March 14, 1950 F. J. TAYLOR, JR 2,500,217

STAPLING MACHINE

Filed Aug. 27, 1948 4 Sheets-Sheet 1

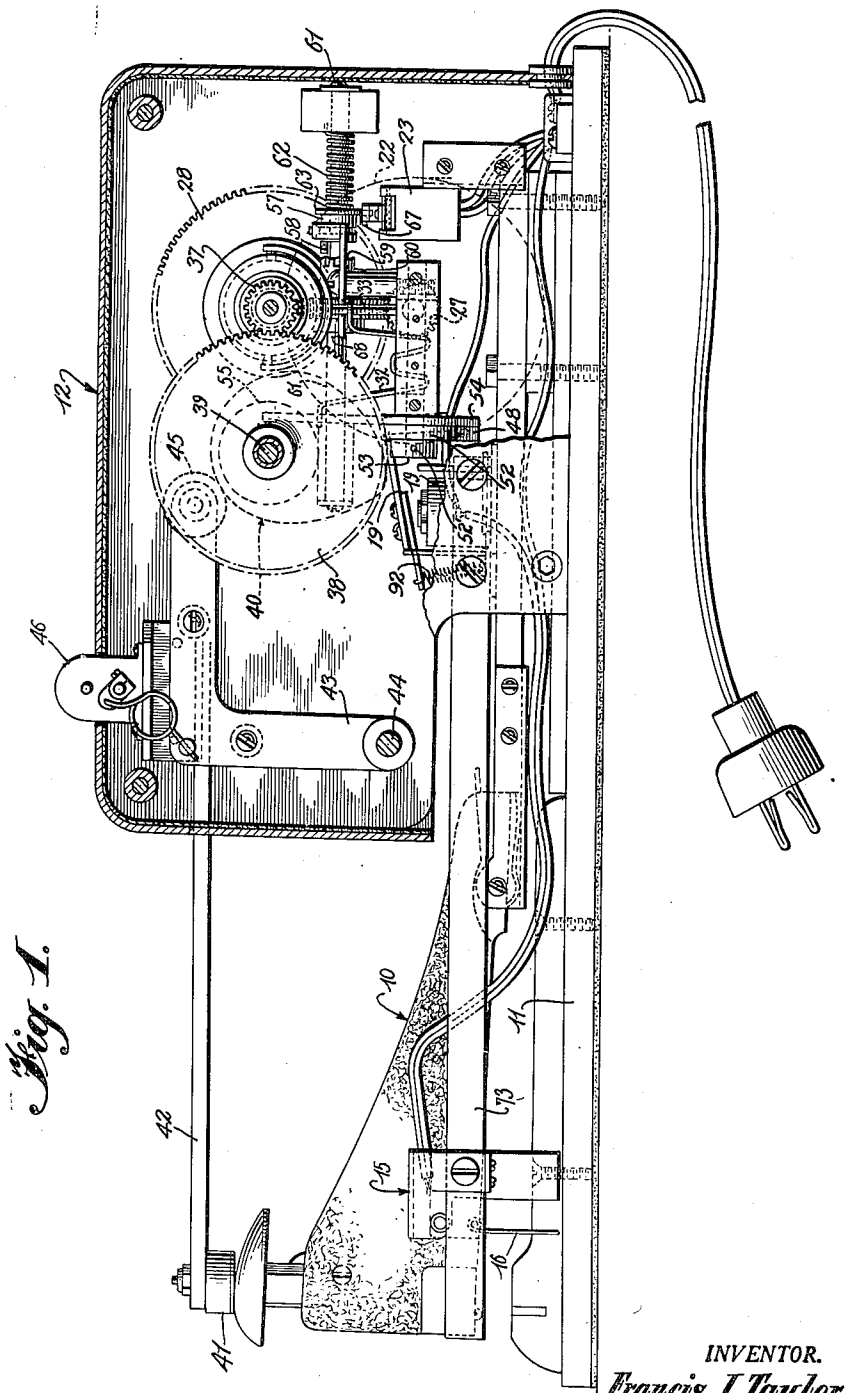


Fig. 1.

