Aug. 21, 1951 C. M. MacCHESNEY 2,564,850

STITCHING MACHINE

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FIG. 1

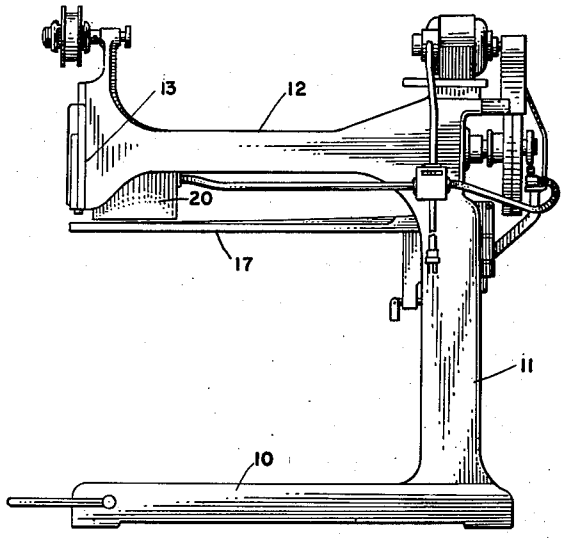


FIG. 2

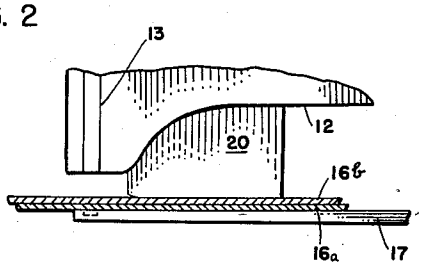


FIG. 3

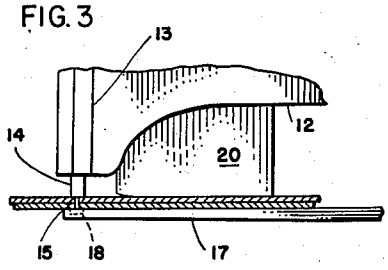
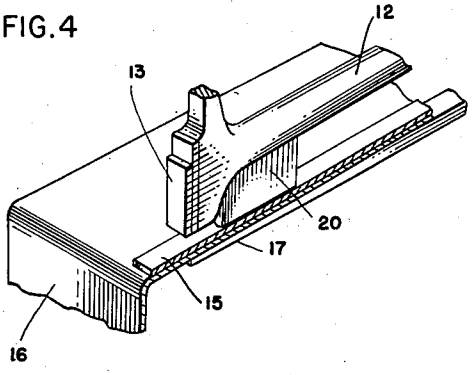


