June 1, 1954 H. GINTOVT 2,680,029

ELECTROMECHANICAL ATTACHMENT FOR BUSINESS FORM MACHINES

Filed April 1, 1952 2 Sheets-Sheet 1

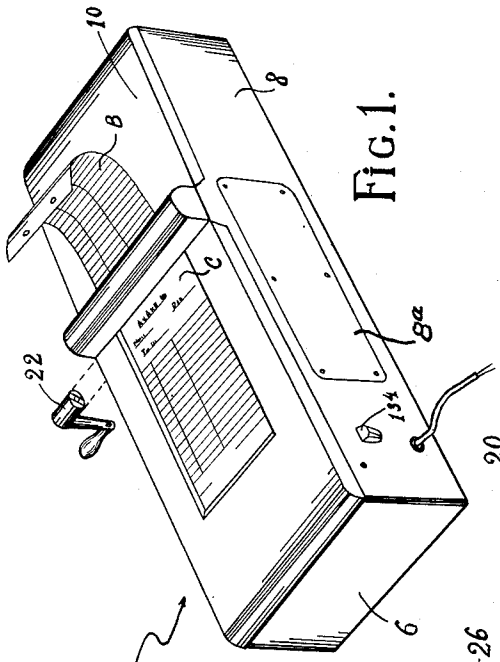


Fig. 1.

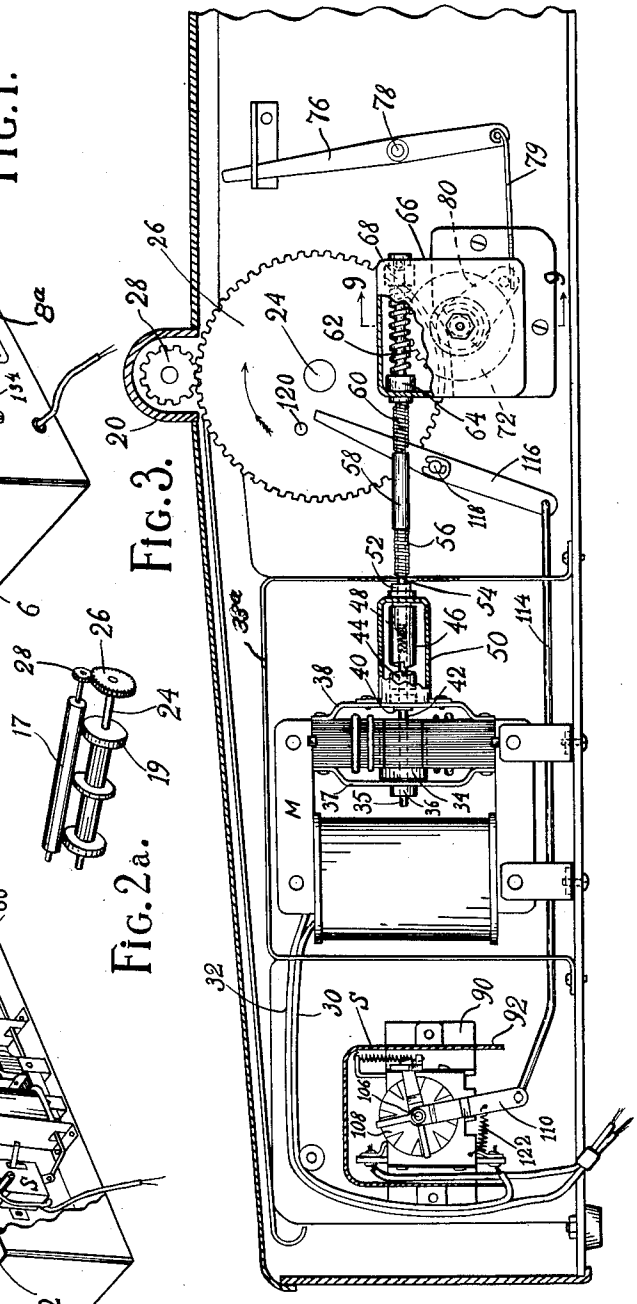


Fig. 3.