INVENTOR.
Francis J. Taylor, Jr.
BY
Jewett, Grad & Browne
ATTORNEYS

March 14, 1950 F. J. TAYLOR, JR 2,500,217

STAPLING MACHINE

Filed Aug. 27, 1948 4 Sheets-Sheet 2

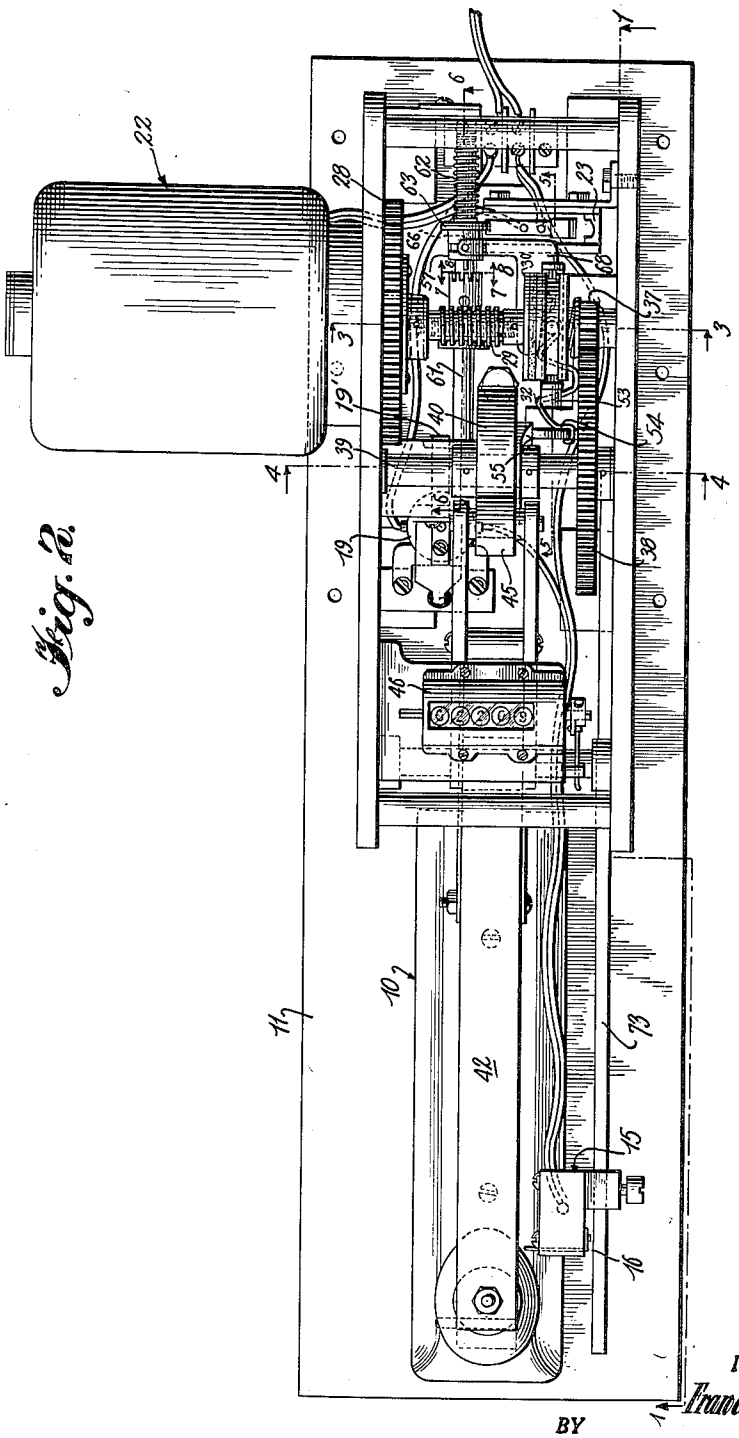


Fig. 2.

INVENTOR.
Francis J. Taylor, Jr.
BY
Jewett, Mead & Brown
ATTORNEYS

March 14, 1950 F. J. TAYLOR, JR 2,500,217

STAPLING MACHINE

Filed Aug. 27, 1948 4 Sheets-Sheet 3

Fig. 4.