FIG. 4



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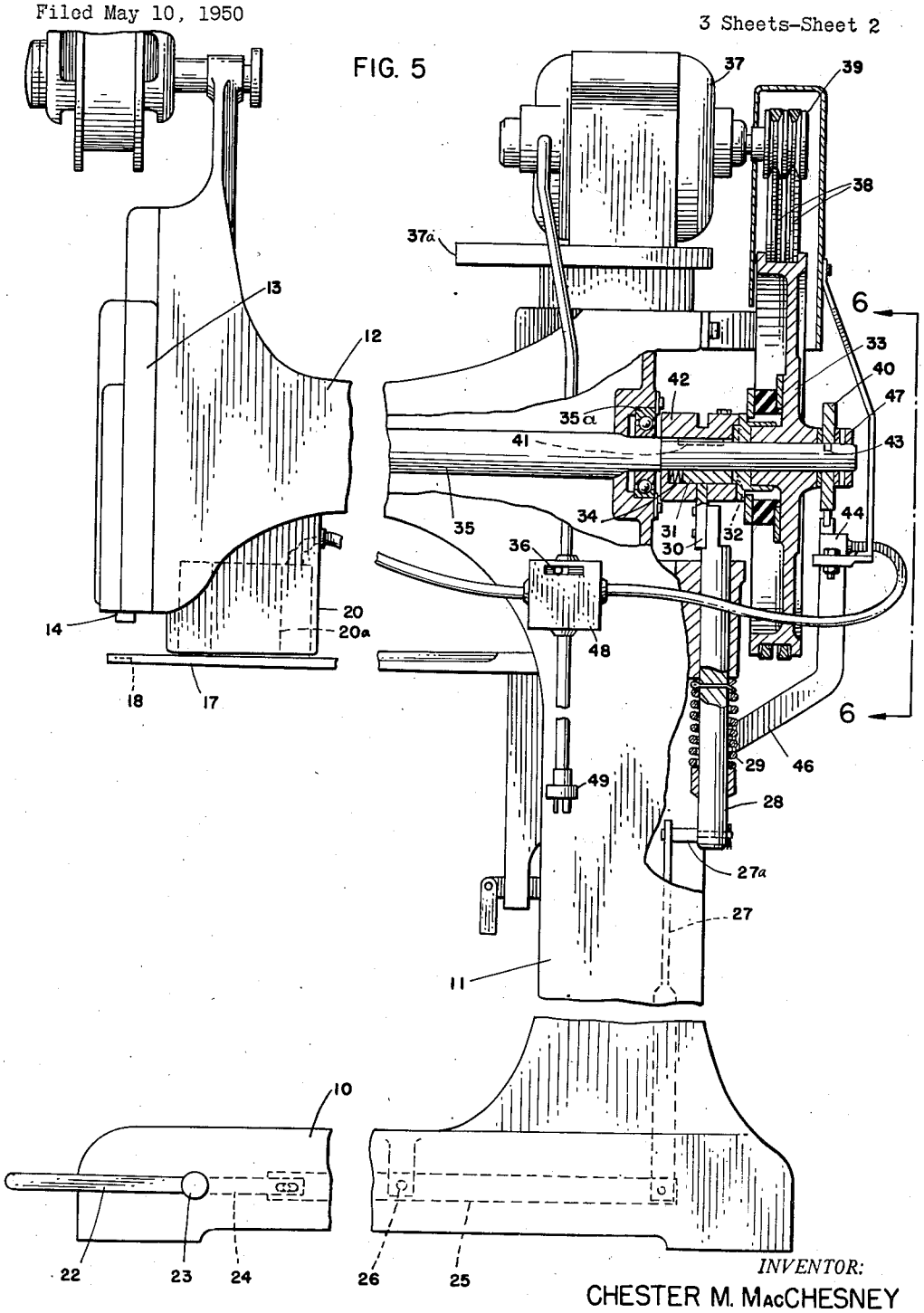
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STITCHING MACHINE

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FIG. 5



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STITCHING MACHINE

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FIG. 6

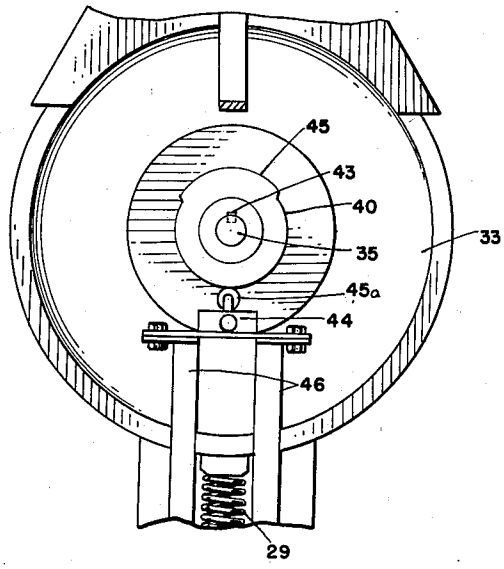
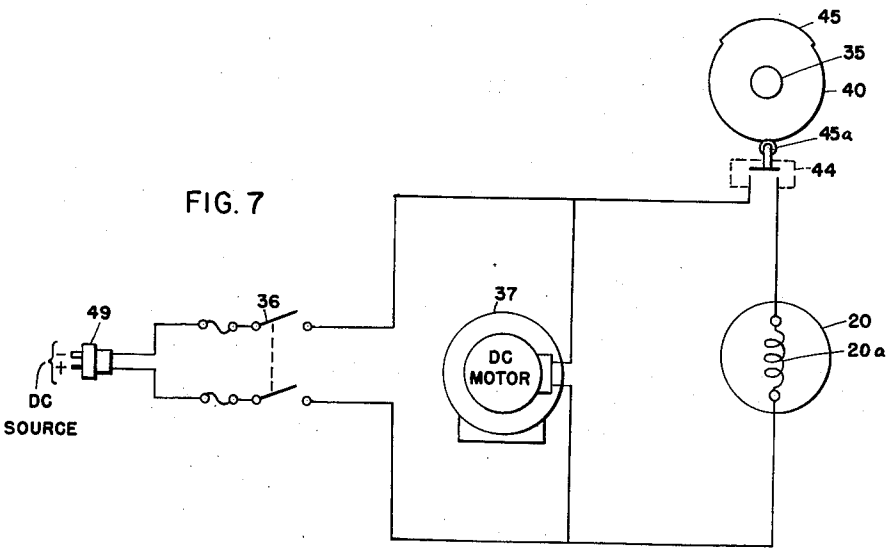


