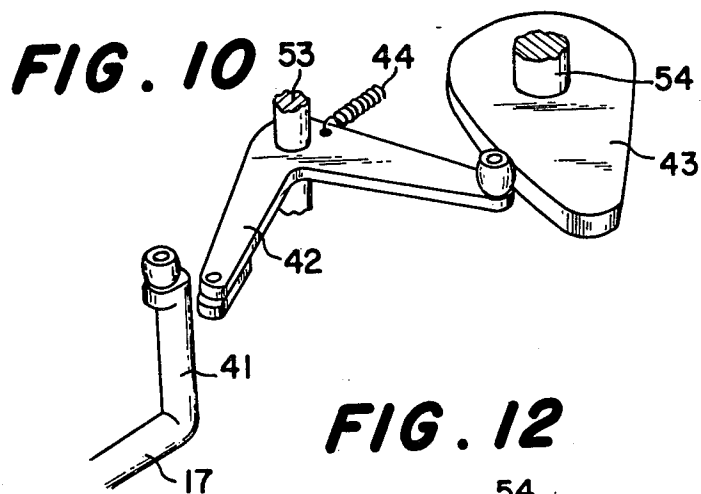


FIG. 11

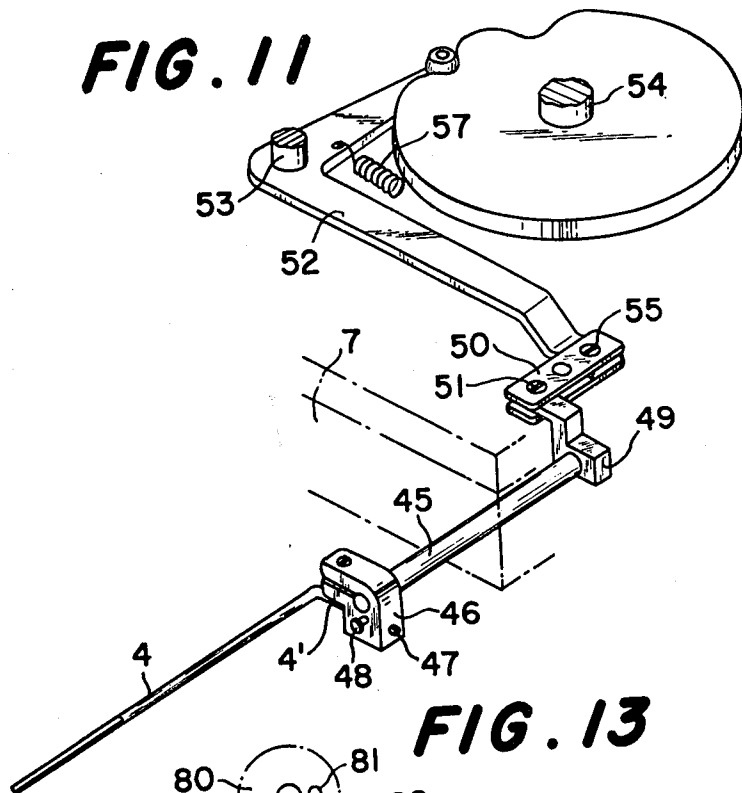


FIG. 13

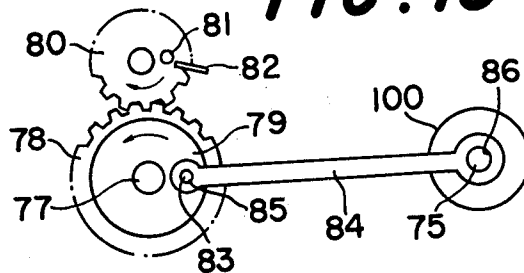


FIG. 14

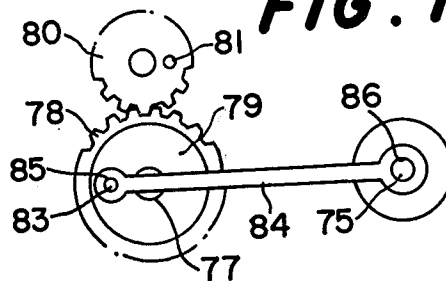


FIG. 15