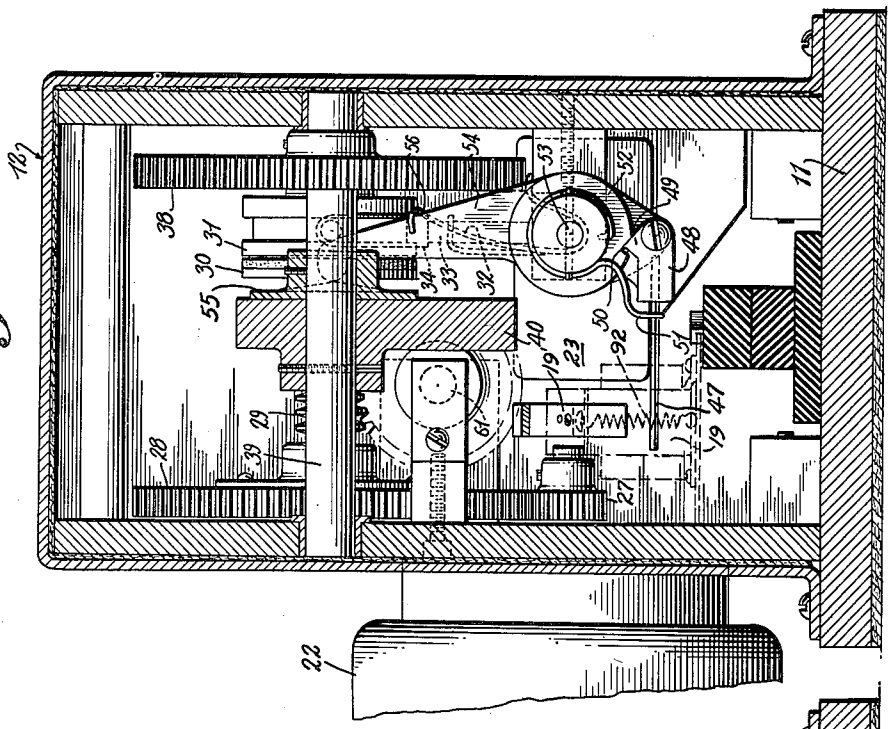
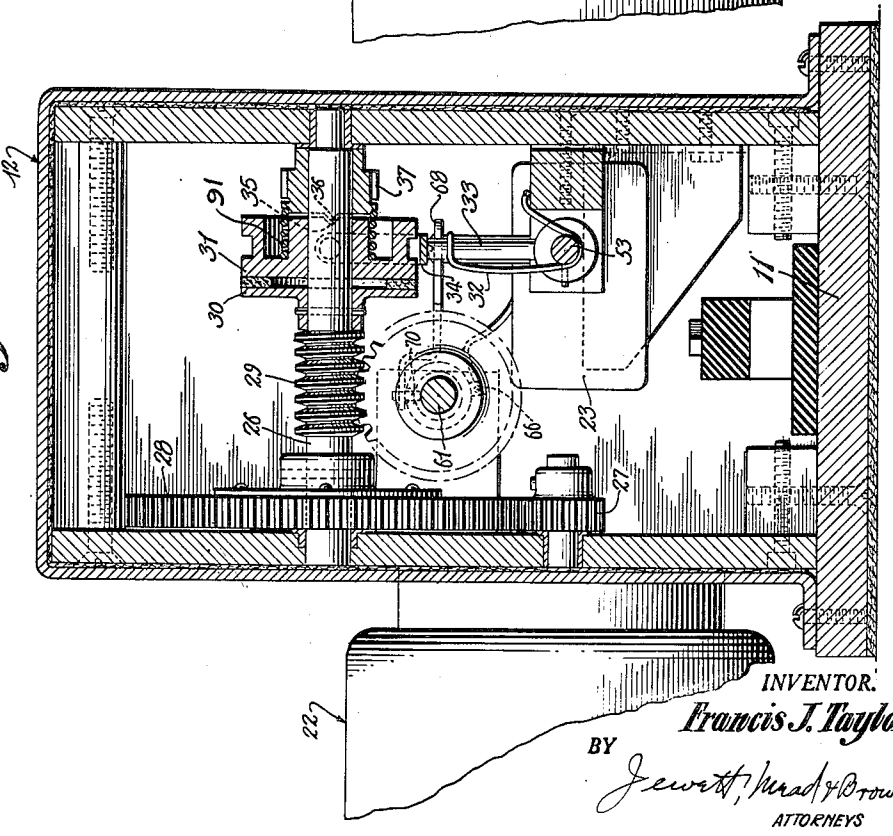


Fig. 3.



INVENTOR.
Francis J. Taylor, Jr.
BY
Jewett, Mead & Brown
ATTORNEYS

March 14, 1950 F. J. TAYLOR, JR 2,500,217

STAPLING MACHINE

Filed Aug. 27, 1948 4 Sheets-Sheet 4

Fig. 5.

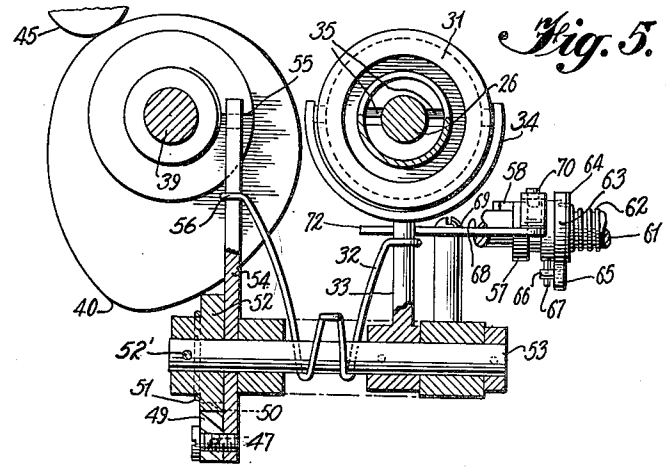


Fig. 6.

