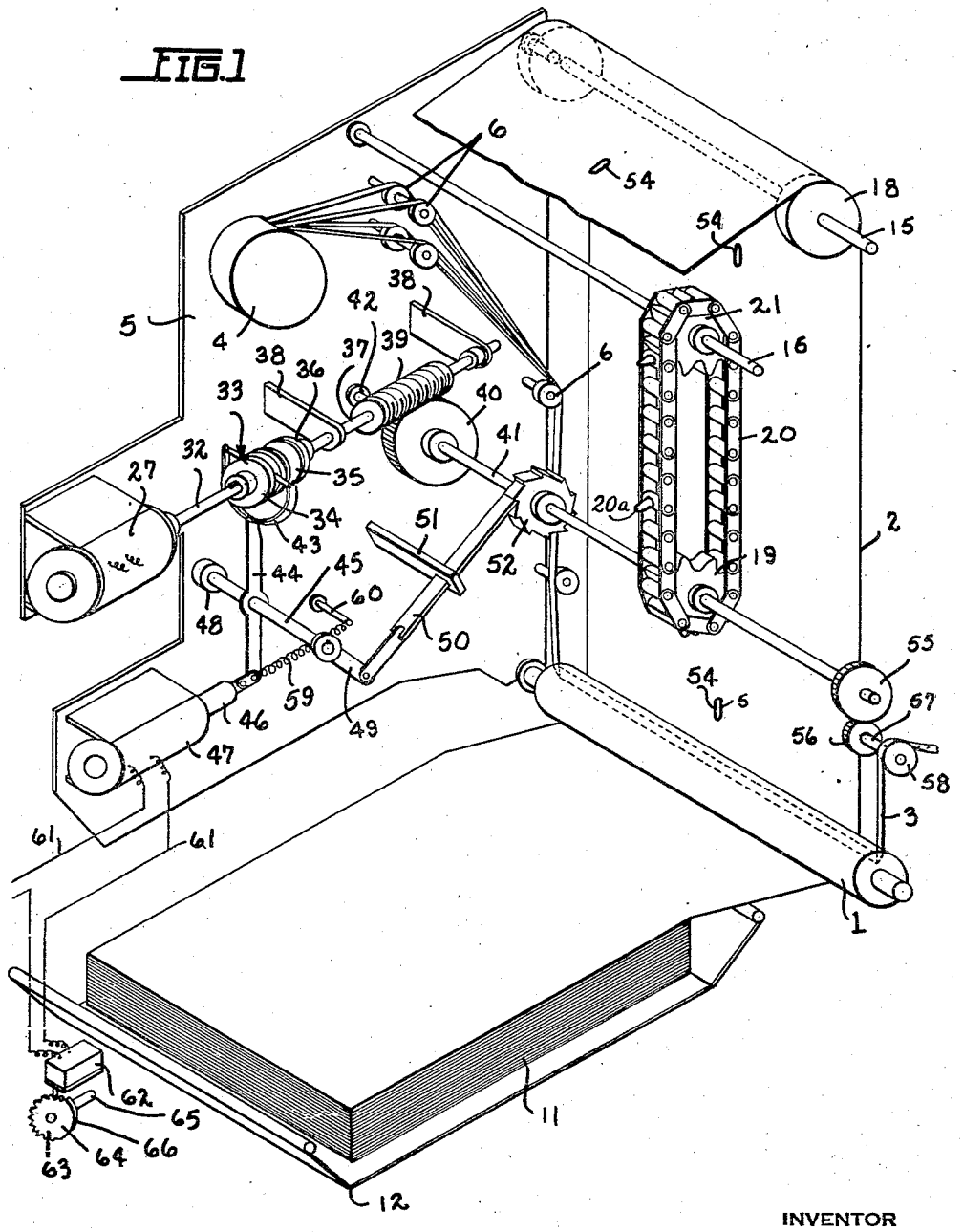
Sept. 17, 1946. R. W. RITZERT 2,407,799

CARBON FEEDING MEANS FOR MANIFOLDING MACHINES

Filed April 28, 1943 3 Sheets-Sheet 1

FIG. 1



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CARBON FEEDING MEANS FOR MANIFOLDING MACHINES

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FIG. 2