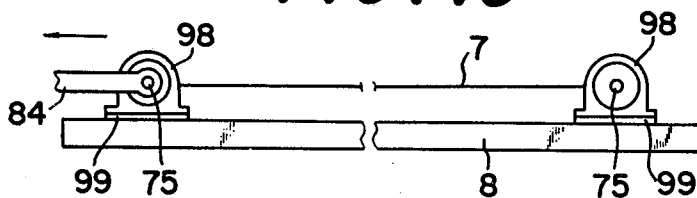


FIG. 16

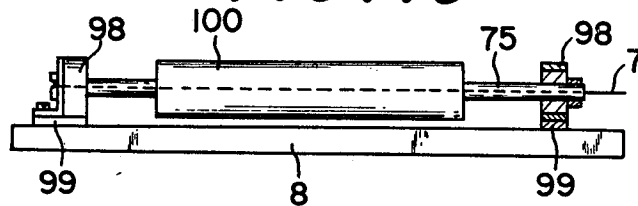


FIG. 20

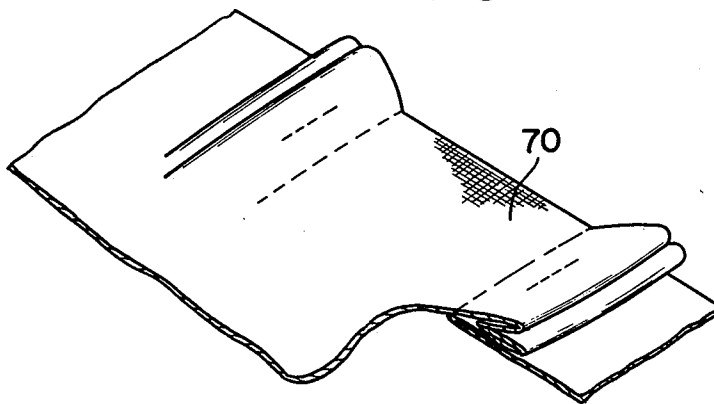


FIG. 17

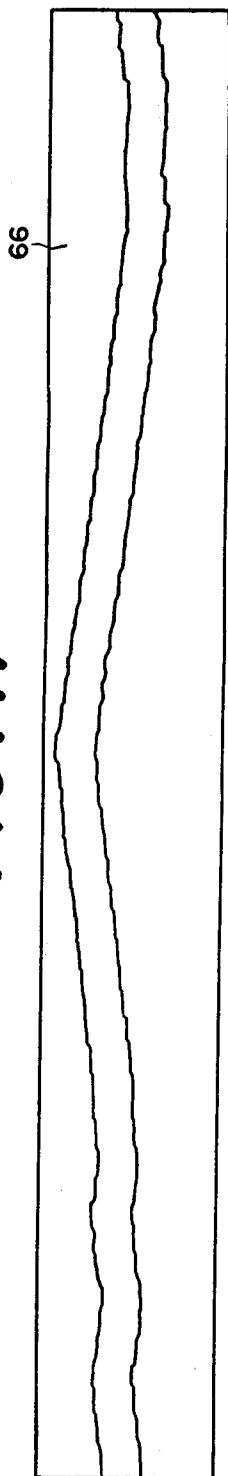
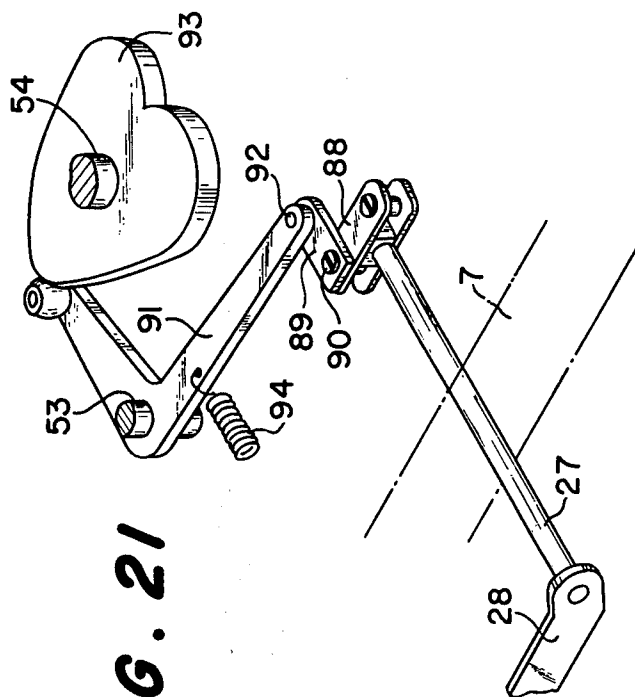