FIG. 7



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UNITED STATES PATENT OFFICE

2,564,850

STITCHING MACHINE

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Application May 10, 1950, Serial No. 161,239

16 Claims. (Cl. 1—11)

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The present invention relates to improvements in stitching machines of the type which is commonly employed for stitching together the overlapping top flaps of a fiberboard box, or the like. This application is a continuation-in-part of my copending application, Serial No. 770,667, filed August 26, 1947, now abandoned.

In machines of this type, the stitching operation is usually performed by driving wire staples, formed either of round or flat wire, through the flaps of the box or carton and clinching them on the other side of the lower flap against a supporting device known as an anvil. A fiberboard box commonly has a top formed of two end flaps and two side flaps which extend over the end flaps when the box is closed. Sometimes, the side flaps overlap each other and are merely stitched together and sometimes, the side flaps do not overlap but are stitched to the end flaps. In order to clinch the staples on the underside of the lower flap, it is necessary to employ some form of anvil which is inserted from one end of the box and thrust beneath the flaps which are to be stitched together with the extremity thereof occupying a position beneath the stitching head of the machine. Inasmuch as the anvil must extend cantilever fashion from the frame of the machine with a connection to the frame only at one end, it has been difficult heretofore to stitch the top flaps of a closed fiberboard box of considerable length because a long anvil does not have adequate support where the stitching occurs but bends away from the stitching head with the result that the staples are not properly clinched. This difficulty has been increased by the fact that the anvil must be made comparatively thin throughout its length in order to permit its insertion beneath the overlapping flaps which are to be stitched together.

The principal object of the invention is to overcome the above mentioned difficulty by providing a stitching machine having a support near the free end of the anvil so that the anvil will not bend away from the stitching head when the staples are driven through the overlapping flaps of a box to be clinched. It is another object of the invention to provide in a stitching machine having an anvil in the form of a long thin blade, an electromagnet for supporting the free end of the anvil. It is still another object of the invention to provide in a stitching machine of the type noted, a mechanism for automatically and selectively controlling the electromagnet in order to support the free end of the anvil only during a predetermined portion of the staple clinching

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operating cycle of the machine. It is still another object of the invention to provide in a stitching machine of the type noted, a cam operated mechanism for completing an energizing circuit for the electromagnet in order to support the free end of the cantilever anvil each time the stitching head of the machine is actuated to perform the staple clinching operation and for interrupting the energizing circuit for the electromagnet immediately after the stitching head has completed its staple clinching operation.