Fig. 2a.

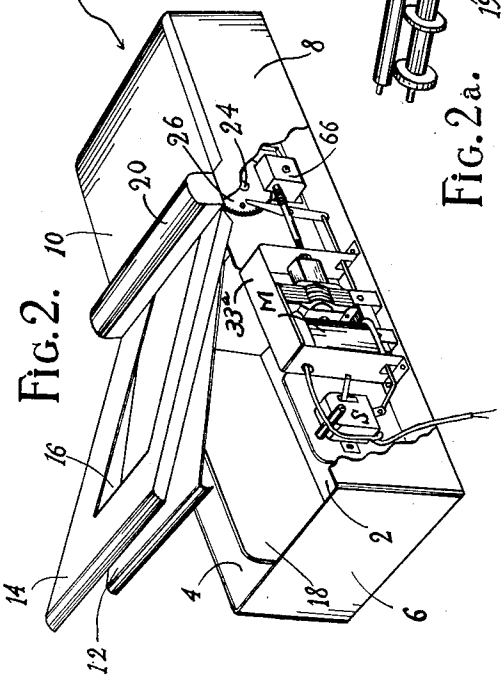


Fig. 2.

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Fig. 4.

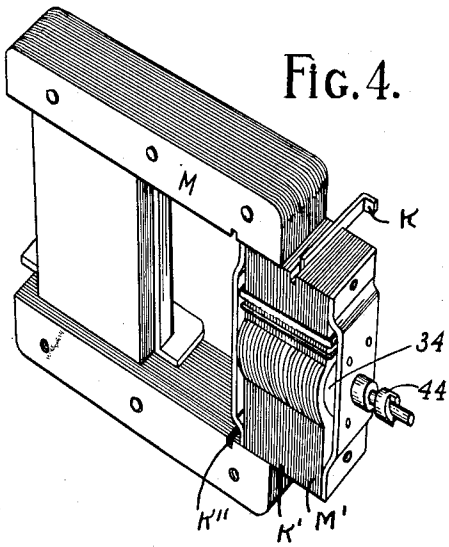


Fig. 6.

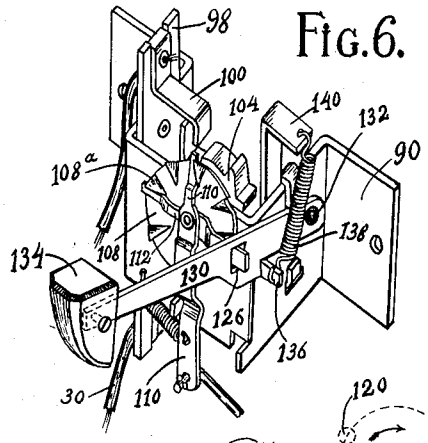
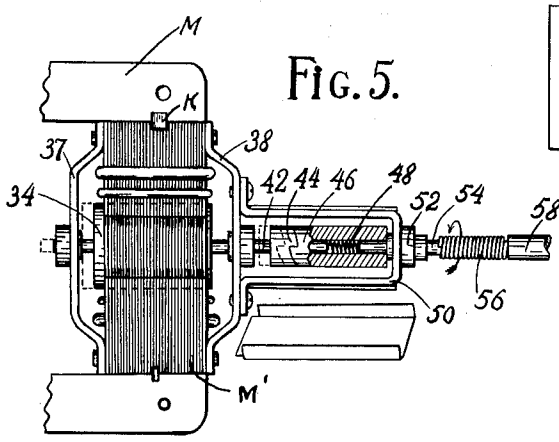


Fig. 5.