FIG. 21



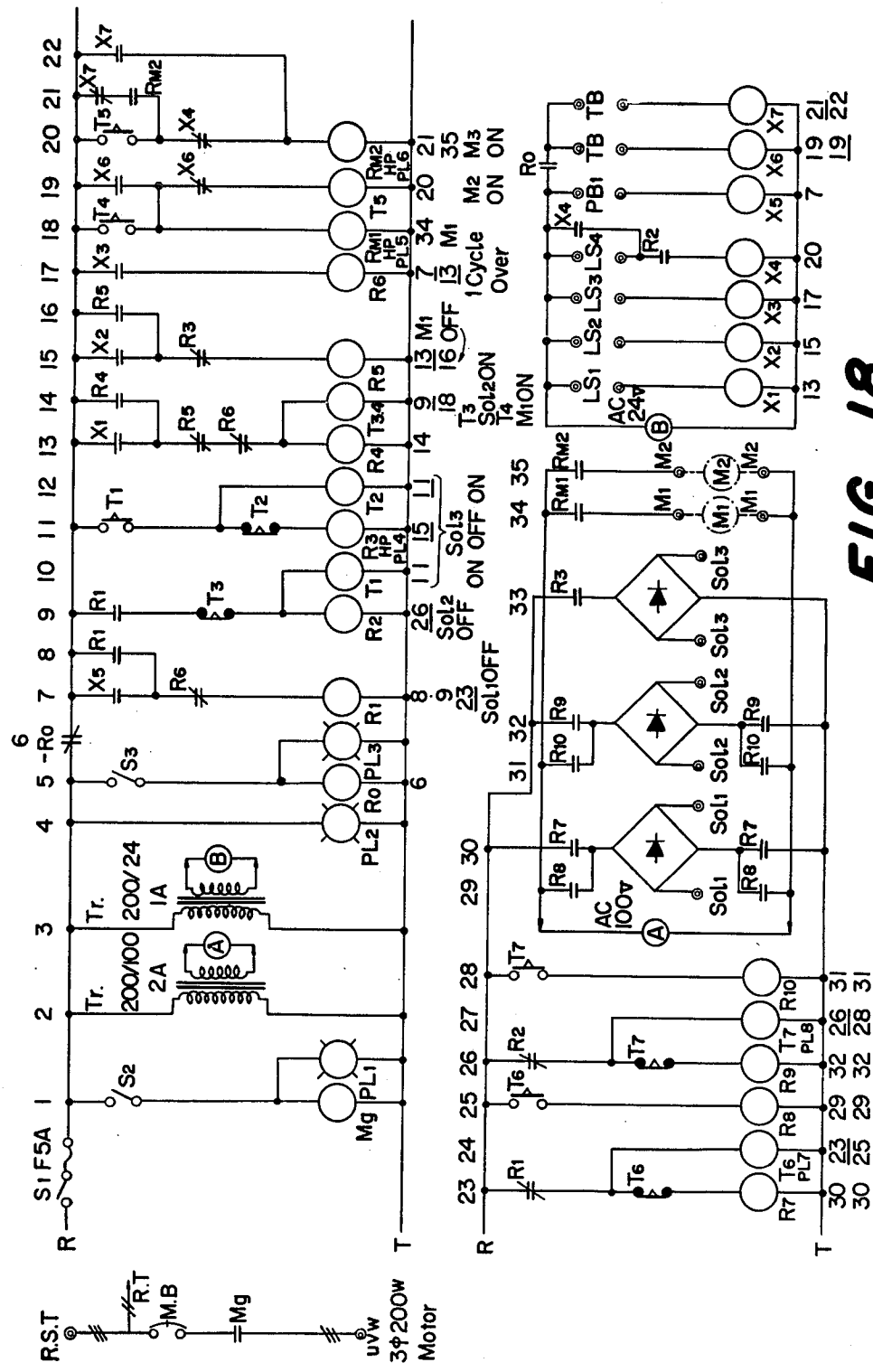
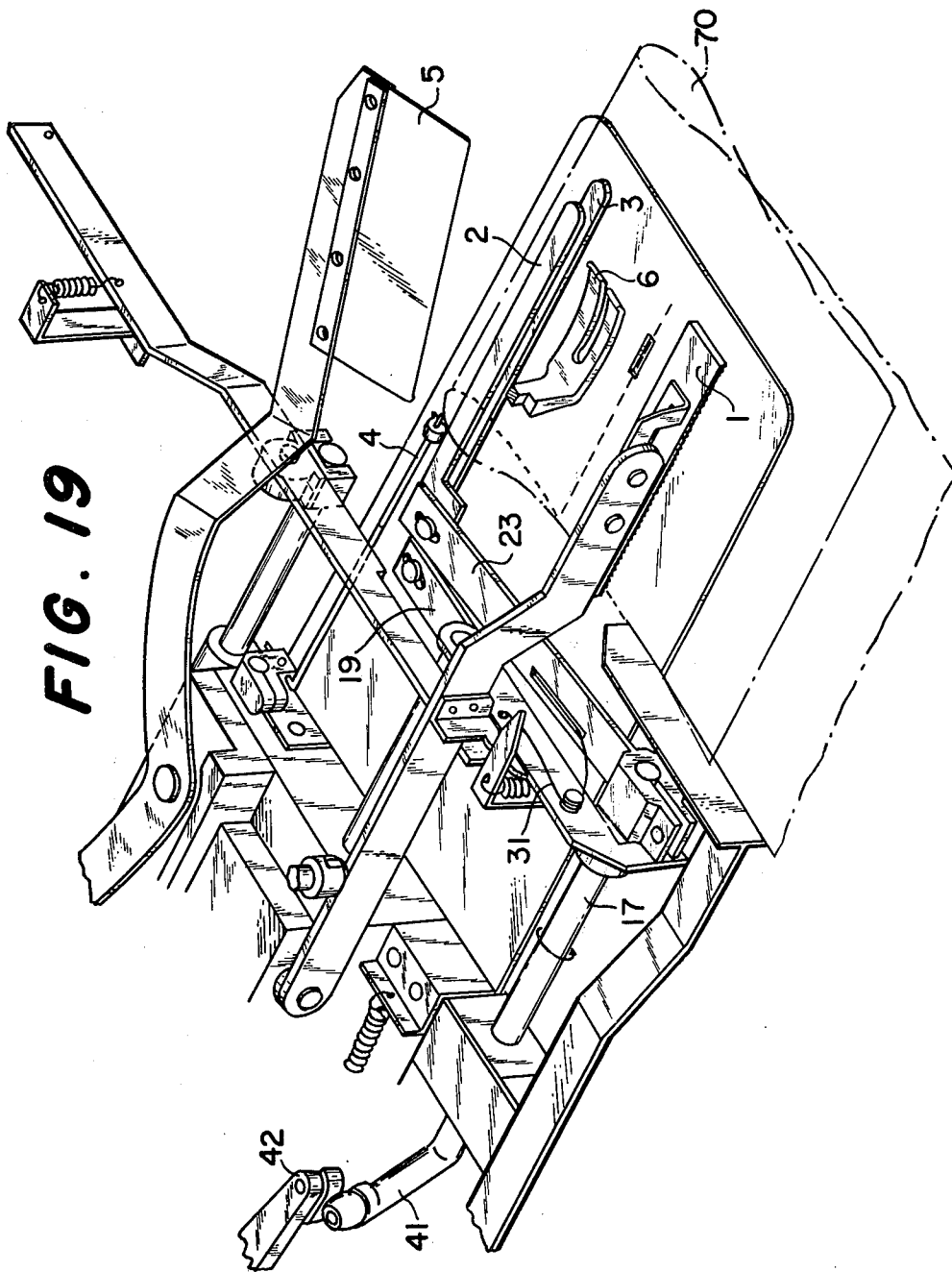