The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the specification taken in connection with the drawings, in which:

Figure 1 shows a side elevation of a stitching machine embodying the features of the present invention;

Fig. 2 shows a vertical section through the overlapping flaps of a box with the extremity of the blade-like anvil of the stitching machine, shown in Fig. 1, occupying a position beneath the stitching head and the anvil supporting electromagnet, preliminary to the driving of a staple;

Fig. 3 shows a view similar to that of Fig. 2 with the punch of the stitching head moved downwardly to drive a staple through the overlapping flaps of the box against the clinching anvil with the electromagnet energized to support the free end of the blade-like anvil;

Fig. 4 shows a perspective view of a portion of the box with the stitching head and electromagnet positioned over the overlapping flaps and with the anvil extending beneath them;

Fig. 5 shows an enlarged side elevation of the stitching machine shown in Fig. 1 with certain parts thereof broken away in order to show more clearly certain details of the interior construction of the machine;

Fig. 6 shows an end view taken along line 6—6 of Fig. 5 and illustrates the details of the cam and cam follower for controlling the electrical circuit for the anvil supporting electromagnet; and

Fig. 7 shows a schematic diagram of the electrical circuit for controlling the drive motor of the machine and for controlling the electromagnet during a predetermined portion of the cycle of operation of the cam and cam follower.

As illustrated in the drawings, the invention is embodied in a stitching machine having a base 10 provided with an upwardly extending pedestal 11 from which there extends a horizontal stitching arm 12 carrying, at its outer end, the stitch-

ing head 13 in which there is mounted for vertical movement, the punch 14 by which staples 15 are adapted to be driven into the overlapping flaps of a box.

The staple forming and driving mechanism in the stitching head 13 for actuating the punch 14 may be of any usual form and, although illustrated generally in the drawings, is not herein described because it does not itself form a part of the present invention.

The box 16 comprises overlapping flaps 16*a* and 16*b* which may be two side flaps overlapping each other or a side flap overlapping an end flap on the box. These flaps are supported by an anvil 17 which is in the form of a thin blade tapering toward its free end and having its larger end securely attached to the pedestal 11. This anvil is recessed on its upper side adjacent its free end to receive a relatively fixed hard metal member 18 which forms a clincher block against which the staples 15 are driven so that their ends are clinched on the underside of the lower flap 16*a*. Mounted adjacent the free end of the anvil 17 and on the underside of the stitching head 13 and the stitching arm 12, there is an electromagnet 20 having a winding 20*a* which is energized at predetermined intervals by connection to an electric circuit in the manner to be described hereinafter.

The mechanism for controlling the operation of the stitching head 13 and for energizing the winding 20*a* of the electromagnet 20, is shown in detail in Figs. 5, 6 and 7. The main shaft 35 is secured at one end to the staple forming and driving mechanism in the stitching head 13 and it is supported at the opposite end by the ball bearing 35*a*. A portion of the shaft 35 extends beyond the ball bearing 35*a* and supports the clutch 42, the flywheel 33 and the cam 40. An electric motor 37 is securely fastened to the motor support 37*a* located on the top of the pedestal 11. The motor 37 is provided with the motor pulley 39 having two V-shaped grooves adapted to receive a pair of drive belts 38. The flywheel 33, carried by the shaft 35, as previously noted, is freely rotatably thereon by motion transmitted thereto by means of the motor 37 and the belts 38. The flywheel 33 is provided with a recess 32 which is engageable by a clutch pin 31 in the clutch 42. The clutch pin 31 is normally tensioned by the compression coil spring 34 to engage the recess 32 in the flywheel 33. However, in order to prevent the engagement of the clutch pin 31 with the recess 32 until energy is to be transferred from the revolving flywheel to the shaft 35, a latch member 30 is provided at the upper end of the rod 28 to hold the clutch pin 31 disengaged from the recess 32.

The clutch 42 is securely fastened to the shaft 35 by a key 41. Accordingly, it will be understood that the shaft 35 and the clutch 42 will rotate as a unit only when the clutch pin 31 engages the recess 32 in the revolving flywheel 33. A cam 40 is also securely fastened to the shaft 35 by means of the key 43. As is best shown in Fig. 6, the cam 40 is provided with a high portion 45 which cooperates, during each revolution of the cam, with the cam follower 45*a* to close and open the contacts of the switch 44. The switch 44 may be of any well-known type designed to close and open an electric circuit as the cam follower 45*a* moves from the low portion to the high portion 45 and back to the low portion of the cam 40. The switch 44 and cam follower 45*a* are supported in cooperative relationship with the cam 40 by means of

a pair of brackets 46 which are secured to the pedestal 11. The clutch 42, the freely rotating flywheel 33 and the cam 40 are held in position on the shaft 35 by means of a retaining ring 47 which may be secured to the shaft by means of pins, locking screws, or the like.