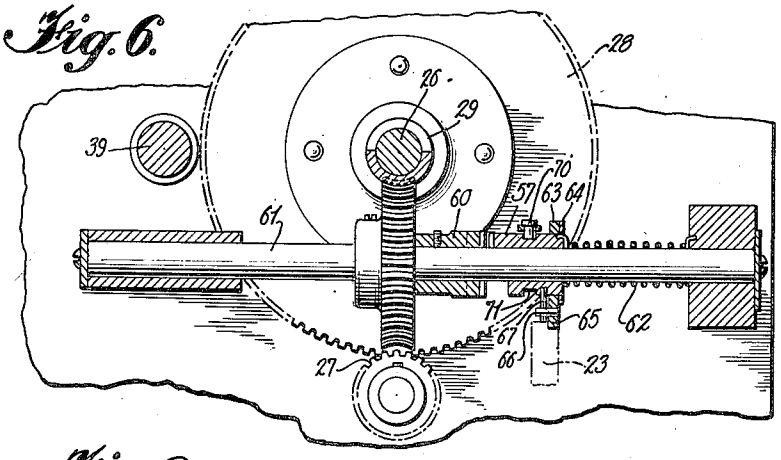


Fig. 7.

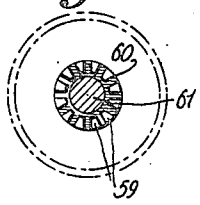


Fig. 8.

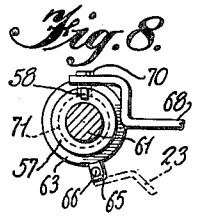


Fig. 9.

INVENTOR.
Francis J. Taylor, Jr.
BY
Jewett, Mead & Browne
ATTORNEYS

Patented Mar. 14, 1950 2,500,217

UNITED STATES PATENT OFFICE

2,500,217

STAPLING MACHINE

Francis J. Taylor, Jr., Baltimore, Md., assignor, by mesne assignments, to Thomas A. Sulkie

Application August 27, 1948, Serial No. 46,491

24 Claims. (Cl. 1—3)

1

The invention relates to stapling machines of the type useful as an office stapler for securing together sheets of paper, fabric or the like.

It is an object of the invention to provide a motor driven stapler of the type referred to.

It is a further object to provide a motor driven stapler of the office type, having a normally inactive motor which is set into operation by the placing of material in stapling position and so constructed that the motor will be automatically stopped at the end of a definite time interval of disuse of the stapler.

It is a further object of the invention to provide a stapler of the type referred to with a normally inactive motor set into operation by placing of material in stapling position, wherein an indefinite number of stapling operations may be performed without stopping of the motor, if not more than a stated interval intervenes between any two stapling operations.

It is a further object to provide a stapler having a motor started by placing material in position to be stapled and wherein the motor will continue to run for a definite period after a stapling operation and will then stop automatically, the said period being sufficient for an operator to even up collections of sheets to be stapled and to present them to the stapler during the said definite period, said presenting of material to be stapled initiating a new period of motor operation.

Other objects will appear from the following description when read with the accompanying drawings showing an illustrative embodiment of the invention and wherein:

Figure 1 is a vertical section on line 1—1 of Figure 2;

Figure 2 is a plan view with the casing omitted;

Figures 3 and 4 are vertical transverse views on lines 3—3 and 4—4, respectively, of Figure 2, looking in the direction of the arrows and upon enlarged scale.

Figures 5, 6, 7 and 8 are detail sections on the corresponding section lines of Figure 2 to an enlarged scale; and

Figure 9 is a diagrammatic figure and diagram of circuits.

To secure the objects of the invention, there is shown an office stapler 10 of any known form mounted on a base 11, a casing 12 being provided to protect the working mechanism.

To secure the objects of the invention, the mechanism thereof is controlled by the circuits shown diagrammatically in Figure 9. As there shown, power intake terminals are shown at 13,

2

14 and a starting switch at 15 which may be closed by contact of the entering edge of work to be stapled with member 16.

Closure of switch 15 provides a circuit from 14, over wire 17, switch 15, wire 18, solenoid 19, wires 20, 21, to terminal 13. Activation of solenoid 19, by mechanism to be described, closes a circuit through motor 22 by closing of switch 23, over wire 24, switch 23, wire 25, the motor 22, wire 21 to terminal 13.

The activity of the motor 22 is therefore directly controlled by switch 23. This switch is closed by action of solenoid 19 and opened mechanically by delayed mechanical action driven by the motor.

As shown in Figure 3, the motor 22 drives shaft 26 through gears 27 and 28. Keyed to the shaft 26 is a driving clutch plate 30 and freely rotatable on the shaft 26 is a driven clutch plate 31. A spur gear 37 is rotatably mounted on the shaft 26 and coil spring 91 abuts against the gear 37 and the clutch plate 31 so as to bias the clutch plate 31 inwardly into engagement with the driving clutch plate 30. The outer face of the clutch plate 31 is formed with a diametric V-shaped notch 35 (Figure 5) which cooperates with a ridge 36 carried by spur gear 37 so as to enable the clutch plate 31 to drive the gear 37. The spur gear 37 in turn engages gear 38 which is keyed to the shaft 39. Non-rotatably mounted on the shaft 39 is a cam 40. It will thus be seen that when the driven clutch plate 31 is in engagement with the driving clutch plate 30 the motor 22 will cause the shaft 26 to rotate and gears 37 and 38 will drive the shaft 39 so as to rotate the cam 40.