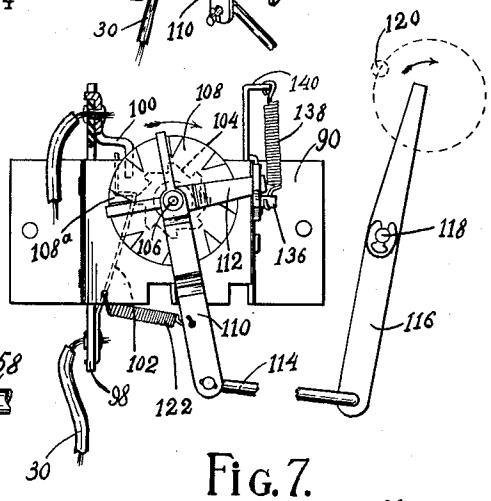
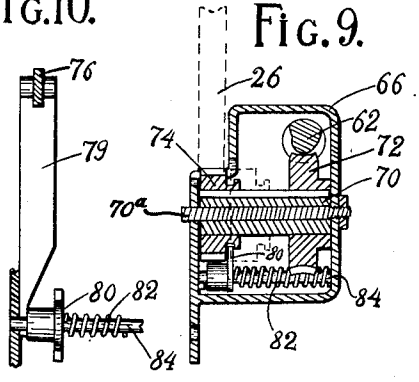


Fig. 7.

Fig. 10.

Fig. 9.



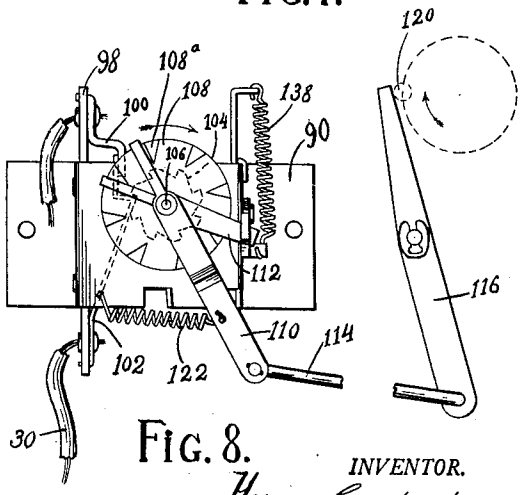


Fig. 8.

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UNITED STATES PATENT OFFICE

2,680,029

ELECTROMECHANICAL ATTACHMENT FOR BUSINESS FORM MACHINES

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Application April 1, 1952, Serial No. 279,891

11 Claims. (Cl. 282—16)

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This invention relates to a mechanism for power driving business form machines of the type which are commonly employed to contain and dispense business forms, such as printed order blanks, connected one to another, and arranged in folded relationship.

In such machines it is customary to provide a feed roll mechanism for periodically moving the forms along the top of the machine into position to receive written subject matter. With each revolution of the feed roll mechanism it is desirable that the used form be carried forwardly into a position where the form can be torn off while a new form is simultaneously brought up ready to be used. Operation of the feed rolls is commonly carried out by means of a hand cranking apparatus. It has long been recognized, however, that power driving means to take the place of the hand cranking apparatus offers desirable advantages, and from time to time efforts have been made to devise a satisfactory power driving mechanism. So far as I am aware these efforts have not been successful owing to limitations in available space in such machines and to the difficulty in securing accurate register with each feeding operation.

It is an object of the present invention, therefore, to improve business form machines of the general class indicated and to devise a simple, efficient, and dependable power driving mechanism for actuating the feed rolls of such business form machines. The invention also aims to provide a compact power driving mechanism which can be simply and cheaply manufactured and attached to business form machines to furnish a highly accurate register of each individual form so that its line of folding with respect to an adjacent form will always stop at the same point and a correct tear line will be observed. Still another object of the invention is to devise a control for power driving mechanisms of the type referred to whereby the power for stopping and starting the machine may be instantly utilized or cut off, as the case may be, and no opportunity can develop for incorrect register. Still another object is to devise a mechanism of the class indicated which requires no particular skill to operate; which cannot interfere with the normal feeding function of the machine if carelessly operated; and which can, at will, be converted to a simple hand cranking operation where this is desired.