The rod 28 which is slidably mounted in the pedestal 11 is normally tensioned upwardly under control of the spring 29 and in order to retain the latch member 30 in position to hold the clutch pin 31 disengaged from the recess 32 in the rotating flywheel 33. A vertical link 27 is secured to the lower end of the rod 28 by means of the stud 27*a*, and the lower end of the vertical link 27 is pivotally secured to one end of the horizontal link 25 provided in the base 10 of the machine. The horizontal link 25, in turn, is pivotally mounted within the base 10 by the pin 26. The left end of the horizontal link 25 is provided with a slotted portion which cooperates with the free end of the rod 24 which is secured to the pin 23. The pin 23 is pivotally mounted on the base 10 and supports the foot operated treadle 22. The manner in which the various parts function to control the operation of the machine will be described hereinafter.

The machine is also provided with a junction box 48, secured to the side of the pedestal 11, having a switch mechanism 36 for opening and closing the electric source of power to the stitching machine. For this purpose, any form of conduit may be utilized to carry the electric wires from the junction box 48 to the windings 20*a* of the electromagnet 20, to the switch 44 and to the motor 37. A plug 49, of the polarized type, is also provided for connecting the machine to a direct current power line.

After the plug 49 has been inserted into an outlet box of a direct current power line, the operator of the machine may actuate the switch 36 and thus complete an electrical circuit for the direct current motor 37. The motor 37, through its drive shaft and pulley 39, causes the flywheel 33 to rotate freely on the main shaft 35 by transmission of motion through the two drive belts 38. At this time, the flywheel 33 freely rotates on the stationary shaft 35 and since the clutch 42 and the cam 40 are keyed to the shaft 35 by the keys 41 and 43, they also remain stationary.

The operator of the machine may now place the box 16 in stitching position with the anvil 17 extending beneath the overlapping flaps 16*a* and 16*b* and with the upper surface of the top flap in close proximity to the underface of the electromagnet 20. The anvil 17, being formed of a magnetizable material, will be attracted upwardly when the winding 20*a* of the electromagnet 20 is energized and thus it will be magnetically supported when the punch 14 is driven downwardly to the position illustrated in Fig. 3.

In order to control the punch 14 of the stitching head 13 and the electromagnet 20 to perform a stapling operation, the operator of the machine depresses the foot treadle 22. The foot treadle 22 and the rod 24 thus rotate in a counterclockwise direction on the pin 23. The rod 24, in turn, rotates the horizontal link 25 in a clockwise direction on the pin 26. The rotation of the horizontal link 25 in a clockwise direction pulls the vertical link 27, the stud 27*a*, the rod 28, and the latch member 30 downwardly against the pressure of the spring 29. In this manner, the latch member 30, which normally holds the clutch pin 31 disengaged from the recess 32 in the flywheel 33, is withdrawn from the