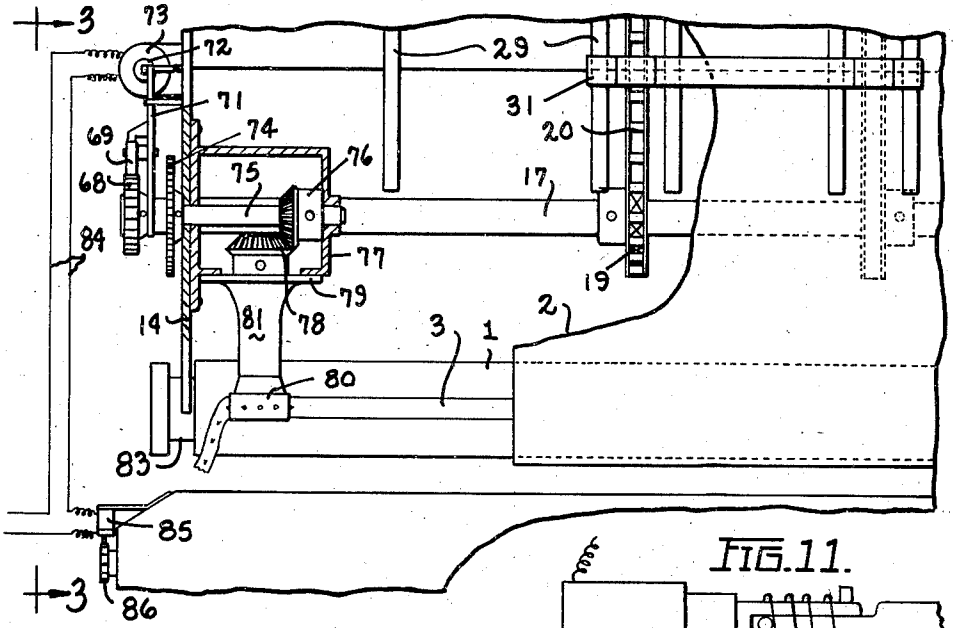


FIG. 11.

FIG. 3

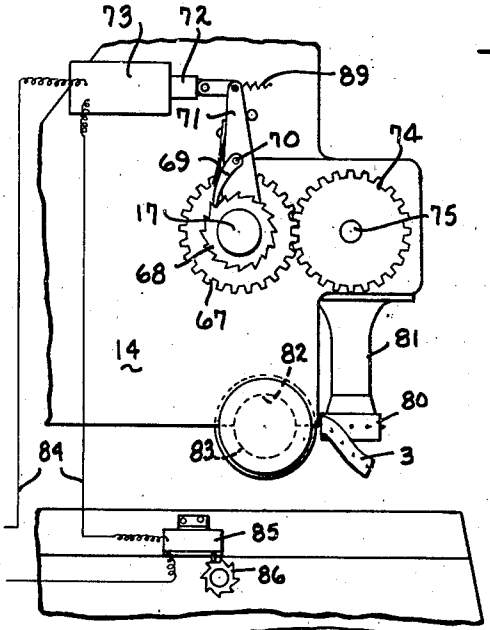


FIG. 4.

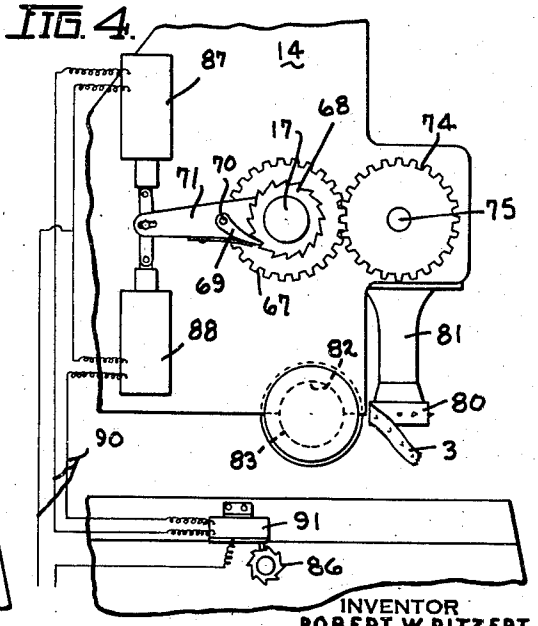
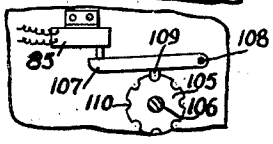


FIG. 9.



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CARBON FEEDING MEANS FOR MANIFOLDING MACHINES

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FIG. 5.