These and other objects and novel features will be more fully understood and appreciated from the following description of a preferred embodiment of the invention selected for purposes

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of illustration and shown in the accompanying drawings, in which

Fig. 1 is a perspective view showing one typical business form machine with which the power driving mechanism of the invention has been associated;

Fig. 2 is another perspective view of the machine shown in Fig. 1, but further illustrating the dual cover mechanism in a raised position to reveal the interior of the machine, and also broken away along one side of the machine casing to indicate the relative position of the power driving mechanism of the invention with respect to the conventional feed roll members of the machine;

Fig. 2*a* is a detail perspective view showing feed rolls of the business form machine;

Fig. 3 is a fragmentary cross-sectional view, partly in side elevation, further illustrating the power driving mechanism shown in Fig. 2, but on a larger scale, and more particularly illustrating the driving connection for the conventional feed roll gears;

Fig. 4 is a perspective view illustrating the electrical motor utilized in furnishing power to the apparatus shown in Fig. 3;

Fig. 5 is a fragmentary detail elevational view of the driving connection between the motor and driving shaft elements, including a clutch device;

Fig. 6 is a perspective view of the switch assembly employed to control application of power generated in the motor shown in Fig. 4;

Fig. 7 is another view of the switch shown in Fig. 6 viewed from one side thereof and including diagrammatically a showing of a lever and stop mechanism associated with the switch;

Fig. 8 is a view corresponding to Fig. 7 but showing the switch in a different position assumed in response to change in the stop and lever mechanism;

Fig. 9 is a detail cross-section taken on the line 9—9 of Fig. 3; and

Fig. 10 is a detail fragmentary view of release means for the worm mechanism.

In the structure shown in the drawings, and referring particularly to Figs. 1 and 2, I have illustrated a preferred embodiment of my invention combined with one type of business form machine. It should be understood, however, that I do not intend to limit the invention to any specific type of business form machine but I may, on the contrary, apply my invention to any one of a number of such machines commonly in use at the present time. It is especially contemplated that the invention is to be adaptable for use with either

new machines or older types of machines now in operation.

The machine shown in the drawings has been generally designated by the arrow B between Figs. 1 and 2 and comprises a casing which includes a bottom 2, side walls as 4, 6 and 8, a top 10, and a pair of cooperating hinged covers 12 and 14, the uppermost of which is cut out to leave an order blank aperture 16. In the conventional form of such machines as ordinarily employed at the present time, an order blank well or receptacle for receiving a stack of folded blanks is provided in the space directly below the cover 12. Usually this well is defined by two vertical side plates or partitions, as 18, one of which is shown in Fig. 2.

When a stack of order blanks in folded relationship has been located in the well, the uppermost blank B, (Fig. 1) is drawn up over the cover member 12 and passed between this member and the cut-out cover 14 and engaged at its forward edge between a pair of feed rolls 17 and 19 located one above another in rolling contact with one another. These rolls extend transversely across a midsection of the casing and lie directly below the annular housing member 20 shown in Fig. 2. The feed rolls are shown removed from the casing in Fig. 2*a*, and are of the conventional type ordinarily employed in machines of this class. The usual method of operating the rolls is to turn by hand a crank 22 which is fast on a shaft 24, the latter carrying the lower roll 19 and at its opposite outer extremity having fixed thereon a gear 26. This gear, in turn, drives a gear 28 on the same shaft with the roll 17.

The roll 19 is customarily arranged to make a single revolution with each turn of the crank and is controlled so that it returns to the same starting point with each cycle of operation. It is important in doing this that the uppermost order blank B be drawn forwardly away from the rolls, and the next succeeding blank C be brought up to writing position with a tear line extending between the two adjacent blanks coming into exact register with a guide edge ordinarily employed for this purpose.

In accordance with the invention I provide a power driving mechanism to operate the rolls 17 and 19 and take the place of the crank 22 when a fully automatic operation is desired. This is accomplished without eliminating the hand cranking mechanism from the machine. I further provide for an arrangement of parts whereby I am enabled to take advantage of the very limited amount of space which occurs between the order blank well partition and the outer side wall 8 of the machine casing.

It is pointed out that earlier attempts have been made to install power driving mechanism operating at a point externally of the side walls of the casing and such devices have not been found to be satisfactory as they require additional space to support them and are not suited for general business use. Because of the small amount of space which actually is present between the partition of the order blank well and the outer side wall of the casing, a distance of from one inch up to one and one-half inches, at the most, standard types of power driving mechanisms cannot be accommodated and no one, so far as I am aware, has succeeded in devising a practical and dependable power driving unit which could be confined in such a narrow space and operate efficiently.