clutch pin 31 and thus permits the clutch pin 31 to slide into engagement with the recess 32 under control of the compression coil spring 34. As soon as the clutch pin 31 engages the recess 32 in the revolving flywheel 33, the main shaft 35 and the flywheel 33 become directly coupled so that the motion of the rotating flywheel 33 is transmitted through the clutch pin 31, the clutch 42 and the key 41 to the shaft 35. The shaft 35 now rotates in unison with the flywheel 33 and, since the cam 40 is keyed to the shaft 35 by the key 43, the cam 40 is also rotated. The rotation of the parts enumerated above may be continued as long as the operator of the machine depresses the treadle 22. During each revolution of the shaft 35, the staple forming and driving mechanism in the stitching head 13 actuates the punch 14 to drive a staple through the overlapping flaps 16*a* and 16*b* and against the clincher block 18 on the anvil 17. By momentarily depressing the foot treadle 22, the operator may control the machine to terminate the staple driving operation at the end of each revolution of the shaft 35. However, each momentary depression of the foot treadle 22 will permit the clutch mechanism to engage the flywheel 33 for one revolution of the shaft 35. As soon as the operator releases the treadle 22, the spring 29 drives the rod 28 upwardly so that the latch member 30 will strike the clutch pin 31. The camming action between the latch member 39 and the clutch pin 31 disengages the clutch pin 31 from the recess 32 in the flywheel 33 at the end of an operating cycle so that the flywheel again rotates freely on the shaft 35 and the shaft 35 is brought to rest at the starting position of an operating cycle.

It should be noted that the shaft 35, the cam 40 and the cam follower 45*a* occupy the positions illustrated in Fig. 6 when the shaft 35 is at rest and ready to start an operating cycle. The flywheel 33, however, is continually rotating on the shaft 35 under control of the motor 37. With the cam follower 45*a* in engagement with the low portion of the cam 45, the contacts in the switch 44 are in their open position. As soon as the operator actuates the foot treadle 22 in the manner described above, the flywheel 33 and the shaft 35 are clutched together to rotate the cam 40. As soon as the high position 45 of the cam engages the cam follower 45*a*, the switch 44 is controlled to close its spring contacts and complete the circuit for energizing the winding 20*a* of the electromagnet 20. The energized electromagnet 20, in turn, attracts the free end of the anvil 17 upwardly to support the same and clamp the box flaps 16*a* and 16*b* against the lower portion of the electromagnet 20, as is best shown in Figs. 2 and 4. As soon as the high portion 45 of the cam 40 rotates beyond the cam follower 45*a*, the switch 44 is controlled to open its contacts to interrupt the energizing circuit for the winding 20*a* of the electromagnet 20. The electromagnet 20 is thereupon deenergized and thus releases its support for the anvil 17. The high portion 45 of the cam 40 is of sufficient length and is positioned on the periphery of the cam 40 so that it controls the switch 44 to energize the winding of the electromagnet 20 just prior to the time that the shaft 35 controls the staple forming and driving mechanism in the stitching head 13 to actuate the punch 14 and to retain the energizing circuit for the winding of the electromagnet 20 until shortly after the staple 14 has been clinched by the member 18 in the anvil 17. In this manner, the attracting force generated by the energized

winding of the electromagnet 20 retains the anvil 17 in a supported position during the actual staple driving operation and the attracting force is not removed until after the staple driving operation has been completed. Consequently, the anvil 17 will not be deflected by the driving force of the punch 14. As soon as the electromagnet 20 is deenergized, the operator of the machine may reposition the flaps 16*a* and 16*b* of the box 16 to another location prior to the subsequent energization of the electromagnet 20.

From the foregoing, it will be understood that the operator may momentarily depress the foot treadle 22 each time a staple is to be driven through the overlapping flaps 16*a* and 16*b* of the box 16 or the operator may retain the foot treadle 22 in a depressed position while several staples are driven. It will also be understood that the electromagnet 20 will be automatically energized to prevent deflection of the anvil 17 during each staple driving operation.

Referring now to Fig. 7, it will be seen that the polarized plug 49 must be plugged into the — and + terminals of a direct current source of power. When the switch 36 is actuated, a circuit is completed for operating the D. C. motor 37. The motor will operate as previously described to drive the flywheel 33. When the foot treadle 22 is depressed to clutch the flywheel 33 to the shaft 35, the shaft and the cam 40 rotate in the manner previously described. As soon as the high portion 45 of the cam 40 engages the cam follower 45*a*, the contacts of the switch 44 are closed to complete the circuit for operating the winding 20*a* of the electromagnet 20. From the foregoing description of the operation of the electric circuit for the stitching machine, it will be understood that a direct current power source is utilized in order to provide a steady flow of current through the winding of the electromagnet 20. If the only source of power available is of the alternating current type, the circuit of Fig. 7 must be modified slightly by substituting an alternating current motor for the direct current motor 37 and by including a rectifying unit, such as a Wheatstone bridge rectifying unit, in the circuit for the electromagnet 20. With the modified circuit arrangement, the alternating current source of power will be connected by way of the switch 36 to the alternating current motor and to the contacts of the switch 44. Each time the contacts of the switch 44 are closed they complete the circuit through the rectifying unit to the electromagnet 20. The rectifying unit functions in this circuit to rectify the alternating current into direct current for controlling the winding of the electromagnet 20.