FIG. 18



TUCKING APPARATUS FOR CURTAIN OR LIKE CLOTH

FIELD OF INVENTION

This invention relates to apparatus for forming tucks in curtains and the like regardless of the quality of the cloth which is involved in the tucking operation.

BACKGROUND

Heretofore, a number of tuck-making devices designed as attachments for sewing machines have been proposed. For example, U.S. Pat. No. 930,469 discloses a simple attachment for producing open welt seams or garments. This attachment is used only for making single type tucks. Further, U.S. Pat. No. 488,547 discloses a device which is adapted to form tucks in cloth and to guide the same to the stitch forming mechanism of a sewing machine. Use of this device enables two tucks, which are formed so as to lie in the same direction, to be simultaneously made and guided to the stitch-forming mechanism of a two-needle sewing machine, so that two continuous seams may be formed in the tucks. Also, U.S. Pat. No. 2,043,735 discloses a tuck-making device whereby graduated or fancy tucks may be made with the same facility as straight tucks. These prior devices all require troublesome and time-consuming hand operation.

SUMMARY OF INVENTION

An object of the invention is to provide an improved apparatus for making quickly and automatically double type of tucks in a curtain cloth or the like.

Another object of the invention is to provide an apparatus for making continuously and quickly a curtain with tucks having loops for fitting hanger hooks.

