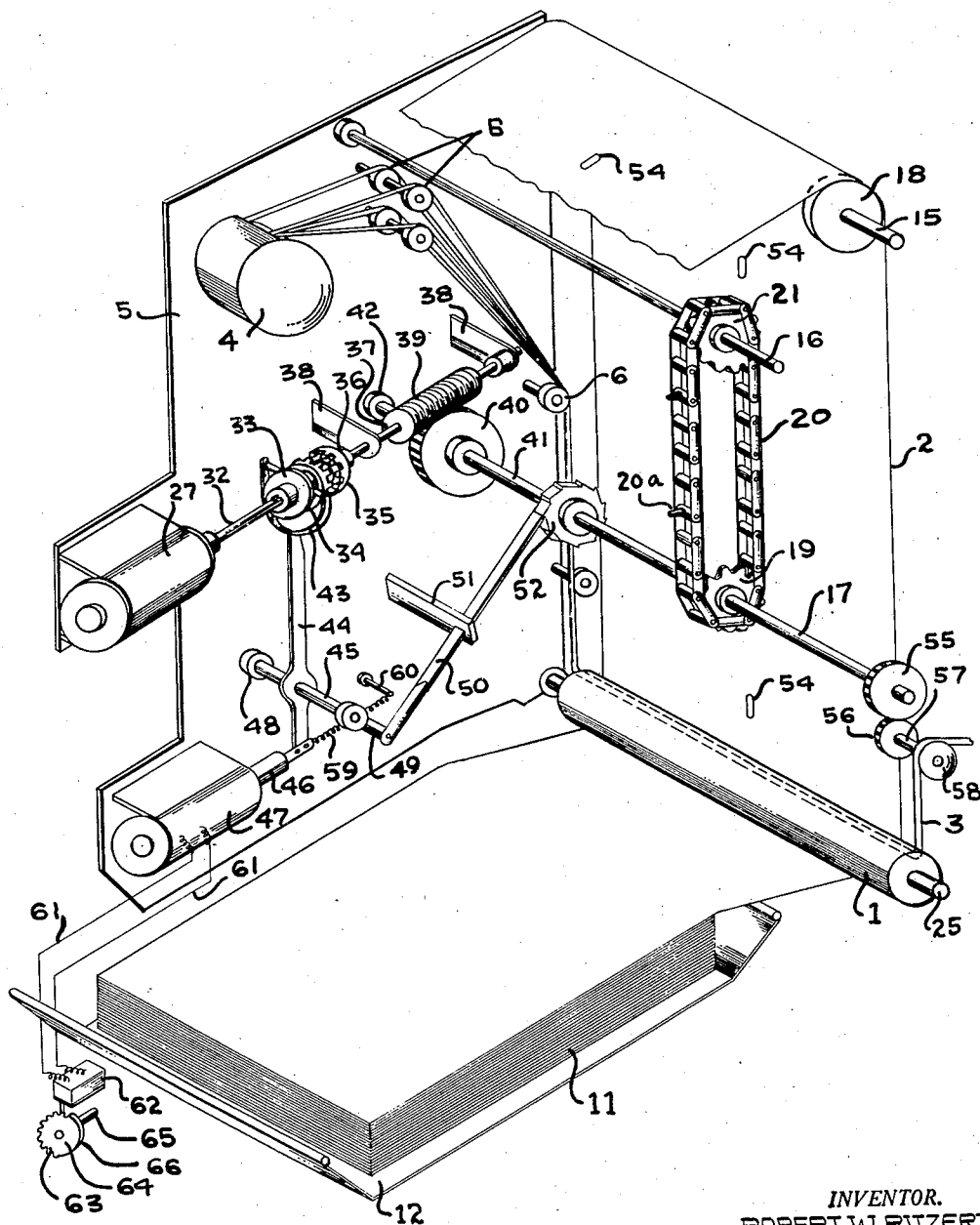


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R. W. RITZERT  
PAPER AND RIBBON FEEDING MECHANISM  
FOR MANIFOLDING MACHINES  
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PAPER AND RIBBON FEEDING MECHANISM  
FOR MANIFOLDING MACHINESRobert W. Ritzert, New York, N. Y., assignor to  
The Egry Register Company, Dayton, Ohio, a  
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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.

This application is a division of my application Serial No. 484,810, filed April 28, 1943, and entitled Carbon feeding means for manifolding machines, now Patent No. 2,407,799, issued September 17, 1946.