It will be apparent that a stitching machine constructed and arranged in the manner described above, permits the use of a relatively thin anvil 17 which may extend beneath the flaps of a box of substantial length while still maintaining adequate support for the free end of the anvil at the time the clinching of the staples takes place by selectively energizing the electromagnet 20. The invention is thus well adapted not only for stitching together the side flaps of the top of the box which overlap each other but also for stitching together the end flaps and the top side flaps which presents more of a problem since it is necessary to place the box in stitching position with the anvil extending over the end flap at one end of the box and beneath the end flap at the other end of the box. After this last mentioned end flap and the side flaps of the last mentioned end

of the box have been stitched together, the box is withdrawn from the anvil and reversed in position with the anvil extending between the flaps which have previously been stitched together in order to occupy a position beneath the unstitched end flap at the opposite end of the box thus requiring the use of an anvil which is very thin.

Although one form of the invention has been shown and described by way of illustration, it will be understood that it may be constructed in various other embodiments which come within the scope of the appended claims.

I claim:

1. A stitching machine comprising a stitcher head, an anvil having a free end extending beneath said stitcher head, and electromagnetic means located adjacent said head for magnetically supporting said free end of said anvil.

2. A stitching machine for driving metal staples comprising a stitcher head, an anvil supported at one end and having a free end extending beneath said stitching head and adapted to occupy a position beneath overlapping box flaps to be stitched together, and electromagnetic means for magnetically attracting said anvil through said flaps in order to support said anvil adjacent said head.

3. A stitching machine for driving metal staples comprising a stitcher head, an anvil supported at one end and having a free end extending beneath said stitching head and adapted to occupy a position beneath overlapping box flaps to be stitched together, and magnetic means located above said flaps for supporting said anvil.

4. A stitching machine for driving metal staples comprising a stitcher head, an anvil in the form of a thin blade of magnetizable material secured at one end and having a free end adapted to extend beneath overlapping box flaps and between these flaps and other flaps of the box, and magnetic means positioned adjacent said head and adapted to support said anvil by magnetic force during the stapling operation.

5. A stitching machine comprising a stitching head, an anvil having one end secured to said stitching machine and having a free end extending beneath said stitching head, an electromagnet supported adjacent to said stitching head, and means for energizing said electromagnet to support said free end of said anvil.

6. A stitching machine comprising a stitching head, an anvil having one end secured to said stitching machine and having a free end extending beneath said stitching head, an electromagnet supported adjacent to said stitching head and above said anvil, and means for energizing said electromagnet to attract said free end of said anvil toward said stitching head.

7. In a stitching machine, a stitching head, an anvil supported at one end and having a free end extending beneath said stitching head and adapted to occupy a position beneath overlapping box flaps to be stitched together, means for operating said stitching head to drive a staple through said flaps and against said anvil, and electromagnetic means for supporting magnetically said anvil adjacent to said stitching head to clinch said staple each time said flaps are stitched together.

8. In a stitching machine, a stitching head operative to drive a metal staple through overlapping box flaps to be stitched together, an anvil supported at one end and having a free end extending beneath said stitching head and adapted to occupy a position beneath overlapping box flaps to be stitched together, selectively controlled means for operating said stitching head, and electromagnetic means controlled by said stitching head operating means for supporting magnetically said anvil adjacent said stitching head during said staple driving operation of said stitching head.