To actuate the stapler 10, a resilient pad 41 is shown carried by bar 42 rigidly secured to bell crank 43 pivoted at 44. The remaining arm of the bell crank carries the cam follower 45 coacting with the cam 40. A counter 46 is shown to indicate the number of copies stapled. The bar 42 is resilient and designed to yield to relieve the mechanism if the stapler jams or it is attempted to operate on too many sheets at any one operation.

The cam 40 will rotate one revolution each time the switch 15 is actuated and the mechanism for achieving this function will now be described. As shown in Figures 4 and 9, the solenoid 19 comprises a hammer 19' pivotally mounted for movement about a horizontal axis and biased upwardly by means of a spring 92. As shown in Figure 5, a shaft 53 is rotatably mounted with respect to the frame. A collar 52 is mounted on one end of the shaft 53 and is non-rotatably keyed with re-

spect to the shaft by means of pin 52'. Adjacent the collar 52 is a follower member 54 freely rotatable on the shaft 53. A member 48 is pivotally mounted on the follower member 54 and has fixed thereto a trip finger 47. Integral with the member 48 is a detent 49 engageable with a notch 50 formed in the collar 52. A spring 51 normally biases the trip finger 47 and member 48 in a clockwise direction about the pivot point of the member 48 as viewed in Figure 4. A spring 32 has one end 56 engaging the follower member 54 so as to bias said follower member in continuous engagement with a cam 55 non-rotatably mounted on the shaft 39 and adjacent the cam 40. A post 33 is non-rotatably keyed to the shaft 53 and has a yoke 34 which engages a peripheral groove formed in the driven clutch plate 31.

The operation of the above recited mechanism will now be described. As shown in Figure 1, the switch 15 is adjustably mounted on the fixed bar 73 so as to vary the location of the inserted staple from the edge of the work piece as may be desired. The work to be stapled is inserted within the stapler and when its leading edge contacts finger 16 the switch 15 will be closed and current will flow through the coil of the solenoid 19 and the magnetic field thus created will draw the hammer 19' downwardly so as to strike the trigger finger 47. The member 48 will best be pivoted with respect to the follower member 54 in counter-clockwise direction as viewed in Figure 4 and the detent 49 will be disengaged from the notch 50. This disengagement of the detent 49 will allow the shaft 53, post 33 and yoke 34 to rotate in a counter-clockwise direction as viewed in Figure 4. The spring 91 will cause the driven clutch plate 31 to engage the driving clutch plate 30 and rotation of the shaft 26 by the motor 22 will in turn cause shaft 39 and hence cams 40 and 55 to rotate.

When the cam 55 has rotated one revolution the rise portion of the cam 55 will again engage the follower member 54 so as to rotate the follower member 54 in a clockwise direction as viewed in Figure 4. The spring 51 will bias the member 48 so as to cause the detent 49 to engage the notch 50 and the clockwise movement of the follower member 54 will in turn be imparted to the collar 52 so as to rotate the shaft 53 with the follower member 54. The clockwise rotation of the shaft 53 will cause the yoke 34 to draw the driven clutch plate 31 out of engagement with the driving clutch plate 30. It will thus be seen that after one revolution of shaft 39, cam 40 and cam 55, the clutch plates 30, 31 will be disengaged and the rotation of shaft 39, cam 40 and cam 55 will cease until the trip finger 47 is again struck by the hammer 19' when the work is again moved against the finger 16. However, the motor 22, and hence shaft 26, work 29, and the driving clutch plate 30 will continue to revolve.

To cause said continued revolution of the motor, switch 23 is provided with a delayed action control, actuated by element 57, driven by clutch pin 58 in engageemnt with any of the notches 59 of hub 60 pinned to shaft 61.

As shown in Figure 6, the element 57 is free on shaft 61 and is anchored to a torsion spiral spring 62, the remaining end of which is anchored to the frame of the device. Retained on element 57 for freedom of circumferential movement and slight friction is disk 63, retained by annular flange 64. The disk 63 is formed with a radial projection 65 carrying a pin 66 extending in parallelism with the axis of shaft 61.

Also element 57 carries a radial pin 67, which contacts pin 66 upon relative rotation between the two pins.

To control the element 57, there is shown a bell crank 68 pivoted at 69 and carrying a pin 70 entering groove 71 in element 57. The remaining arm 72 of the bell crank stands in the path of movement of post 33.

