

May 9, 1961

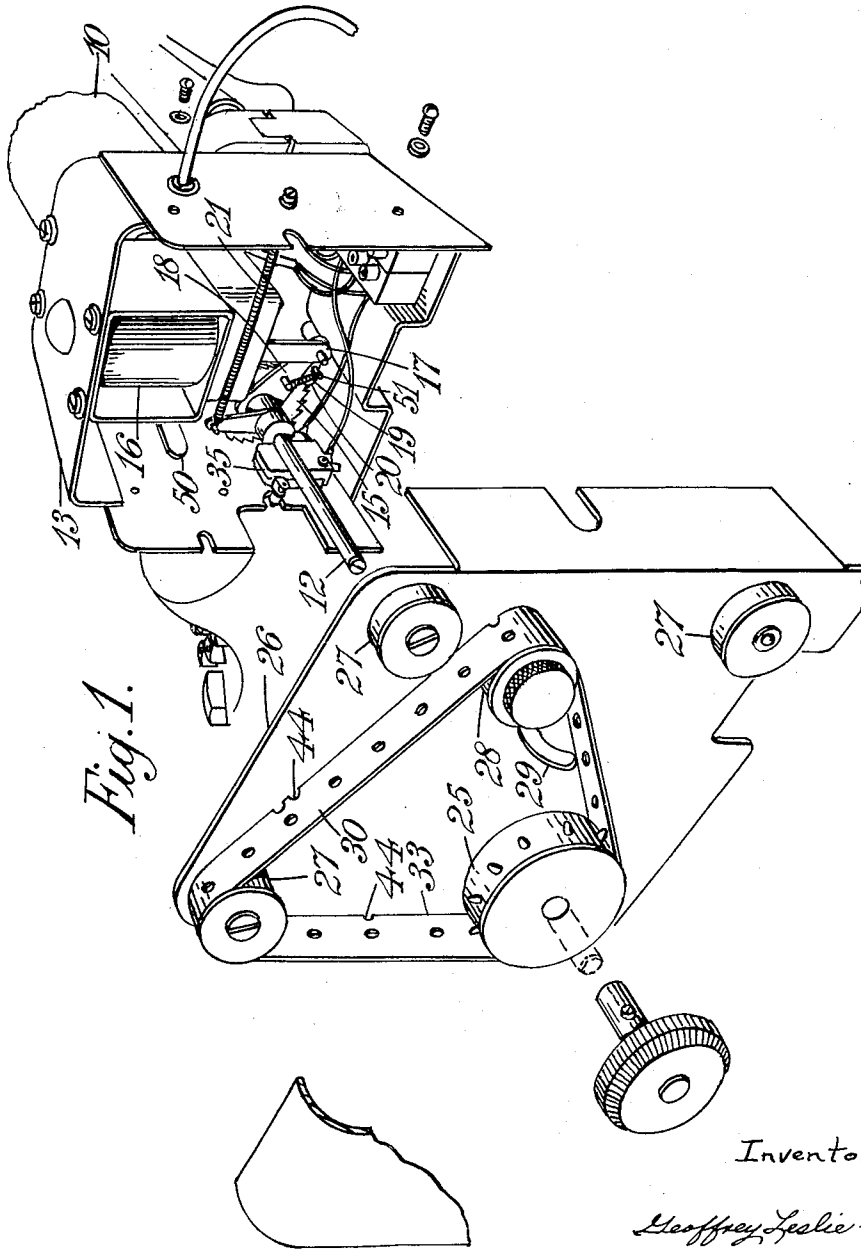
G. L. TAPERELL

2,983,355

MACHINE FOR MANIPULATING SHEETS OR WEBS OF STATIONERY

Filed Nov. 21, 1957

5 Sheets-Sheet 1



Inventor

Geoffrey Leslie Taperell

By
Watson, Cole, Grindle & Watson
Attorneys

May 9, 1961

G. L. TAPERELL

2,983,355

MACHINE FOR MANIPULATING SHEETS OR WEBS OF STATIONERY

Filed Nov. 21, 1957

5 Sheets-Sheet 2

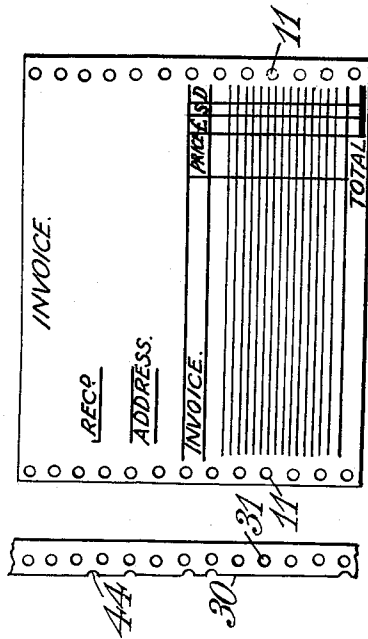


Fig. 8.