9. In a stitching machine, a stitching head operative to drive a metal staple through overlapping box flaps to be stitched together, an anvil supported at one end and having a free end extending beneath said stitching head and adapted to occupy a position beneath overlapping box flaps to be stitched together, selectively controlled means for operating said stitching head, electromagnetic means operative to support magnetically said anvil, means for operating said stitching head to drive a metal staple through the overlapping box flaps and against said anvil, and means controlled by said last mentioned means for operating said electromagnetic means prior to the operation of said stitching head and for retaining said electromagnetic means operated until said stitching head has driven a staple through the overlapping box flaps and against said anvil.

10. In a stitching machine, a stitching head, an anvil supported at one end and having a free end extending beneath said stitching head and adapted to occupy a position beneath overlapping box flaps to be stitched together, an electromagnet, means for energizing said electromagnet to attract the free end of said anvil toward said stitching head, and means for controlling said stitching head to drive a metal staple through the overlapping box flaps and against said anvil during the time said electromagnet is energized.

11. A stitching machine for driving metal staples comprising a stitching head, an anvil supported at one end and having a free end extending beneath said stitching head and adapted to occupy a position beneath overlapping box flaps to be stitched together, an electromagnet supported adjacent to said stitching head, and means for energizing said electromagnet in order magnetically to support said anvil through said box flaps during the time said box flaps are stitched together.

12. In a stitching machine, a stitching head operable to drive a metal staple, an anvil supported at one end and having a free end extending beneath said stitching head and adapted to occupy a position beneath overlapping box flaps to be stitched together, an electromagnet supported adjacent to said stitching head, means for energizing said electromagnet in order magnetically to attract said anvil adjacent to its free end each time said box flaps are to be stitched together, and means for operating said stitching head to drive a metal staple through the overlapping box flaps only when said electromagnet is energized.

13. In a stitching machine, a stitching head for driving metal staples, an electromagnet supported adjacent to said stitching head, an anvil having one end secured to said machine and having a free end extending beneath said stitching head and said electromagnet, a drive shaft for said stitching head, a cam secured to said drive shaft, a continuously rotating driving mechanism, a clutch, means for actuating said clutch to couple said driving mechanism and said drive shaft to revolve said shaft and said cam, said stitching head being operated in response to each revolution of said drive shaft to

drive a metal staple against said anvil, and means controlled in response to each revolution of said cam for energizing said electromagnet to support magnetically the free end of said anvil during each operation of said stitching head.

14. In a stitching machine, a stitching head for driving metal staples, an electromagnet, supported adjacent to said stitching head, an anvil having one end secured to said machine and having a free end extending beneath said stitching head and said electromagnet, a drive shaft for said stitching head, a cam secured to said drive shaft, a continuously rotating driving mechanism, a clutch, means for actuating said clutch to couple said driving mechanism and said drive shaft to revolve said shaft and said cam, said stitching head being operated during a portion of each revolution of said drive shaft to drive a metal staple against said anvil, and means controlled during a portion of each revolution of said cam for energizing said electromagnet in order magnetically to attract and support said free end of said anvil each time said stitching head is operated.

15. In a stitching machine for driving metal staples, a stitching head, an anvil positioned beneath said stitching head, an electromagnet supported adjacent to said stitching head and above said anvil, intermittently operated means for energizing said electromagnet in order to attract said anvil toward said stitching head, and additional intermittently operated means for controlling said stitching head intermittently to drive metal staples against said anvil only during the time said anvil is attracted toward said stitching head.

16. In a stitching machine for driving metal staples, a stitching head, an anvil positioned beneath said stitching head, an electromagnet supported adjacent to said stitching head and above said anvil, intermittently operated means for energizing said electromagnet in order intermittently to attract said anvil toward said stitching head, and additional intermittently operated means for controlling said stitching head intermittently to drive metal staples against said anvil, said intermittently operated means and said additional intermittently operated means being arranged so that said stitching head is controlled after said electromagnet is energized and said electromagnet is retained energized until after said stitching head has driven a metal staple against said anvil.

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