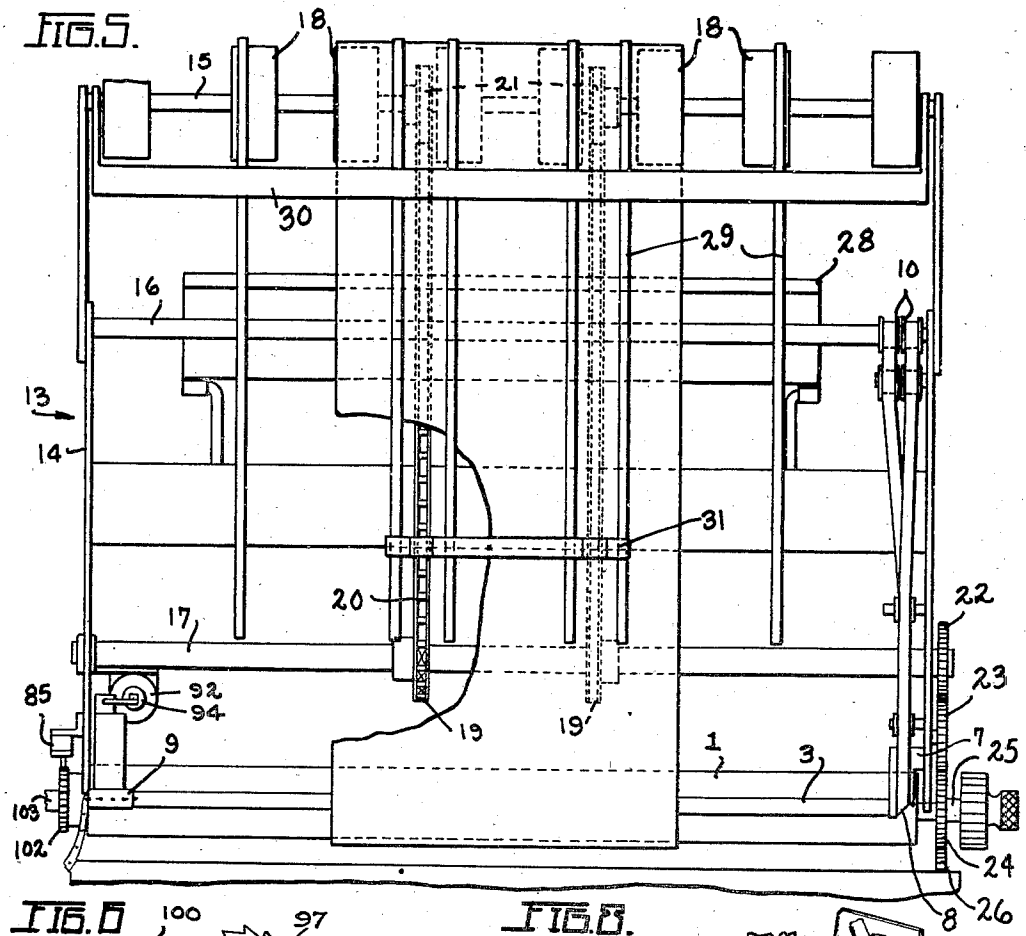


FIG. 6

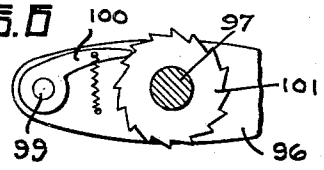


FIG. 8.

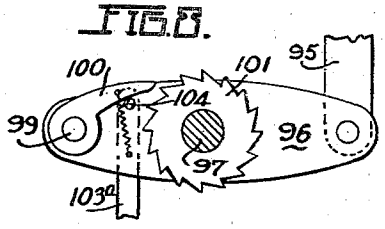
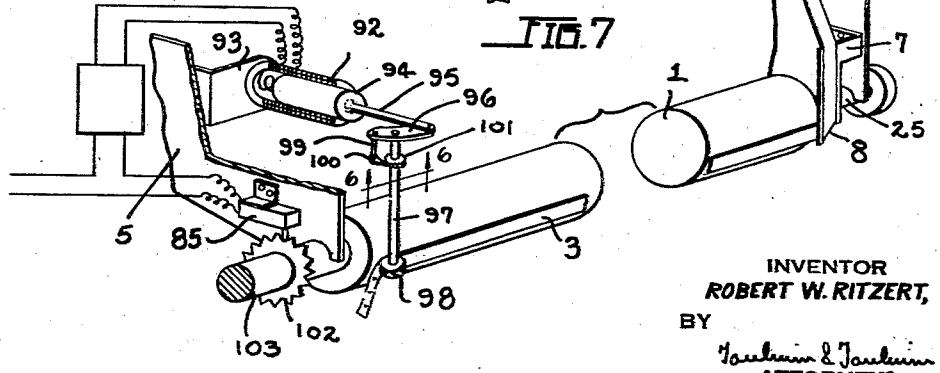


FIG. 7



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UNITED STATES PATENT OFFICE

2,407,799

CARBON FEEDING MEANS FOR MANIFOLDING MACHINES

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Application April 28, 1943, Serial No. 484,810

5 Claims. (Cl. 197—126)

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The present invention relates to manifolding machines, and in particular to such machines which are adapted to make multiple copies of typed or printed material by means of copying ribbons or carbons, particularly those machines used in connection with typing, adding and tabulating machines and the like.

The multiple typing or printing is provided by a plurality of carbon ribbons or webs which are interleaved transversely of and between the paper sheets at the position of the platen. These ribbons are caused to move across the paper, i. e. normal to the movement of the paper, during the spacing line interval by means of a pin wheel drive. Thus the carbon ribbons are moved from one side of the paper to the other side in steps corresponding to the line spacing operations of the main typing machine, the separate movements of the ribbons ranging between one-quarter and one-half inch.

When the last line has been typed or printed on the paper, an automatic ejection mechanism is brought into play to move the superposed sheets or webs of paper rapidly upwardly over a considerable distance such that the succeeding sheet of the superposed paper lengths are placed in position for the next typing or printing operation. During this ejection spacing feeding operation of the paper webs, the pin wheel which feeds the carbon ribbons across the paper is moved to make certain that the carbon ribbons are free from the typed or printed sheets. It will be understood that the pin wheel does not rotate during the typing or printing operation.

The pin wheel is therefore called upon to have a number of different rotary operations, extending over different periods of time and these rotary movements may be separated by periods of time during which the pin wheel remains stationary. In the case of a motor driven machine, the motor rotates continuously so that a suitable form of clutch must be inserted between the motor drive and the intermittently movable pin wheel. The control element for this clutch is normally of a complicated type since the clutch must operate entirely automatically and over different time intervals during the line spacing and eject operations of the machine and must be kept open during the typing of the successive lines of print.