To achieve the above and other objects of the invention there is provided apparatus for tucking cloth with a sewing machine. This apparatus comprises a base, a slider arranged on said base for sliding movement in both the transverse and lengthwise directions with respect to the cloth to be tucked, a working plate fixedly secured to said slider to extend horizontally therefrom and having a working position for guiding and supporting the cloth and a first presser pivotably connected to said slider and extending transversely of the cloth for lifting and lowering movement over the working plate. A second presser is provided on the base positioned on the working plate adjacent the first presser and parallel relation thereto. An upper spatula and a lower spatula are mounted on the slider for lifting and lowering movement over the working plate for backward and forward movement relative to the working position of the working plate in the transverse direction of the cloth to be tucked. The lower and upper spatulas are arranged one above the other and in a position parallel to the first and second pressers and are movable up and down so as to be brought into and out of engagement with each other. A width setting bar is mounted on the slider for forward and backward movement relative to the working position of the working plate in the transverse direction. A tucking plate is pivotably connected to the slider so as to be inserted between the upper and lower spatulas when the spatulas are moved away from each other.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the whole apparatus

in which the first presser, the second presser, the upper spatula and the lower spatula are position on the working plate,

FIGS. 2 through 5 and FIG. 19 are perspective views showing the operation of the parts which perform the tucking,

FIG. 6 is a plan view showing the upper spatula arm lever and the lower spatula arm lever,

FIG. 7 is a front view showing the relation between the first arm lever, the lower arm plate and support plate,

FIG. 8 is a side view of the same,

FIG. 9 is an end view taken through line A—A in FIG. 6,

FIG. 10 is a perspective view of the mechanism for rotating the rotatable shaft,

FIG. 11 is a perspective of a slide mechanism for the width setting bar,

FIG. 12 is a perspective view of the mechanism for swinging the tucking plate,

FIG. 13 and FIG. 14 are front views showing the mechanism for actuating the slider,

FIG. 15 is a front view showing the relation of the slider and the base,

FIG. 16 is a side view of the same,

FIG. 17 is a view showing the sewing cam,

FIG. 18 is a circuit diagram,

FIG. 20 is a perspective view showing a cloth tucked and sewn, and

FIG. 21 is a perspective view of the mechanism for sliding the upper spatula and the lower spatula.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention will next be described in detail with reference to an embodiment thereof shown in the accompanying drawings. Those parts which perform the formation of tucks include a first presser 1, an upper spatula 2, a lower spatula 3, a width setting bar 4, a tucking plate 5 and a second presser 6.

Said first presser 1 is fixed at 16 to one end of a first arm lever 11 of which the other end is pivotally affixed at 15 to a slider 7. Positioned over one end portion of said first arm lever 11 and fixed to the slider 7 is a frame 13 carrying a pushing shaft which is normally biased downward by means of a spring 10 so that a roller 14 pivotally attached to the lower end of the shaft 12 pushes downwardly the end portion of said first arm lever to bring the above-mentioned first presser 1 against the upper surface of a working plate 7' connected to one end of the slider 7. (See FIGS. 1 and 2).

Referring to the upper spatula 2 and lower spatula 3, there is a rotatable shaft 17 rotatably supported at its middle 18 by the slider 7 and on one end of said rotatable shaft 17 is loosely fitted one end of a lower spatula arm plate 19 having at its other end a slot 21 through which extends a machine screw 22 for fastening the lower spatula 3 such that the lower spatula 3 is held parallel to said first presser 1 and in contact with the working plate 7' of the slider 7 located under the arm of the sewing machine. The lateral position of the lower spatula 3 may be adjusted by means of said slot 21. Adjacent to the lower spatula arm plate 19 there is an upper spatula arm plate 23 fixed at its one end to the rotatable shaft 17 as by 24 and having at its other end a slot 25 through which extends a machine screw 26 for fastening the upper spatula 2 to overlie the lower spat-

ula 3. The lateral position of the upper spatula 3 may be adjusted by means of said slot 25. On one end of a support shaft 27 rotatably carried by the slider 7 at its middle is a support plate 28 fixed at one end thereof which has a hooked portion 29 at the other end engaged around the peripheral groove 19' of the cylindrical portion at the end of said lower spatula arm plate 19 so that said support plate 28 remains normally still without turning along with the swinging of the lower spatula arm plate 19. A pin 30 extends from the center of the support plate 28 to engage the center of a spring 31 of which one end is fixed to the support plate 28 and the other end is fixed to the end of the upper spatula arm plate 23, whereby said spring 31 is through its expanding action, normally urging said upper spatula arm plate 23 downward to position the upper spatula 2 on the lower spatula 3 (See FIG. 2).