In a typical prior art machine which the present machine represents an improvement thereover, the manifolding attachment is constituted of a framework carrying rollers over which the required number of paper sheets are fed upwardly from the typing or printing platen of the main machine and the finished copies are received in their basket or carrier at the rear of the machine.

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 line spacing 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 sheets 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 because obviously the carbon ribbons must be maintained stationary at this time.

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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 very 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 therefor, 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. Whereas in the earlier machines, the ribbon feeding pin wheel and the paper moving mechanism were driven from a common drive and therefore were mechanically interconnected, it has been found desirable to separate the common drive into separate drive mechanisms so that they may be individually adjusted. If this separation of drive were accomplished in a fully mechanical system, the resulting complications of the mechanical parts including gears, clutches and other control elements would be so great as to render the machine impractical both from the operative and expense standpoints.

The invention will be better understood when reference is made to the following description considered in connection with the accompanying drawing which 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 more clearly.

## General arrangement

In general, the manifolding machine of this invention as shown in the figure is an attach-

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ment to be used in conjunction with a ribbon 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.

In the manifolding machine of the present invention, the carbon paper ribbons are automatically fed by predetermined steps between the typing operations of successive lines of type, so that this motion of the ribbons breaks up the natural tendency to adhere to the paper forms with which they are interleaved. This ribbon feeding is synchronized with the line spacing mechanism of the main machine to which the manifolding machine is attached and is controlled in accordance with the motion of the line spacing parts of the main machine. Furthermore, certain of such main 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 flatwise 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.

It has been pointed out that the paper forms or webs are subjected to at least two upward movements of different character, namely:

(1) The movement represented by the line spacing action when the paper is moved a distance corresponding to the distance between typed lines and

(2) The so-called "eject" movement in which the paper is moved a considerably greater distance represented by the distance between the last typed line of one form and the first typed line of the succeeding form.

These movements take place at different times because the line spacing movement is obviously effected much more often than the eject movement. Likewise, the ribbon feeding mechanism is also subjected to various kinds of movements

During the line spacing operation the ribbon

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is moved only over a short distance by the pin wheel whereas during the eject movement the ribbon is moved a considerable distance by rotating the pin wheel through many revolutions.

In view of the fact that all of these movements are derived from a single source of mechanical power such as an electric motor, it becomes necessary to provide clutches and control elements of a complicated character since these clutches must be operated automatically at predetermined time periods and also over predetermined time durations. The movements must be synchronized with one another in order for the entire machine, including the typing or printing mechanism and the manifolding attachment to operate efficiently and without breaking the paper or the carbon ribbons. All of these requirements lead to a very complicated clutch arrangement with its attendant increase of the possibility of breakdown and also including considerable costs of maintenance and expense.

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

In the drawing 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 is employed, this plate being secured to the right hand side plate 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 over which the ribbons are caused to move, thus giving them a horizontal direction. 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 which is rotatably actuated.

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 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 in often employed in connection with a manifolding operation in which the paper sheets or webs

are presented on a stack of paper which has reversely positioned folds or creases. A paper stack is indicated at 11 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. This frame may consist of a number of side strips 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 while the roller shaft 17 is provided with a sprocket wheel 19. The intermediate shaft 16 is also provided with a sprocket wheel 21.

A chain 20 is carried by these sprocket wheels and is provided with outwardly extending projections 20a which register with spaced openings 54 in the multiple paper webs. The arrangement is such that as the chain is moved upwardly, the paper sheets 2 are caused to be fed in the vertical direction of the guide rollers 18. The shaft 17 is rotated in a manner which will be described presently and the manifolded paper is pulled from the stack 11, and after passing around platen 1 is caused to move vertically upwardly over the rollers 18 by means of the sprocket chain and the upper end of the paper may be received as a folded stack by a basket (not shown).

The rotary effort for the shaft 17 is obtained from a motor 27. The latter may be secured to one of the side walls 5 of the machine and shaft 32 connects the motor to a clutch generally indicated at 33. This clutch is a 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 alignment with the shaft 32. The shaft 37 may be journaled 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 journaled 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 journaled at each end in any suitable manner as indicated at 43 and the nearer end of the shaft 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 receives 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 13 carrying a sprocket chain 20 which engages the sprocket wheel 21. As the one leg of the sprocket chain is caused to move upwardly in this manner, the webs 2 are given a corresponding upward movement. The outer end of the

shaft 41 carries a gear 55 which meshes with a gear 56 mounted on a shaft 57 journaled 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.