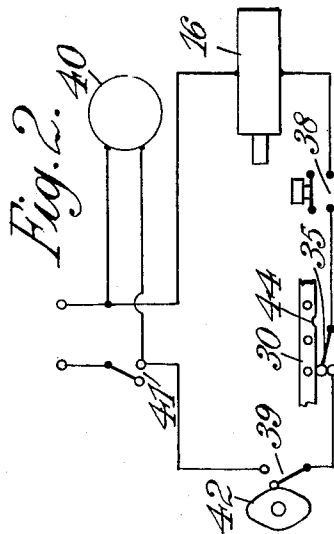


Fig. 2.

Inventor
Geoffrey Leslie Taperell

By
Watson, Cole, Hendler & Watson
Attorneys

May 9, 1961

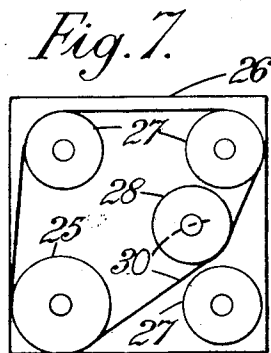
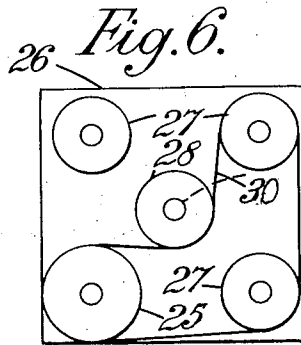
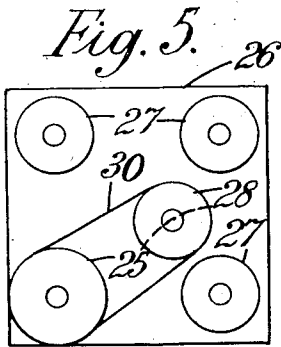
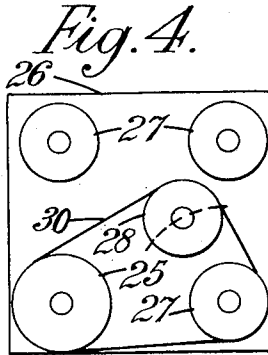
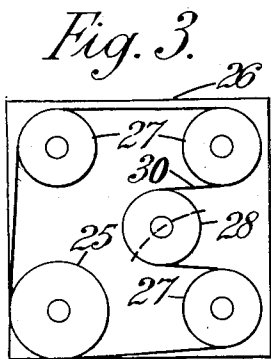
G. L. TAPERELL