With these limitations in mind I have devised a novel electrical motor arrangement which can be accommodated in the narrow space occurring between one of the well partitions 18 and the outer side wall 8, and therefore the standard size of casing can be utilized without change in size or appearance. I have further devised, in combination with the motor arrangement, a unique worm driving gear mechanism which can be effectively connected in driving relationship with the electrical motor, in its confined position and which functions as a means of interlocking the feed rolls with the worm drive when the motor is deenergized. The driving force delivered through the worm gear mechanism furnishes an adequate source of power to the feed rolls of the machine, which power can be cut off instantaneously without the feed rolls over-riding their starting point.

This electrical motor arrangement has been generally denoted by the letter M and shown in Figs. 2, 3, 4 and 5, and is preferably of the induction type with current being supplied from a standard alternating current 110 volt line through electrical conductors 30 and 32 connected to the winding of the field member, as shown in Fig. 3, to operate a rotating inductor 34. This rotating inductor is further shown in Figs. 4 and 5, and, as will be noted from an inspection of these figures, is particularly arranged to take advantage of and operate in the narrow elongated passageway which is present between the well partition 18 and the side wall 8 of the machine. This is made possible by the preferred construction of the field member shown in the drawings, which construction includes a stack of U-shaped laminae stamped from sheets of magnetic iron, and associated with the U-shaped laminae is a removable pole member M' which carries the rotating inductor 34. This pole member is adjustably received between the arms of the U-shaped field member and is preferably held, for example, by key members K which slide into keyways K' and K'' formed in the pole member and the field member, respectively, all as shown in Fig. 4. To protect the motor M I provide a shield or cover 33*a*, as shown in Fig. 3, and this member is formed of a non-magnetic metal. Similarly, I may provide a detachable cover 8*a* to provide access to the motor, and this member also is preferably formed of a non-magnetic material.

As will be seen from the drawings, the rotating inductor extends, in its longitudinal dimension, in a direction parallel to its axis of rotation and also parallel to the plane of the sides of the field member, and when the current is flowing the inductor will be subjected to a magnetic pull or force which moves the rotating inductor in a direction from left to right, as viewed in Figs. 3 and 5, in accordance with well known electrical induction principles. Advantage is taken of this type of movement to connect a worm gear mechanism between the inductor and the feed rolls. Thus, in one preferred construction the inductor 34 has its shaft extremity 35 received in a bearing 36 which is, in turn, mounted in a bracket member 37 attached to the motor M, as shown. Similarly, a second bracket member 38 is attached at the opposite side of the motor and supports a bearing 40 in which is pivotally received an opposite shaft extremity 42. Fast on this shaft extremity is a clutch element 44 which is adapted in response to movement of the inductor in a direction from left to right, as viewed in Fig. 3, to engage with a second clutch element 46. The shaft extremity 42 in moving into an engaged

clutch position is forced against a spring member 48 contained within a bore formed centrally in the clutch element 46. When the motor is deenergized, the spring operates to push back the shaft 42, together with attached clutch element 44, and thus disengage the clutch when the motor M is not operating. The two clutch elements and inductor shaft may be housed within a casing 50 which is conveniently fastened to the bracket 38.

At the opposite end of the casing 50 is a bearing 52 through which is received a shaft 54 connected to the clutch element 46. To this shaft 54 is attached a flexible coupling element 56 which may comprise a coiled spring. The opposite end of the spring 56 is secured to the reduced end of another drive shaft element 58, and when the motor through the clutch elements 44 and 46 drives the shaft 54, the spring 56 acts as a torque arresting means or flexible coupling for cushioning the shock of sudden stop and starting forces. It may also be desired to utilize a second coupling member 60 secured to the drive shaft 58, as suggested in Fig. 3 of the drawings.