Upon such "continued revolution" of the motor, the element 57 will wind spring 62 and pin 67 will impinge upon pin 66, to cause projection 65 to open the circuit of the motor as shown in Figure 8 where the switch finger is designated 23 for convenience. The motor will now be at rest.

If a piece of work to be stapled is caused to actuate switch 15, the blow of the hammer 19' will release the detent 49 from engagement with the notch 50 of the collar 52 so as to enable the collar 52, shaft 53 and post 33 to be pivoted about the axis of the shaft 53 in a counter-clockwise direction as viewed in Figure 4. This pivotal movement will be effected by the actuation of the spring 91 pressing the driven clutch plate 31 into engagement with the driving clutch plate 30 and thereby moving the yoke 34. Movement of post 33 will actuate bell crank 68 to withdraw projection 58 from its notch 59 thus allowing spring 62 to revolve element 57 until pin 67 arrives upon the other side of pin 66 from its switch opening position. Also, sliding of element 57 on shaft 61 will remove projection 65 from its clutch opening position whereupon the motor will continue to operate for a predetermined period after the single revolution of cam 40. This period will be during substantially two revolutions of shaft 61. During the first revolution, element 57 will revolve and pin 67 will come around behind pin 66, to carry pin 66 and disk 63 around during the second revolution, at the end of which the motor switch 23 will be opened.

The delayed time interval will depend upon the gearing. As a result of research, a period of about 12 seconds is preferred, as giving time for an operator to even up batches of sheets to be stapled. The motor will continue to run indefinitely if work is successively introduced within each delayed cut-off period.

A valuable feature of the invention is the clutch shown in Figure 3. The ridge 36 cooperates with the notch 35 to increase the friction of the clutch as the resistance to be overcome by the clutch increases.

Minor changes may be made in the physical embodiment of the invention within the scope of the appended claims without departing from the spirit of the invention.

I claim:

1. A stapling machine comprising a stapling means, a rotary motor, means for drivingly connecting the motor and the stapling means, said connecting means being normally unconnected, a work-engaging member positioned so as to contact the work when the work is placed in stapling position with respect to the stapling means, adjustable mounting means for supporting said work-engaging member whereby the position of the work-engaging member with respect to the stapling means may be varied so as to provide that the staple may be secured to the work at a predetermined location on the work and means responsive to the contact of the work with the work-engaging member for causing said connecting means to be drivingly connected to the motor and the stapling means, whereby when the work is placed in stapling position in contact with the work-engaging member the motor will actuate

the stapling means to cause the latter to staple the work.

2. A stapling machine comprising a stapling means, a rotary electric motor having an energizing circuit and drivingly connected to said stapling means, said motor energizing circuit being normally open, a work-engaging member positioned so as to contact the work when the work is placed in stapling position with respect to said stapling means, and means responsive to the contact of the work with the work-engaging member for closing said motor energizing circuit, whereby when the work is placed in stapling position in contact with the work-engaging member the motor will actuate the stapling means to cause the latter to staple the work.

3. The combination set forth in claim 2, having means for automatically opening said motor energizing circuit at a predetermined period of time after the contact of the work with the work-engaging member.

4. A stapling machine comprising a stapling means, a rotary electric motor having an energizing circuit, means for drivingly connecting the motor and the stapling means, said motor energizing circuit being normally open and said connecting means being normally unconnected, a work-engaging member positioned so as to contact the work when the work is placed in stapling position with respect to said stapling means, means responsive to the contact of the work with the work-engaging member for closing said motor energizing circuit, and means responsive to the contact of the work with the work-engaging member for drivingly connecting said connecting means to the motor and the stapling means whereby when the work is placed in stapling position in contact with the work-engaging member the motor will actuate the stapling means to cause the latter to staple the work.

5. The combination set forth in claim 4, having means for disconnecting said connecting means when a single stapling operation has been completed.

6. The combination set forth in claim 4, having means for automatically opening said motor energizing circuit at a predetermined period of time after the contact of the work with the work-engaging member.

7. The combination set forth in claim 4, having means for disconnecting said connecting means when a single stapling operation has been completed, and means for automatically opening said motor energizing circuit at a predetermined period of time after the contact of the work with the work-engaging member.

8. A stapling machine comprising a stapling means, a motor, means for drivingly connecting the motor and the stapling means and comprising a driving clutch element connected to the motor and a driven clutch element connected to the stapling means, means for maintaining said clutch elements in mutually disengaged relation, a work-engaging member positioned so as to contact the work when the work is placed in stapling position with respect to the stapling means, means for adjustably mounting said work-engaging member whereby the position of the work-engaging member with respect to the stapling means may be varied so as to provide that the location of the staple with respect to the work may be selectively predetermined and means responsive to the contact of the work with the work-engaging member for deactivating said clutch disengagement maintaining means and for maintaining said clutch elements in mutually engaged relation whereby when the work is placed in stapling position in contact with the work-engaging member the clutch elements will engage so as to enable the motor to actuate the stapling means.