The primary object of the present invention is to eliminate this complicated clutch and its control element. As a substitute therefore, a mechanism is provided of the electrical type which will perform all of the functions of the intermittent drives heretofore performed by the clutch and yet will be of a more simple design with consequently less expense.

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Another object of the invention is to provide an adding and tabulating machine having a manifolding attachment with an improved and simplified form of mechanism by which the paper moving drive may be readily separated from the ribbon moving or pin wheel drive, thus facilitating synchronizing or other control effects between these various movements.

These objects are carried out in brief in accordance with the present invention by substituting a wholly electrical actuating mechanism for both the paper moving drive and the ribbon feed in such a way that one of the drives may be operated independently of the other or may be operated simultaneously and in both cases without requiring complicated clutch apparatus and a complicated control mechanism for the clutch.

The invention will be better understood when reference is made to the following description considered in connection with the accompanying drawings in which:

Figure 1 is a perspective view of a conventional typing or adding and tabulating machine improved in accordance with the invention. This view is taken from the rear of the machine with some of the parts removed in order to show the parts involved in the invention more clearly.

Figure 2 is a fragmentary elevational view of a modified structural arrangement, partly broken away and a section of the actuating elements for rotating the paper and ribbon drives.

Figure 3 is an elevational end view of the mechanism shown in Figure 2 and taken at approximately the line 3—3 in that figure.

Figure 4 is a view similar to Figure 3 but showing a modified structural arrangement.

Figure 5 is an elevational view of the improved machine looking from the front but with the paper web broken away to show the otherwise hidden parts.

Figure 6 is a view of the ratchet wheel shown in Figure 7, looking approximately from the position of line 6—6 in that figure in the direction of the arrows.

Figure 7 is a perspective diagrammatic view of the details of an electrically operated system for actuating the ribbon feeding mechanism. This structure represents a modification of the apparatus shown in the other figures.

Figure 8 shows a modified form of ratchet

wheel and pawl which is employed for rotating the ribbon feeding pin wheel.

Figure 9 represent a fragmentary diagrammatic view of a modified form of star wheel and associated mechanism which initiates the operation of the pin wheel shown in Figure 7.

General arrangement

In general, the manifolding machine of this invention as shown in Figures 1 and 2 is an attachment to be used in conjunction with a machine adapted to type or print a record, such as a tabulating and listing machine, typewriting machine or adding machine. The machine ordinarily is provided with typing mechanism, including type and a ribbon, together with means for printing a single copy of a record or multiple copies with the use of sheets of carbon paper interleaved between the multiple paper sheets or webs.

In the machine disclosed in this application the multiple copies of the record are made upon multiple paper webs interleaved with "one-time" copying ribbons between the multiple paper webs and traveling in a direction perpendicular to the direction of motion of the sheets or webs. In this manner, necessity for the use of carbon sheets is eliminated, together with the difficulties of realining the carbon sheets when occasion requires. The copying ribbons employed in the present invention are made of a cheap material and can be used one time and then discarded. A short strip of the copying ribbon which may consist of a carbon paper ribbon is equivalent to an entire sheet of the carbon paper hitherto employed.

Certain machines for which my invention is intended, such as tabulating and listing machines are equipped with mechanisms for automatic ejection movement of the paper forms; that is, for moving the paper webs a multiplicity of line spacings between successive forms in order to pass from the typing position, at the bottom of one form, to the typing position at the top of the next form. These forms are provided with reversely arranged creases or folds in order more conveniently to be handled and they are presented to the main machine and the manifolding attachment in this manner.

These forms are caused to lie flat-wise against a vertical framework of the machine during the typing or printing operation and when this operation is completed the forms are fed upwardly over the frame in such a way that they will return to their creased or folded condition and be received by a basket or trough.

In general, I propose to eliminate clutches and mechanical power transmission mechanisms, replacing them by electrical systems of a simplified arrangement and parts.

Referring more particularly to Figures 1 and 5, reference character 1 designates the platen of the machine and the middle line of the platen would represent the normal typing or printing position at which the type arms contact with the paper. The lengths of paper being typed or printed are indicated at 2 and for simplicity only one thickness of paper has been illustrated although it will be understood that there is normally a plurality of paper sheets being fed simultaneously through the machine and interleaved with carbon paper ribbons indicated at 3. These ribbons, of which four have been illustrated assuming that five sheets of paper are being typed or printed simultaneously are supplied from a spool compartment 4 of any suitable and well known type, the latter being secured to one of the side frames 5 of the machine. The spools are separated from one another within the compartment 4 and the four strands of ribbon are carried over suitably positioned and individual guide rolls 6 mounted on spindles which project inwardly from the side plate. In order to change the direction of the ribbons from the vertical to the horizontal so as to cause the ribbon to extend along the length of the platen a so-called turn plate 7 is employed, this plate being secured to the right hand side plate 5 as seen in Figure 5. The turn plate may comprise an angularly shaped sheet of metal having a large flat plate and being provided at the bottom with a diagonally extending edge 8 over which the ribbons are caused to move, thus giving them a horizontal direction as seen in Figures 5 and 7. At the opposite end of the platen the ribbons which are now arranged in stack form due to the converging action of the turn plate are caused to pass around a pin wheel 9 which is rotatably actuated in the manner which will be described hereinafter.