An angled hook 33 is secured to said lower spatula arm plate 19 in a position such that under the horizontal part 34 of said hook 33 is located a projection 35 extending from the previously mentioned first arm lever 11. A spring 36 is stretched between the horizontal part 34 of the hook 33 and the support plate 28 so as to urge the lower spatula 3 onto the working plate 7' of the slider 7.

There is a second lever 38 pivotally supported at its center on the base 8. One end of the second arm lever 38 is positioned under the first arm lever 11 and a tension spring 39 is mounted between the other end of the second arm lever 38 and the base 8. A connecting rod 40 is provided between the end of the second arm lever 38 and a first solenoid (See FIGS. 2 and 7). An arm 41 formed on the other end of afore-mentioned rotatable shaft 17 is adapted to be pushed by a push lever 42 swingably on a vertical shaft 53 fixed on the slider 7.

One end of said second push lever 42 is forced to engage with a second cam 43 secured to a cam shaft 54 by means of a spring 44 extending between the push lever 42 and the slider 7 (See FIGS. 2 and 10). The width setting bar 4 is slidably fixed at one end thereof to the slider 7 and it is held parallel to the upper spatula 2 and lower spatula 3 as well as is positioned on the right hand side of the working plate 7' of the slider 7. A sliding shaft 45 slidably supported at its middle by the slider 7 has on one end thereof a fixing plate 46 with a hole 47 for slidably receiving a bent portion 4' of the width setting bar 4 to be fastened to the fixing plate 46 by means of a set screw 48.

To the other end of said sliding shaft 45 is secured a connecting plate 49 pivotally connected at 51 to one end of a link 50, whose other end is pivotally connected at 55 to one end of a first push lever 52 swingably mounted on said vertical shaft 53. The other end of said lever 52 is forced against a first cam 56 secured to said cam shaft 54 by means of a spring 57 stretched between the lever and the slider 7. The lateral position of the width setting bar 4 may be adjusted by shifting the bent portion 4' along the hole 47 of the fixing plate 46 (See FIG. 11).

The tucking plate 5 is swingably supported at the center by the slider 7 and its one end is normally positioned outwardly of the width setting bar so that the tucking plate may come in between the upper and lower spatulas 2 and 3 when they are open apart, and the other end is connected pivotally to one end of a link 61 whose other end is pivoted at 64 to one end of a third push lever 63 swingably mounted on said vertical

shaft 53, the other end of the push lever 63 being slidably engaged with a third cam 65 fixed on said cam shaft 54 (See FIG. 12).

The slider 7 is mounted on the base 8. Thus, the slider 7 has bearings 100 on both sides, through each of which extends a support shaft 75 fixed on both ends to support plates 99 through the intermediary of bearings 98, the support plates 99 being in turn set on the base plate 8 (See FIGS. 15 and 16). The traverse mechanism for the slider comprises a cam 66 of the sewing machine (LK cycle sewing machine), and a swingable arm 67 engaging said cam 66 at one end as at 68 and connected pivotally as at 69 at the other end to the slider 7 by means of a link 67'. The cross slide mechanism for the slider comprises a motor 76 set on the base 8, a gear 78 fixed on the shaft of the motor, a disc 79 attached to the side of the gear 78, a gear 80 engaging the gear 78 and having a pin 81, a limit switch 82 so positioned as to be tripped by said pin 81, and a rod 84 pivotally connected at 85 with an eccentric pin 83 projecting from said disc 79 and at 86 with the support shaft 75 (See FIGS. 13 and 14).

The second presser comprises the presser foot of said LK cycle sewing machine and is located between the first presser 1 and the upper and lower spatulas 2 and 3 (See FIG. 1).

On the other end of the support shaft 27 is fixed a connecting plate 88 to which is pivotally connected one end of a link 89 whose other end is pivotally connected at 92 to one end of a forth push lever 91 swingably mounted on the vertical shaft 53. The push lever 91 is urged to engage at the other end a cam 93 fixed on the cam shaft 54 by means of a spring 94 stretched between said lever 91 and the slider 7 (See FIG. 21).

The operation of the apparatus will now be described. Upon turning on the switch for a first solenoid, a second solenoid and the sewing machine driving motor, the first solenoid will be energized and pull the connecting rod 40 downward by its attractive force. The second arm lever 38 will then swing on the pivot 37 and cause, with one end thereof, the first arm lever 11 to swing upward about the pivot 15 against the action of the spring 13. As a result, the first presser 1 will be elevated. When the first arm lever 11 swings upward as stated above, its projection 35 pushes the angled hook 33 upward against the tension of the spring 36 to cause the lower spatula arm plate 19 to rotate the rotatable shaft 17 (as shown by the arrow). The lower spatula 3 will then move upward and at the same time lift the upper spatula 2 against the action of the spring 31, followed by the upward swing of the upper spatula arm lever 23 whereby the rotatable shaft 17 will be rotated and stop.