In combination with the motor, clutch and torque arresting means I provide a special worm gear mechanism including a worm 62. The spring 60 is anchored to one end of the worm member 62 which is mounted in a bearing member 64, in turn received in a housing 66. A second bearing member 68 in the housing 66 supports the remaining end of the worm 62, as shown in Fig. 3.

Mounted in the housing 66 in keyed relation on a hollow shaft 70 (Fig. 9) is a worm wheel 72 which is adapted to be driven by the worm 62 in response to rotative movement of the drive shaft 58 and motor shaft 42. The shaft 70 is mounted on a pin 70a. Also mounted on the shaft 70 is a pinion 74 which is adapted to mesh with the large gear 26 indicated in broken lines in Fig. 9. The pinion 74 is slidably keyed to the shaft 70 and is formed with a reduced neck in which runs a slider element 80. The latter member is slidably mounted on the shaft 84 and normally is held in the position shown in Fig. 9 by a spring 82. The pinion 74 therefore may be moved in a direction axially of the shaft 70 in response to movement of a lever 76 pivoted in the machine frame at 78 and attached to a control arm 79. This results in the pinion 74 becoming disengaged from the large gear 26. It will be seen that the mechanism described provides a convenient means for completely disconnecting the driving engagement of the worm mechanism with the large gear 26 and therefore permits the rolls 17 and 19 to be operated in the conventional manner by turning the handle 22. It will also be observed that the above described construction provides a means for interlocking the worm drive with the feed roll in a constantly registered position at such time as the electrical motor is deenergized.

In combination with the electrical motor means and worm driving gear mechanism described, I further provide a special switch device for periodically stopping and starting operation of the feed rolls. This switch device is shown at the left-hand side of Figs. 2 and 3 wherein it has been generally denoted by the letter S. The objectives which the switch is designed to accomplish are as follows:

If the operating switch handle is depressed and released it is intended that the circuit be closed, and remain closed, until the feed rolls have made one revolution. Similarly, if the operating knob is depressed and held down, it is desired that the circuit be closed, and remain closed, for a single revolution of the feed rolls. Finally, if the operating knob is depressed intermittently within the time of one cycle of operation it is intended that the circuit will be closed; remain closed for a single revolution of the feed rolls; and will automatically stop at the end of a single revolution. As noted in these figures the switch may be conveniently supported on a U-shaped bracket member 90 which may, for example, rest on the bottom 2 of the casing or a side thereof and be fastened in some convenient manner, as by welding. A cover 92 is adjustably secured over the switch and in contact with the bracket 90.

The bracket 90 supports an insulated terminal plate 98 on which is secured an electrical terminal 100 and a contact spring 102 which normally seeks to engage with the terminal 100 in the position shown in dotted lines in Fig. 3. Mounted for engagement with the contact spring 102 is a wheel 104 (Fig. 6) having serrated peripheral edges which, as the wheel rotates, are adapted to move the spring 102 into and out of contact with the terminal 100 and thus open and close a circuit through the conductor 30 and the motor M.

The wheel 104 is carried on a shaft 106 which is rotatably mounted through the U portion of the bracket 90, as may be better seen in Figs. 7 and 8. Also fixed on this shaft 106 is a selector disk 108 which is formed with a series of indented portions and adjoining shoulders 108a. Loosely pivoted on the shaft 106 in close proximity to the outer surface of the wheel 108 are two operating arms 110 and 112. Each of these arms has outer extremities which are offset to provide engaging tips adapted to engage against the shouldered portions 108a of the disk.

At the lower end of the arm 110, as illustrated in Fig. 7, is pivotally pinned a rod 114, the opposite extremity of which is pivotally attached to a lever 116 and the lever itself is mounted on a pivot 118 which may be fastened or mounted in some convenient portion of the adjacent side wall of the machine, as shown in Fig. 3. The upper end of the lever 116 is arranged to overlie the gear 26 and project upwardly into the path of travel of a stop member 120 fixed on the face of the gear 26, as best shown in Fig. 3. The stop member has also been indicated diagrammatically in two different positions in Figs. 7 and 8, respectively.