Thus the pin wheel serves to exert a pull on the various lengths of ribbon and therefore maintains the latter in a taut condition. This tautness is facilitated by applying a braking action on the spools 10 contained in the compartment 4. It will be understood that the ribbons 3 interleave the paper lengths 2 and when the machine is originally set up the ribbons are taken through the spaces formed between the sheets of paper as is well understood in the art.

A typewriting machine of the character shown is often employed in connection with a manifolding operation in which the paper sheets or webs are presented from a stack of paper which has reversely positioned folds or creases. Such a paper stack is indicated at 11 (Figure 1) and the stack is carried in a basket 12 which may be secured to the frame of the machine. After passing under the platen 1 the paper is guided vertically upward over the frame generally designated by the numeral 13. See Figure 5. This frame may consist of a number of side strips 14 secured endwise together and spaced apart by an upper shaft 15, an intermediate shaft 16 and a lower shaft 17. The uppermost shaft 15 is provided with a plurality of rollers 18 spaced at various distances apart to accommodate any desired width of paper. The intermediate shaft 16 may serve as a mounting for the ribbon spools 10 while the lower shaft 17 is provided with a pair of sprocket wheels 19.

A chain 20 is carried by these sprocket wheels, the upper ends of the chain meshing with an equivalent pair of wheels mounted on the shaft 15, as shown in Figure 5, or on shaft 16 as shown in Figure 1. The sprocket chains 20 are provided with outwardly extending projections 20*a* which register with spaced openings 54 contained in the multiple paper webs. The arrangement is such that as the chains are moved upwardly, the paper sheets 2 are caused to be fed in the vertical direction over the guide rollers 18. The sprocket wheels 19 are actuated by means of a gear 22 secured to the shaft 17, at the outside of the frame members. This gear meshes through a gear train 23 with a gear 24 which is mounted on the platen shaft 25. The gear 24 is power driven through a pinion 26 which may be mechanically connected in any suitable and well known manner to the main drive motor 27 shown

in Figure 1. A suitable form of clutch is inserted between the motor and the gear train which drives the sprocket shaft 17. Consequently, as the shaft 17 is rotated in a manner which will be described in detail, the manifolded paper is pulled from the stack 11 and after passing around the platen 1 is caused to move vertically upwardly over the rollers 18 by means of the sprocket chains and the upper end of the paper may be received as a folded stack by the basket 28.

The paper is maintained in a relatively flat state as it is moved upwardly over the rollers by means of a skeleton frame which may be formed of a plurality of vertically extending metal strips 29 secured at their upper ends to a horizontally disposed bar 30 and the lower ends of which carry a short horizontal bar 31. This frame, or rather the lower ends thereof press against the paper.

The motor 27 may be secured to one of the side walls 5 of the machine and a shaft 32 connects the motor to a clutch generally indicated at 33. This clutch is of simple and conventional type, employing a grooved collar 34 which is keyed to the shaft 32 but is permitted to slide along the shaft. The collar is provided with teeth (not shown) at its inner end and these teeth are adapted to engage the teeth 35 of the coupling 36 which is mounted on a shaft 37 in alinement with the shaft 32. The shaft 37 may be journalled in bearings formed by the brackets 38. A worm 39 is secured to the shaft 37, this worm meshing with a worm wheel 40 which is secured to a shaft 41 journalled at 42 in the side wall.

For moving the collar 34 toward and away from the clutch portion 36 a bifurcated yoke 43 is employed, the upper legs of which engage the circumferential groove in the collar. This yoke is carried on an upright arm or lever 44 which is pivoted on a shaft 45 intermediate the length of the lever. The lower end of the lever is pivotally secured to the plunger or slidable armature 46 of an electromagnet 47 which is also secured in any suitable manner to the side wall. The shaft 45 is journalled at each end in any suitable manner as indicated at 48 and the nearer end of the shaft as seen in Figure 1 is provided with a crank 49. The free end of the crank is pivotally secured to an extensible arm 50 which passes through a stationary guide bar 51 provided with a slot which received the arm 50.

Directly in line with the arm 50 there is a ratchet wheel 52 mounted on the shaft 41 and any one tooth of which is adapted to be engaged by the upper end of the arm 50. The shaft 41 is extended across the rear of the paper 2 and is provided with one or more paper feeding sprockets 19 carrying a sprocket chain 20 which engages the sprocket wheel 21. As was explained in connection with Figure 5 there are normally two sprocket wheel and chain arrangements although only one has been shown in Figure 1 and the chain carries projections 20*a* which register with openings 54 in the paper webs 2, thus moving these webs upwardly as the sprocket wheel 19 is rotated. The outer end of the shaft 41 carries a gear 55 which meshes with a gear 56 mounted on a shaft 57 journalled in any suitable and well known manner. A pin wheel 58 is mounted on the shaft 57 and the ribbon or the ribbon stack 3 is carried around the pin wheel as indicated.