9. A stapling machine comprising a stapling means, a motor, means for drivingly connecting the motor and the stapling means and comprising a driving clutch element connected to the motor and a driven clutch element connected to the stapling means, means biasing said clutch elements toward mutual engagement, a locking mechanism for maintaining said clutch elements in mutually disengaged relation, and a solenoid means for releasing said locking mechanism and having an energizing circuit controlled by a switch, and a work-engaging member positioned so as to contact the work when the work is placed in stapling position with respect to the stapling means and adapted to actuate the solenoid energizing switch, whereby when the work contacts the work-engaging member said solenoid energizing switch will be actuated to cause the solenoid means to release said locking mechanism and thereby drivingly connect the motor to the stapling means.

10. The combination set forth in claim 9 having means for reactivating said locking mechanism for disengaging said clutch elements upon completion of a single stapling operation.

11. A stapling machine comprising a frame, a stapling means secured thereto and having a vertically movable staple driver which staples the work therebeneath when moved downwardly, a lever pivotally mounted on the frame and having on one end engaging said staple driver, a cam rotatably mounted on the frame and engaging said lever, a motor, means for drivingly connecting the motor and said cam, said connecting means being normally unconnected, a work-engaging member positioned so as to contact the work when the work is placed in stapling position beneath the staple driver, and means responsive to the contact of the work with the work-engaging member for causing said connecting means to be drivingly connected to the motor and the cam, whereby when the work is placed in stapling position in contact with the work-engaging member the motor will rotate the cam so as to cause the lever to move the staple driver downwardly.

12. The combination set forth in claim 11, having means for disconnecting said connecting means upon completion of a single stapling operation.

13. The combination set forth in claim 11, wherein said lever is resiliently yieldable.

14. The combination set forth in claim 11, wherein said lever has a transverse cross-section of greater width in the horizontal direction than in the vertical direction so as to provide that the lever may resiliently yield upon interference with the downward movement of the staple driver.

15. A stapling machine comprising a frame, a stapling means secured thereto and having a vertically movable staple driver which staples the work therebeneath when moved downwardly, a lever pivotally mounted on the frame and having one end engaging said staple driver, a cam rotatably mounted on the frame and engaging said lever, a motor, means for drivingly connecting the motor and the cam and comprising a driving clutch element connected to the motor and a driven clutch element connected to the cam, means for maintaining said clutch elements in mutually disengaged relation, a work-engaging

member positioned so as to contact the work when the work is placed in stapling position beneath the staple driver, adjustable means for mountably supporting said work-engaging member and for varying the position of the work-engaging member with respect to the stapling means and means responsive to the contact of the work with the work-engaging member for deactivating said clutch disengagement maintaining means and for maintaining said clutch elements in mutually engaged relation.

16. A stapling machine comprising a frame, a stapling means secured thereto and having a vertically movable staple driver which staples the work therebeneath when moved downwardly, a lever pivotally mounted on the frame and having one end engaging said staple driver, a cam rotatably mounted on the frame and engaging said lever, a motor, means for drivingly connecting the motor and the cam and comprising a driving clutch element connected to the motor and a driven clutch element connected to the cam, means biasing said clutch elements toward mutual engagement, a locking mechanism for maintaining said clutch elements in mutually disengaged relation, a solenoid means for releasing said locking mechanism and having an energizing circuit controlled by a switch, and a work-engaging member positioned so as to contact the work when the work is placed in stapling position and adapted to actuate the solenoid energizing switch so as to release said locking mechanism.

17. The combination set forth in claim 16 having means for reactivating said locking mechanism for disengaging said clutch elements upon completion of a single stapling operation.

18. A stapling machine comprising a stapling means, a motor, clutch means for drivingly connecting the motor and the stapling means, said clutch connecting means being normally unconnected, a work-engaging member positioned so as to contact the work when the work is placed in stapling position with respect to the stapling means, adjustable mounting means for supporting said work-engaging member whereby the position of the work-engaging member with respect to the stapling means may be varied so as to provide that the staple may be secured to the work at a predetermined location on the work, and means responsive to the contact of the work with the work-engaging member for causing said clutch connecting means to be drivingly connected to the motor and the stapling means, whereby when the work is placed in stapling position in contact with the work-engaging member the motor will actuate the stapling means to cause the latter to staple the work.

19. A stapling machine comprising a stapling means, an electric motor having an energizing circuit, clutch means for drivingly connecting the motor and the stapling means, said motor energizing circuit being normally open and said clutch connecting means being normally unconnected, a work-engaging member positioned so as to contact the work when the work is placed in stapling position with respect to said stapling means, means responsive to the contact of the work with the work-engaging member for closing said motor energizing circuit, and means responsive to the contact of the work with the work-engaging member for drivingly connecting said clutch connecting means to the motor and the stapling means whereby when the work is placed in contact with the work-engaging member the motor will actuate the stapling means to cause the latter to staple the work.