It will thus be seen that when the large gear 26 rotates in a clockwise direction, as viewed in Fig. 3, the stop 120 will move around into contact with the upper end of the lever 116 and will pivot the lever into some position such as that suggested in Fig. 8. In so doing it will, through the rod 114, pull the lower end of the arm 110 forwardly into a position such as that shown in Fig. 8 against the action of a coiled spring 122 connected into the arm 110 at one end and anchored at the other end in the bracket 90. The arc of rotation through which the tip of the arm 110 may be turned by the rod 114 is less than the distance between any two adjacent portions 108a of the disk and therefore cannot move into a position to produce further rotative movement of the disk in a clockwise direction until the disk has itself been stepped ahead by the arm 112. Once the disk has been stepped ahead by the arm 112 at some predetermined point the stop 120 moves out of contact with the lever 116 and the arm 110 can then pass over the next succeeding

portion 108a, and when actuated by the spring 122 will produce the desired rotative movement.

The second arm 112 is arranged in a position substantially at right angles or some other angle to the arm 110 whose tip likewise may move through an arc less than the distance between the portions 108a, and this arm has an outer extremity received through a slot 126 formed in a switch bar 130 which is pivotally attached at 132 to the bracket 90 and which carries at its outer end an operating knob 134. At one side of the bar 130 is a projection 136 to which is secured an extremity of a spring 138 and the other end of the spring is anchored in an upright angle piece 140. The action of the spring 138 is to normally hold the operating bar and knob 134 in a raised position. By depressing the knob 134 and thus pivoting the bar 130 downwardly, the arm 112 is caused to rotate on its shaft for a short distance in a clockwise direction.

Assuming that the device is in its normal position shown in Fig. 7, such a limited rotation of the disk 108 will allow the contact spring 102 to come into contact with the terminal 100 and thus close a circuit through the motor. The closed circuit thus made will remain in operation during the period in which the stop member 120 on the gear 26 makes a single revolution starting from a point, such as that shown in Fig. 3, and returning to this same point. In the manner already described, the stop 120 after engaging with the lever 116 causes the arm 110 to first move in a counter-clockwise direction and then to step the disk member ahead a sufficient amount to raise the contact spring 102 out of engagement with the terminal 100. No further operation of the device takes place until the knob 134 is again depressed. The relationship between the arm 112 and the arm 110 is such that the arm 112 sets the switch in a closed position and cannot operate again until the arm 110 has performed its function, as described above.

From the foregoing description it will be seen that I have provided a simple but efficient mechanism for power driving the feed rolls of a business form machine, and I am enabled to develop a satisfactory degree of energy by means of a special motor arrangement in which a rotating inductor is caused to move in the direction of its length and parallel to its axis of rotation, as well as parallel to the plane of the sides of the field member, in the narrow passageway or space lying between the order blank well and the side wall of the machine casing. It is also pointed out that I have combined with this motor arrangement a special worm driving gear mechanism which translates energy from the rotating inductor directly to the gearing for the feed rolls of the machine so that there is no lost motion at any point in the mechanism. Moreover, the stopping and starting point can be very finely set. Another important feature of the construction described resides in the fact that the switch mechanism has been especially devised to control the movement of both of these mechanisms in such a related manner that energy can be instantly cut off, at will, and the register of the tear line connected order blanks may be accomplished in a practical manner. The assembly is characterized by a relatively small number of parts which can be cheaply and quickly combined in the space referred to with a minimum of installation cost, and without interfering with the normal operation of the machine in any way. Furthermore, the entire operation can be converted from a power drive to a manual cranking operation by merely throwing the lever 76. I may also desire to modify the invention by providing a separate electromagnetic control relay which is arranged in series with the motor M to independently control the clutch.

While I have shown a preferred embodiment of the invention, it should be understood that changes and modifications may be resorted to in keeping with the spirit of the invention as defined by the appended claims.