The armature 46 of the electromagnet is normally held in an extended position by means of a tension spring 59 secured to an anchor rod 60. An electrical circuit indicated by the wires 61 is taken from the electromagnet 47 to a micro-switch 62 of any suitable and well known character. The movable contact of the switch extends downwardly therefrom and this contact is adapted to engage the teeth 63 of a circular element 64 which is mounted on a rotatable shaft 65. In addition to the teeth 63 the element 64 is provided preferably with a smooth cam surface 66 for reasons which will be explained presently.

Operation of the structure shown in Figure 1

Assume that the shaft 65 (lower left hand corner of Figure 1) is connected to an element of the main typing or printing machine which element is controlled in its movement such as to provide the proper sequential movements of the ribbon feeding and paper feeding mechanism, during the line spacing and eject operations. A machine sold on the market under the name of "IBM" provides such an element and assume that when this element is caused to move during the operation of the "IBM" machine a rotary effect of a predetermined amount and at the proper time is supplied to the shaft 65. The teeth 63 of the member 64 will successively engage the reciprocable rod of the switch 62 and will cause the circuit 61 to be closed and opened sequentially. If this circuit were connected to a battery (not shown) the current impulses would cause the successive energization and de-energization of the electromagnet 47. Assume for the moment that the electromagnet is energized during one of these impulses, the arm 44 is caused to swing about the shaft 45 and the clutch 33 becomes engaged. The motor 27 is assumed to be continually operating so that motion is transmitted to the worm 39 and the shaft 41 is accordingly rotated. Under these conditions the paper 2 will be caused to move upwardly and the pin wheel 58 will also rotate to move the ribbon 3 a predetermined distance to the right. This is the effect which takes place during the so-called line spacing operation in which the paper is moved upwardly a distance represented by the distance between two successive lines of typed imprints and the ribbon is moved a predetermined distance across the paper to present fresh carbon surfaces to the type arm preparatory for typing the next line. It is apparent that there are as many teeth on the element 64 as may be necessary to line space each form until finally the last line on the form is completed.

It is then necessary to cause the paper form to be ejected in order to bring the next form into position so that the first line on this form may be typed. By this time the shaft 65 will have been rotated to a position such that the cam surface 66 will be directly under the movable contact member of the limit switch and will hold the circuit 61 closed over a relatively long period of time. Under these conditions the clutch 33 will be engaged for a corresponding longer period of time causing the sprocket chains 20 to move the paper upwardly through the predetermined distance required for the eject operation and at the same time causing the pin wheel 58 to be rotated as many times as is desired according to the operating schedule of a manifold typing or printing machine. It will be understood that the shaft 65 is not operated continuously but only during those periods of time when it is desired

that the paper 2 be moved through a predetermined distance upwardly and the pin wheel shall be rotated a predetermined number of times.

In order to prevent over-running of the sprocket chains 20 and wheel 58 because of their momentum at the end of a spacing or ejecting operation, spring 59 acts instantaneously upon de-energization of electromagnet 47 to rotate shaft 45 and arm 49 counter-clockwise, to thus move the end of arm 50 into the path of the teeth upon ratchet wheel 52. Arm 50 thus acts to prevent any further paper-advancing movement of shaft 41 and the parts connected therewith, until electromagnet 47 is again energized.

In Figures 2 and 3 a modified arrangement is shown. These figures illustrate a pair of paper moving chains 20 which are mounted on sprocket wheels 19, the latter being carried on a shaft 17. The shaft extends through the side frame member 5 of the machine and is provided with a gear 67, also a ratchet wheel 68. A pawl 69 pivoted at 70 is adapted to engage the teeth of the ratchet wheel, the pawl being carried on an arm 71 which is pivotally connected to the plunger 72 of an electromagnet 73. The gear 67 is adapted to engage with a gear 74 which is mounted on the outside of the frame member 5, this gear being carried on a shaft 75 which terminates in a bevel gear 76 pinned to the shaft. The bevel gear and its shaft 75 are journalled in a casing 77 secured to the side frame member 5. The bevel gear 75 is adapted to mesh with a bevel gear 78 which is journalled in the bottom portion 79 of the casing 77. A shaft (not shown) extends downwardly from the gear 78 to a pin wheel 80, the shaft being contained in a protective housing 81. As shown in Figures 2 and 3 the side frame member 5 may be provided at its lower end with an arcuate slot which fits over a portion of reduced diameter 83 formed at one end of the platen 1. An electrical circuit 84 passes through a battery (not shown) to a micro-limit switch indicated at 85. The movable contact member or finger of the switch is adapted to engage the teeth of a star wheel 86. The latter is mounted on a shaft similar to the shaft 65 as explained in Figure 1 and is connected to an element of the main "IBM" machine which will give the shaft the proper amount of rotation at the proper times for controlling the movements of the paper webs and the pin wheel.

Assume that the wheel 86 is being rotated clockwise automatically at the beginning of the line spacing operation, the circuit through the switch 85 is closed momentarily due to the upward movement of the finger so that the electromagnet 73 becomes energized. The arm 71 is caused to move counterclockwise thus rotating the ratchet wheel 68 in the same direction. The shaft 17 on which the sprocket wheels 19 are mounted is thus given a counterclockwise rotational impulse to cause the paper to move upwardly a distance corresponding to the space between the successive typed lines. At the same time the gear 67 causes the gear 74 to rotate clockwise and this rotary effort is transferred through the bevel gear 78 to the pin wheel 80 thus causing the carbon ribbon to move the proper distance to the left as seen in Figure 2.