The second solenoid is energized simultaneously with the energization of the first solenoid thereby to elevate the second presser 6 which is constituted by the presser foot of the sewing machine (in a manner well known).

As a result, the first presser 1, the upper spatula 2, the lower spatula 3 and the second presser 6 come and stop at elevated positions over the working plate 7' of the slider 7. At that time, the sewing machine driving motor is of course rotating.

Then, as shown in FIG. 2, the cloth 70 is placed with one end portion thereof arranged over the upper spatula 2 and the width setting bar 4 while applying one longitudinal edge thereof to a ruler fixed to the slider 7. Thereafter, it is folded backward around the width

setting bar and passed under the lower spatula 3 so that its leading end underlies the remaining portion of the cloth in a position under the first presser 1. The cloth 70 is stretched from the width setting bar 4. It is needless to say that the lengthwise edge of the cloth 70 should be always held along the ruler 71 during that process.

Then a first button is pressed to disenergize said first solenoid. Thereupon the first solenoid will reverse and the second arm lever 38 will swing back due to the action of the spring 10 to lower its left-hand end, so that the first arm lever 11 which has been lifted up by the end of the second arm lever 38 will be let down swinging about the pivot 15. Accordingly the first presser 1 will come down to hold the cloth 70 on the working plate 7' of the slider 7. When the first arm lever 11 comes down as mentioned above, the angled hook 33 of the lower spatula arm lever 19 will not be pushed upward by the projection 35 of the first arm lever 11 any longer and therefore the lower spatula arm lever 19 will swing downward under the tension of the spring 36 about the rotatable shaft 17 so as to bring the lower spatula 3 into contact with the underlying portion of the cloth 70. The above-mentioned downward movement of said lower spatula arm lever 19 causes the upper spatula arm lever 23 also to move downward under the action of the spring 31 so that the upper spatula will overlie the lower spatula 3. Of course, the rotatable shaft 17 rotates at that time (as shown by the arrow in FIG. 3).

Next a starting switch (not shown) is turned on, whereupon the second solenoid will be deenergized. The second solenoid will then reverse to lower the second presser 6, which has been elevated, to hold the cloth 70 on the working plate 7' of the slider 7. When the second solenoid is deenergized as stated above, a third solenoid is energized to make a clutch of the sewing machine on whereby the sewing machine starts its operation as it now receives power from said sewing machine driving motor and rotates the cam shaft. The cam 66 rotates and this rotation is converted into the traverse movement of the operating arm 67 which causes the slider 7 to traverse as the sewing needle 72 is sewing. The proceeding of such operation is represented in the development chart of the cam shown in FIG. 17. Since the sewing machine is an LK cycle machine 8 in which one cycle comprises two runs of sewing, it stops because of the disconnection of a clutch after the first run of sewing has been completed. This stopping of the sewing machine is sensed by a limit switch which will operate a relay to energize the second solenoid. Thereupon the second presser 6 is raised and stops, and this stop is electrically sensed to operate a relay (for this purpose refer to the circuit shown in FIG. 18) to drive motor 75, whose rotation is transmitted to the gear 78 to rotate it in the direction of the arrow in FIG. 13, causing rotation of the arm lever 84 to shift the slider 7 to the left (See FIG. 15). Each revolution of the gear 80 makes its pin 81 strike the limit switch 82 to stop the motor 76, so that the slider 7 will stop at the leftmost position (See FIG. 14).

When the second presser 6 has completed its rising, it is sensed electrically and this information is transferred to a relay to excite the motor 73 which will rotate the cam shaft 54 so that the first cam 56 will cause the width setting bar 4 to be retracted through the first push lever 52, the arm 50, the connecting plate 49, the

sliding shaft 45 and the connecting plate 46, while on the other hand the second cam 43 causes the second push lever 42 to push the arm 41 to rotate the rotatable shaft 17 so that the upper spatula 2 will be lifted up to some distance from the lower spatula 3 and therefore the cloth 70 will be opened (See FIG. 19). At the same time the third cam 65 causes the tucking plate 5 to be swung about the pivot 60 through the action of the third push lever 63 and the link 61 so that the tucking plate will be brought between the upper spatula 2 and the lower spatula 3. In the mean time, the second cam 43 causes the arm 41 and the shaft 17 to reverse to let the upper spatula 2 down. Accordingly a tuck is formed on the cloth 70 by means of the first presser 1, the upper spatula 2 the lower spatula 3 and the tucking plate 5 (See FIG. 4).