I claim:

1. In a business form machine of the class having a business form well and an outer casing constructed and arranged with its side walls lying in spaced relation to the sides of the said well to define a narrow passageway, a pair of feed rolls transversely mounted in the casing in position to engage and feed business forms from the said well, gear means for actuating the feed rolls, said gear means extending into said passageway, an electrical motor constructed and arranged to fit into the narrow passageway, a worm drive for operatively connecting the electrical motor in driving relationship with the said gear means, and an electrical switch device responsive to movement of said gear means for controlling the operation of the said electrical motor.

2. In a business form machine of the class having a business form well and an outer casing constructed and arranged with its side walls lying in spaced relation to the sides of the said well to define a narrow passageway, a pair of feed rolls transversely mounted in the casing in position to engage and feed business forms from the said well, gear means for actuating the feed rolls, said gear means extending into said passageway, a power driving mechanism disposed in close proximity to the said gear means in the passageway, said power driving mechanism including a worm drive operatively connected to the gear means, an electrical motor for actuating the worm drive, said motor being constructed and arranged to fit between the sides of the narrow passageway, and an electrical switch device mounted in the passageway for controlling the operation of the said electrical motor.

3. A structure as defined in claim 2, in which the electrical switch device is operatively connected to, and under the control of, the said gear means.

4. A structure as defined in claim 2, in which the electrical switch device includes an actuating arm, a pivoted lever connected to the actuating arm, one end of said lever projecting into close proximity to the said gear means, and a stop element rotatable with the said gear means for periodically engaging against and moving the pivoted lever.

5. A structure as defined in claim 2, in which the worm drive includes a worm wheel, a worm, a driving shaft extending along the passageway and connected to said worm, and clutch means for engaging said shaft in driving relationship with the electrical motor.

6. A structure as defined in claim 2, in which the worm drive includes a worm wheel, a worm, a driving shaft for rotating the worm, a clutch mechanism for engaging the electrical motor in driving relationship with the said driving shaft, said electrical motor being of the induction type and including a rotor element constructed and arranged to move in an axial direction and cause the clutch to assume an engaged position when the electrical motor is energized.

7. A structure as defined in claim 2, in which the electrical motor comprises an induction motor including a field, a rotor, and a control circuit, and means for supporting the rotor in a position in which it may move axially toward and away from the said gear means.

8. A structure as defined in claim 2, in which the electrical motor comprises a field, a rotor, and a control circuit, means for supporting the rotor in a position in which it may move axially toward and away from said gear means, a clutch element carried by said rotor, a second clutch element attached to said worm drive and adapted to resiliently engage with the said first clutch element when the motor is energized.

9. A structure as defined in claim 2, in which the electrical switch device comprises electrical terminals, spring contact means for closing a circuit through said terminals, a rotatable wheel member constructed and arranged to alternately move the contact means in to and out of a closed circuit position, and selector disk mechanism for selectively moving the rotatable wheel member.

10. A structure as defined in claim 2, in which the electrical switch device comprises electrical terminals, spring contact means for closing a circuit through said terminals, a rotatable wheel member constructed and arranged to alternately move the contact means in to and out of a closed circuit position, selector disk mechanism for selectively moving the rotatable wheel member, said selector disk mechanism including a selector disk having a series of spaced-apart serrations located therearound, an arm pivotally mounted on the disk for rotation through an arc of a magnitude less than the distance between any two serrations, and a second arm pivotally mounted on the disk in angular relationship with respect to the first arm and adapted to produce a small rotative movement of the disk into a position where one of the serrations may be engaged by the said first arm, said latter arm being responsive to movement of the said gear means.

11. In a business form machine of the class having a business form well and an outer casing constructed and arranged with its side walls lying in spaced relation to the sides of the said well to define a narrow passageway, a pair of feed rolls transversely mounted in the casing in position to engage and feed business forms from the said well, gear means for actuating the feed rolls, said gear means extending in to the said passageway, an electrical motor constructed and arranged to fit in to the narrow passageway, a worm drive for operatively connecting the electrical motor in driving relationship with the said gear means, an electrical switch device responsive to movement of said gear means for controlling the operation of the said electrical motor, and said worm drive occurring in interlocked relationship with the said gear means to instantly stop the feed rolls and hold them in a stationary position when the electrical motor is deenergized.

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