The same modified operation applies to the condition in which the successive paper forms on the machine are being substituted for one another during the eject operation in which case the star wheel 86 is rotated through a greater angular distance causing the pawl 69 to rotate the ratchet wheel 68 through a correspondingly greater distance and this increased movement is carried to the sprocket wheels 19 and the pin wheel 80.

Figure 4 shows apparatus which in some respects is similar to that illustrated in Figure 3 except that a double form of electromagnet represented by the elements 87, 88 is employed. These elements 87 and 88 operate alternately. In this structure there is no necessity for a tension spring 89 (Figure 3) for withdrawing the armature of the electromagnet because the elements 87, 88 serve when energized to withdraw the armature of the opposite electromagnet. A double three-wire circuit indicated at 90 is taken from the electromagnets, this circuit being connected to a double contact limit switch 91 which is different from the previously described limit switch 85 in that contact is made when the movable finger moves upwardly and a different contact is made when the finger is permitted to move downwardly. A star wheel 86 similar to that explained in connection with Figure 3 may be employed but the requirements as to the operation of the star wheel are different in Figure 4 than that explained in connection with Figure 3.

Thus as the wheel 86 is rotated clockwise the reciprocable finger is first caused to move upwardly at which time the electromagnet 88 becomes energized. This operation will cause the pawl 69 to rotate the ratchet wheel 68 counterclockwise and to transfer this movement to the sprocket chains 20 and the pin wheel 80 as was explained in connection with Figure 3. However, as the star wheel 86 is turned a few degrees more the movable finger is permitted to drop, thus opening the circuit of the electromagnet 88 and closing the circuit of the electromagnet 87. The latter upon being energized moves the left hand end of the pawl arm 71 upwardly with a powerful action to a position ready for the pawl 69 to engage the ratchet wheel 68 when the electromagnet 88 is again energized as the result of further movement of the wheel 86. Consquently, in the structure shown in Figure 4 the arm 71 is given a strong downward movement by the electromagnet 88 upon rotation of the star wheel 86 and the pawl arm is returned with a powerful movement to its initial position by the electromagnet 87 ready to engage the succeeding tooth on the ratchet wheel upon further energization of the electromagnet 88. Due to the increased positiveness of the movement of the pawl arm 71 by the use of the two opposed electromagnets, the arrangement shown in Figure 4 gives a much quicker action than that shown in Figure 3.

Figures 6 and 7 show still other structure which may be employed for moving the ribbons during the line spacing and eject operations of the typing machine. The structures shown in these figures differ from those explained in the other figures in that mechanism is provided for driving only the ribbon feeding pin wheel and no provision has been illustrated by which to drive the paper fed sprocket chains. A solenoid 92 may be employed, this solenoid being secured by a bracket 93 to one of the side frame members 5. The solenoid is horizontally disposed and contains a slidable plunger or armature 94 provided with a rod extension 95. The latter is pivotally connected to a horizontal arm 96 which is rotatably mounted at the upper end of a shaft 97 carrying at its lower end a ribbon feeding pin wheel 98. A downwardly extending rod 99 is se-

cured to the arm 96 and a pawl 100 is pivotally mounted on the rod 99.

The arrangement is such that when the electromagnet 92 becomes energized in a manner explained hereinafter the rod 95 moves inwardly, causing the arm 96 to rotate counterclockwise as seen from the top. This movement causes the pawl 100 to engage the teeth of a ratchet wheel 101 which is secured to the shaft 97. The latter is therefore given a counterclockwise rotation. As the pin wheel 98 is rotated counterclockwise the ribbon 3 is pulled to the left. As in the case of the other constructions, the electromagnet 92 is intermittently energized, the movements taking place during the line spacing and eject operations. This can be accomplished by means of the switch 85, the movable contact finger of which is operated the proper number of times by a star wheel 102. The latter may be connected on the shaft 103 of the platen 1 so that as the platen is rotated a few angular degrees during the line spacing operation, and a number of complete revolutions during the eject operation, the electromagnet 92 is energized to move the ribbon 3 the proper distance across the paper webs. As in the other figures, this ribbon may constitute a number of strands interleaved with the paper forms.

In Figure 8 I have shown a modified form of the structure described in connection with Figures 6 and 7 and which is intended to actuate the ribbon feeding pin wheel 98 when the solenoid 92 is intermittently energized through the switch 85. The pawl 100, instead of continually contacting with the ratchet wheel 101, as in Figure 6, is now caused to be moved away from the ratchet wheel by means of a bar 103*a* provided with a pin 104 on which the inner surface of the pawl 100 rides.