After this, the third cam 65 reverses the third push lever and the link 61 to draw out the tucking plate from between the upper spatula 2 and the lower spatula 3. Thereafter the fourth cam 93 causes the upper and the lower spatulas 2 and 3 to be retracted through the action of the fourth push lever 91, the link 89, the connector plate 88 and the support plate 28 (See FIG. 5). Thereupon a projection 95 formed on the cam shaft strikes the limit switch 96 to stop the motor 73. The signal from the limit switch 96 will excite a relay to deenergize the second solenoid and therefore the second presser 6 will come down. Then, as previously stated, the third solenoid is energized to make the clutch of the sewing machine make the slider 7 traverse as sewing is performed. Thus, the second run of sewing with the LK cycle sewing machine comes to an end. Then the first solenoid and the second solenoid become deenergized and the first presser 1 and the second presser 6 are lifted.

The clutch is then disconnected. This disconnection of the clutch is sensed by a limit switch to excite a relay to start the motor 73 and the motor 76 to rotate the cam shaft 54, causing upper and lower spatulas 2 and the width setting bar to proceed forward to return to their initial positions. The operation of the motor 76 also causes the returning of the slider 7 rightward to its initial position. The cloth 70 may now be taken out. A tuck has thus been formed in the cloth as shown in FIG. 20.

What is claimed is:

1. An apparatus for tucking cloth with a sewing machine, said apparatus comprising a base, a slider arranged on said base for sliding movement in both the transverse and lengthwise directions with respect to the cloth to be tucked, a working plate fixedly secured to said slider to extend horizontally therefrom and having a working position for guiding and supporting the cloth, a first presser pivotably connected to said slider and extending transversely of the cloth for lifting and lowering movement over the working plate, a second presser on the base positioned on the working plate adjacent said first presser in parallel relation thereto, an upper spatula and a lower spatula mounted on the slider for lifting and lowering movement over the working plate and for backward and forward movement relative to the working position of the working plate in the transverse direction of the cloth to be tucked, said upper and lower spatulas being arranged one above the other in a position parallel to said first and second pressers and being movable up and down so as to be brought into and out of engagement with each other, a width setting bar

mounted on the slider for backward and forward movement relative to the working position of the working plate in the transverse direction, and a tucking plate pivotably connected to the slider so as to be inserted between the upper and lower spatulas when the spatulas are moved away from each other.

2. An apparatus as set forth in claim 1 comprising a first lever, a spring, upper and lower arm plates and further springs, first presser being pivotably connected to said slider through said first lever and being normally pressed against the working plate by means of the first said spring, said upper and lower spatulas being pivotably connected to the slider through said upper and lower arm plates, said arm plates being juxtaposed with respect to each other and being normally pressed against the working plate by means of said further springs, said upper and lower spatula arm plates being constituted so as to be lifted and lowered in connection with the lifting and lowering movement of said first lever.

3. An apparatus as set forth in claim 2 comprising a solenoid and a second lever pivotably connected to the base substantially at right angles to said first lever, said second lever being positioned at one end below the first lever and connected at the other end to said solenoid, whereby the first presser can be moved upwardly and downwardly.

4. An apparatus as set forth in claim 1 comprising a rotatable shaft, said lower spatula arm plate being loosely mounted on said rotatable shaft which is pivota-

bly connected to the slider, said upper spatula arm plate being fixedly mounted on said rotatable shaft, whereby said upper and lower spatulas can be moved into and out of engagement with each other.

5. An apparatus as set forth in claim 4 comprising a support plate arranged between said upper and lower spatula arm plates in a position parallel thereto, said support plate being engaged at its one end with a boss of the lower spatula arm plate on said rotatable shaft extending slidably from the slider in the transverse direction of the cloth to be tucked and being fixedly mounted at the other end on a support shaft extending slidably from the slider in parallel relation to said rotatable shaft, and said support plate being connected to the upper and lower spatula arm plates through said springs, whereby the upper and lower spatulas can be moved backward and forward relative to the working position of the working plate by moving the support shaft.

6. An apparatus as set forth in claim 5, characterized in that said slider includes a plurality of cam means including a first cam means for operating the width setting bar, a second cam means for operating the width setting bar, a second cam means for operating the rotatable shaft, a third cam means for operating the tucking plate and a fourth cam means for moving said upper and lower spatulas backward and forward relative to the working position of the working plate.

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