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*

Assume that the shaft 65 (lower left hand corner of the drawings) 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 let us 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 any over running of the sprocket chains 20 and the pin wheel 58 due to their momentum at the end of their respective operations, the spring 59 serves immediately to disconnect the clutch 33 and the ratchet wheel 52 prevents any further forward movement of the shaft 41 since the arm 50 is moved by spring 59 into contact with the face of wheel 52 to prevent any further forward movement of the parts connected therewith.

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 distance 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.

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

1. In a typing machine having a platen, first means shiftable to move paper to be typed over and across said platen, second means operable to move a ribbon transversely across said paper and axially along said platen, control means connected to effect movement of said first and second means in unison, said control means including an electric motor and a disengageable clutch, an electro-magnet for controlling said clutch, and a switch for controlling said electro-magnet, said switch being operable in accordance with the desired line spacing and sweep feeding operations

2. A manifold typing machine comprising typing apparatus including a platen, means for moving paper in multiple sheet form over the platen during the line spacing and eject operations of the machine, a plurality of carbon ribbons interleaving with said paper sheets at the typing position, means for moving the ribbons crosswise of the sheets during said line spacing and eject operations, said means including an electric motor connected to a shaft having a clutch, said clutch being controlled by an electro-magnet, and means including a switch connected to said electro-magnet and also a timing mechanism for impulse-energizing the electro-magnet in accordance with the desired line spacing and eject operations whereby the electro-magnet is intermittently energized at predetermined intervals and causes the clutch to be engaged so that power can be transmitted from the motor to the paper and ribbon moving means.

3. A manifold typing machine comprising typing apparatus including a platen, means for moving paper in multiple sheet form over the platen during the line spacing and eject operations of

the machine, a plurality of carbon ribbons interleaving with said paper sheets at the typing position, means for moving the ribbons crosswise of the sheets during said line spacing and eject operations, said means including an electric motor connected to a shaft having a clutch, said clutch being controlled by an electro-magnet, means including a switch connected to said electro-magnet and also a timing mechanism for impulse-energizing the electro-magnet in accordance with the desired line spacing and eject operations whereby the electro-magnet is intermittently energized at predetermined intervals and causes the clutch to be engaged so that power can be transmitted from the motor to the paper and ribbon moving means, and means operable in response to the deenergization of said electro-magnet for preventing overrun of each of the paper moving and carbon moving means.

4. A typing machine including a platen, means for moving paper over the platen, a typing device actuated in accordance with said paper moving means, ribbon moving apparatus, and means for actuating said ribbon moving apparatus and said paper moving means including a motor, a shaft connected to said motor and having a clutch, an electro-magnet for controlling said clutch, and a switch responsive to the operation of said device for controlling said electro-magnet.

5. 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 a continuously operating motor in common, a clutch interposed between said motor and said paper moving and ribbon moving means, and means for controlling said clutch, said last-mentioned means comprising an electro-magnet which is controlled through a switch which operates at intervals, the contacts of which are closed in accordance with the desired line spacing and sweep feeding movements.

6. 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 a continuously operating motor in common, a clutch interposed between said motor and said paper moving and ribbon moving means, means for controlling said clutch comprising an electro-magnet and a controlling switch for said electro-magnet, which operates at intervals, the contacts of said switch being closed in accordance with the desired line spacing and sweep feeding movements, and means controlled by the deenergization of said electro-magnet for preventing the paper moving means and the ribbon moving means from overrunning.

7. A typing machine including a platen, means for intermittently sliding paper over the platen, a carbon ribbon extending crosswise of the paper and lengthwise of the platen, means for moving said carbon ribbon transversely of the paper, both of said paper moving means and ribbon moving means including an electric motor in common, means including a clutch and shafting for mechanically connecting the motor to each of the paper moving and ribbon moving mechanisms, electrical means including an electro-magnet and a spring-tensioned plunger for engaging and disengaging said clutch in accord-

ance with the desired line spacing and sweep feeding operations of the machine, and a ratchet wheel on said shafting with an arm in contact therewith and controllable by said plunger for preventing overrunning of the paper over the platen and of the ribbon across the paper when said motor is disengaged through said clutch from the shafting.

ROBERT W. RITZERT.

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