It is apparent that as the arm 96 swings on its shaft 97 in response to the reciprocations of the rod member 95 and the further outwardly the pawl 100 is moved by the arm 103 the fewer the number of teeth on the ratchet 101 will be caused to engage with the pawl. Consequently, the rate at which the ratchet wheel 101 is rotated will depend on the setting of the pawl member 100 which is brought about by a transverse movement of the bar 103. The latter may be operated by hand to any adjusted position depending on the rate that it is desired to rotate the pin wheel 98 in response to each reciprocation of the solenoid operated rod 95.

It is apparent that the pin wheel operating structure shown in Figure 7 may be used either with or without mechanism for providing an eject operation. If an eject operation is desired, suitable and well known mechanism may be provided for rotating the sprocket shaft 17 in timed relation with the rotation of the star wheel 102.

A suitable inertia device for preventing repeated actuations of switch 85 when wheel 105 is turned above a predetermined minimum angular rate, is shown in Figure 9. Assume that a notched wheel 105 is carried on a shaft 106 which rotates in timed relation with mechanism for operating the paper feeding shaft 17. Assume also that the micro-switch 85 is connected to the solenoid 92 (Figure 7) and has the same function as was explained in connection with that figure. A heavy metal bar 107 pivoted at 108 is positioned between the contact of the switch 85 and the wheel 105. A pin 109 is suspended from the bar 107 and is adapted to project into the notches 110 of the wheel. If the

wheel 105 is rotated rapidly, as for example, during an eject operation, the pin 109 is forced from the notch 110 and due to the inertia of the bar 107, the pin will not re-enter a notch in the wheel until the latter has come to rest.

Under these conditions, the switch 85 will have been operated only once during the complete movement of the wheel 105 so that the pin wheel 98 (Figure 7) will have moved only through a very limited angular distance, notwithstanding the fact that the notched wheel 105 has been moved perhaps through seevral revolutions during the eject operation. Inasmuch as the pin wheel 98 has moved the equivalent of only one notch in the wheel 105, only a very short length of ribbon 3 (Figure 7) has been pulled along the platen during the eject operation.

It is apparent that any desired relative rate of movement between the carbon ribbon and the paper web may be obtained for a given rate of rotation of wheel 105, by predetermining the weight of the bar 107, the length of the bar including the position of the pivot, also the depth of the notches and the number of notches in the wheel 105.

From the foregoing it is evident that I have disclosed inexpensive yet effective apparatus for moving the paper webs upwardly the requisite distance during the eject operation and also for pulling the ribbon or ribbons along the platen the proper distances according to the type of operation. The control in all of these cases is constituted of a simple electrical switch cooperating with a star wheel or cam which is automatically actuated in accordance with the movements of the machine parts. The various elements which are employed for providing the paper and ribbon drives are standard parts, requiring no special machine work and these drives are of the most direct and effective character.

It will be understood that I desire to comprehend within my invention such modifications as come within the scope of the claims and the invention.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A typing machine including a platen, means for moving paper over the platen, a carbon ribbon extending crosswise of the paper and lengthwise of the platen, means for moving said carbon ribbon over the paper both of said paper moving means and ribbon moving means including an electromagnet in common, and means for energizing said electromagnet intermittently in accordance with line spacing and sweep feeding operations of the machine, said last mentioned means including an electrical circuit and a switch therein, also including a star wheel adapted to intermittently operate said switch in accordance with the desired line-spacing and sweep feeding operations of the machine.

2. A typing machine including a platen, means for moving paper over the platen, a carbon ribbon extending crosswise of the paper, and axially along of the platen at the typing position, means for moving the carbon ribbon during predetermined operations of the machine, said paper moving and ribbon moving mechanism including a pair of solenoids connected in opposition within an electrical system, cores slidable in said solenoids, means connecting said cores for movement in opposition to each other and a ratchet mechanism including an arm connected to said core connecting means for actuating said paper

moving means and said ribbon moving means, said solenoids being adapted to be energized in sequence to effect line spacing and sweep feeding operations of the machine.

3. A typing machine including a platen, means for moving paper over the platen, means for moving a transfer ribbon transversely across the paper axially of said platen, means effecting movement of said paper moving means and said ribbon moving means in unison and including a ratchet wheel, a pawl operable to move said wheel in step-by-step increments, an electromagnet connected to operate said pawl to advance said paper and ribbon, and a second electromagnet connected to retract said pawl.

4. In a typing machine including a platen, means for moving paper over the platen, means for moving a carbon ribbon over and axially along said platen, both of said paper moving means and said ribbon moving means including an electromagent in common, and means for energizing said electromagnet intermittently in accordance with line spacing and sweep feeding operations

of the machine, said energizing means including a circuit, a switch in said circuit, and a star wheel adapted to intermittently operate said switch in accordance with desired line-spacing and sweep feeding operations.

5. In a typing machine having a platen and type movable into typing engagement with said platen, first means operable to move paper in line spacing and sweep feeding movements over said platen, second means operable to feed a ribbon over said paper and axially along said platen, means operating said first and said second means step by step in unison, including an electromagnet, a switch in circuit with and adapted to energize said electromagnet, a star wheel operable in accordance with the desired line spacing and sweep feeding operation of the machine and an inertia arm positioned to be oscillated by rotation of said wheel below a predetermined rate, to intermittently actuate said switch in its oscillations, said arm being insensitive to rotation of said wheel above said predetermined rate.

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