20. A stapling machine comprising a stapling means, a rotary motor, means for drivingly connecting the motor and the stapling means, said connecting means being normally unconnected, a work-engaging member positioned so as to contact the work when the work is placed in stapling position with respect to the stapling means, means responsive to the contact of the work with the work-engaging member for causing said connecting means to be drivingly connected to the motor and the stapling means, whereby when the work is placed in stapling position in contact with the work-engaging member the motor will actuate the stapling means to cause the latter to staple the work, and means for disconnecting said connecting means when a single stapling operation has been completed.

21. A stapling machine comprising a stapling means, a motor, means for drivingly connecting the motor and the stapling means and comprising a driving clutch element connected to the motor and a driven clutch element connected to the stapling means, means for maintaining said clutch elements in mutually disengaged relation, a work-engaging member positioned so as to contact the work when the work is placed in stapling position with respect to the stapling means, means responsive to the contact of the work with the work-engaging member for deactivating said clutch disengagement maintaining means and for maintaining said clutch elements in mutually engaged relation whereby when the work is placed in stapling position in contact with the work-engaging member the clutch elements will engage so as to enable the motor to actuate the stapling means, and means for reactivating said clutch disengagement maintaining means upon completion of a single stapling operation so as to enable the motor to activate the stapling means only during a single stapling operation.

22. A stapling machine comprising a frame, a stapling means secured thereto and having a vertically movable staple driver which staples the work therebeneath when moved downwardly, a lever pivotally mounted on the frame and having one end engaging said staple drive, a cam rotatably mounted on the frame and engaging said lever, a motor, means for drivingly connecting the motor and the cam and comprising a driving clutch element connected to the motor and a driven clutch element connected to the cam, means for maintaining said clutch elements in mutually disengaged relation, a work-engaging member positioned so as to contact the work when the work is placed in stapling position beneath the staple driver, means responsive to the contact of the work with the work-engaging member for deactivating said clutch disengagement maintaining means and for maintaining said clutch elements in mutually engaged relation, and means for reactivating said clutch disengagement maintaining means upon completion of a single stapling operation so as to enable the motor to activate the stapling means only during a single stapling operation.

23. A stapling machine comprising a stapling means, an electric motor having an energizing circuit and drivingly connected to said stapling means, said motor energizing circuit being normally open, a work-engaging member positioned so as to contact the work when the work is placed in stapling position with respect to said stapling means, means responsive to the contact of the

work with the work-engaging member for closing said motor energizing circuit whereby when the work is placed in stapling position in contact with the work-engaging member the motor will actuate the stapling means to cause the latter to staple the work, means for automatically opening said motor energizing circuit at a predetermined period of time after the contact of the work with the work-engaging member, said motor energizing circuit comprising a switch and said means for opening said motor energizing circuit comprising a rotatably mounted member, means for drivingly connecting the member and the motor so as to rotate said rotatable member at a predetermined rate of speed during operation of the motor, and means cooperating with said rotatable member and said switch for actuating said switch so as to open said circuit when said member has been rotated by the motor through a predetermined angular displacement, whereby said period of time will be determined by the time taken by the motion of said member through said angular displacement.

24. The combination set forth in claim 23 having means responsive to the contact of the work with the work-engaging member for rotating the rotatable member back to the original position assumed by the rotatable member before being rotated by the motor.

FRANCIS J. TAYLOR, JR.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
349,093	Heysinger	Sept. 14, 1886
692,757	Barber	Feb. 4, 1902
945,769	Elliot	Jan. 11, 1910
945,770	Elliot	Jan. 11, 1910
1,023,505	Clark	Apr. 16, 1912
1,041,987	Engberg	Oct. 22, 1912
1,508,467	Novick	Sept. 16, 1924
1,516,336	Crofoot	Nov. 18, 1924
1,807,170	Peterson	May 26, 1931
1,837,910	Kleinschmit	Dec. 22, 1931
1,868,536	Maynard	July 26, 1932
1,933,152	Ryan	Oct. 31, 1933
1,940,980	Svenson	Dec. 26, 1933
2,087,779	Pankonin	July 20, 1937
2,088,350	Shanks et al.	July 27, 1937
2,093,689	Svenson	Sept. 21, 1937
2,125,731	Lipps	Aug. 2, 1938
2,205,861	Oussani	June 25, 1940
2,252,886	Fusco	Aug. 19, 1941
2,272,533	Svenson	Feb. 10, 1942
2,288,881	Bauwens	July 7, 1942
2,320,703	Maynard	June 1, 1943
2,380,116	Lind	July 10, 1945
2,403,947	Oussani	July 16, 1946