2,983,355

MACHINE FOR MANIPULATING SHEETS OR WEBS OF STATIONERY

Filed Nov. 21, 1957

5 Sheets-Sheet 3



Inventor
Geoffrey Leslie Taperell

By
Watson, Cole, Grindler & Watson
Attorneys

May 9, 1961

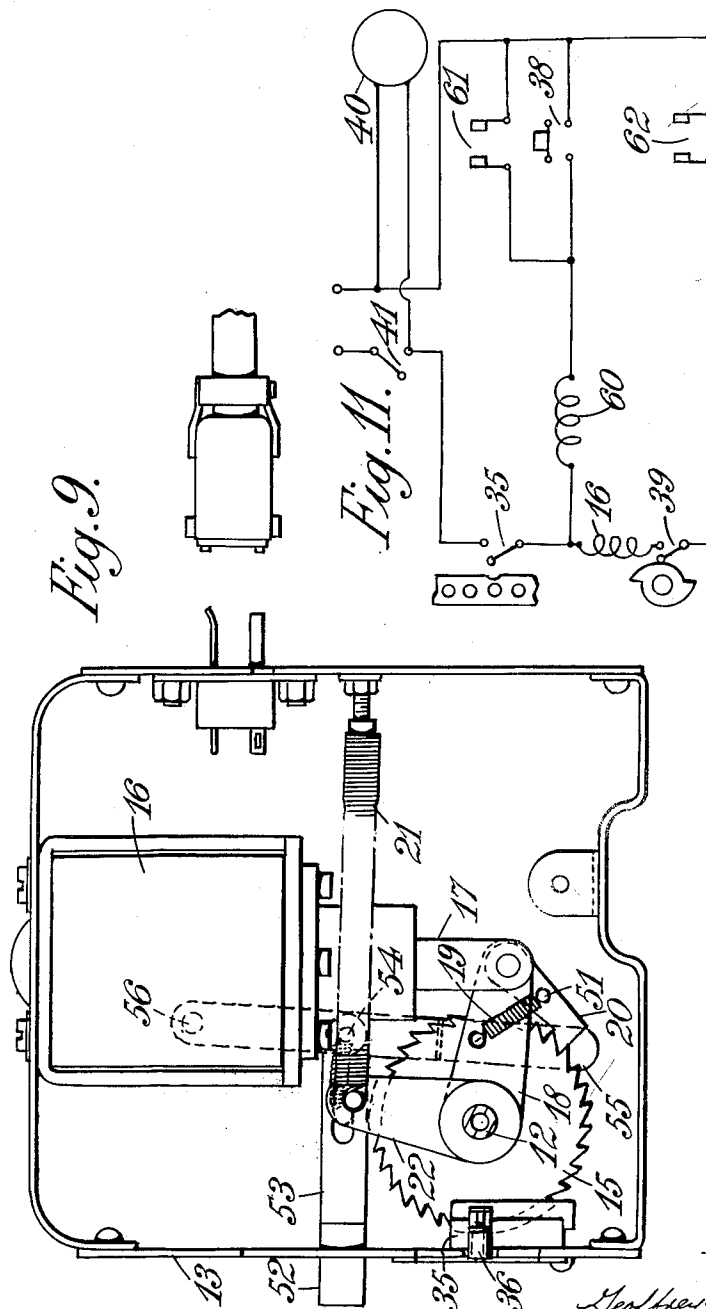
G. L. TAPERELL

2,983,355

MACHINE FOR MANIPULATING SHEETS OR WEBS OF STATIONERY

Filed Nov. 21, 1957

5 Sheets-Sheet 4



Inventor
Geoffrey Leslie Taperell
By
Watson Cole, Shindler & Watson
Attorneys

May 9, 1961

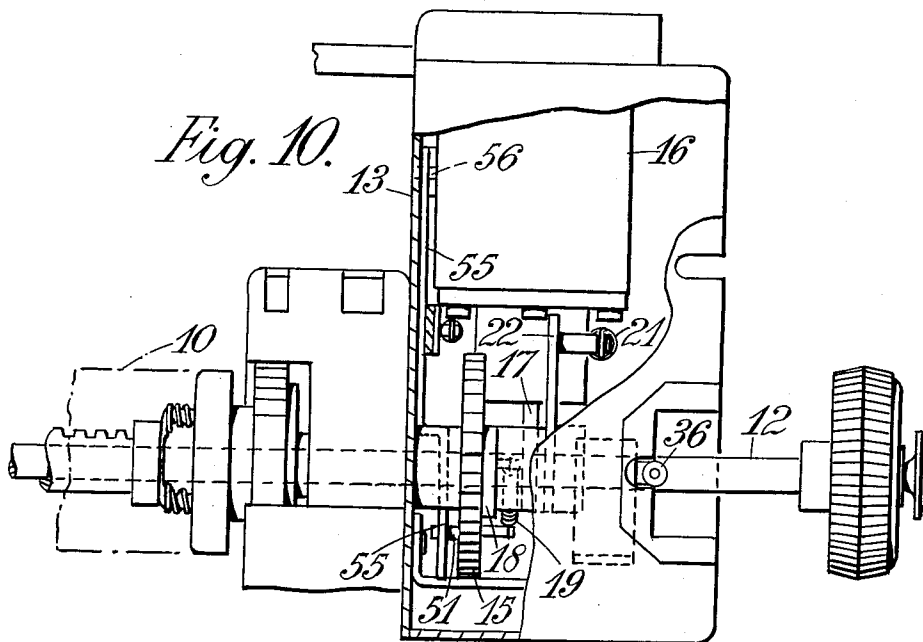
G. L. TAPERELL

2,983,355

MACHINE FOR MANIPULATING SHEETS OR WEBS OF STATIONERY

Filed Nov. 21, 1957

5 Sheets-Sheet 5



Inventor
Geoffrey Leslie Taperell
By
Watson, Cole, Grindle & Watson
Attorneys

1

2,983,355

MACHINE FOR MANIPULATING SHEETS OR WEBS OF STATIONERY

Geoffrey Leslie Taperell, London, England, assignor to W. H. Smith & Son (Alcara) Limited, London, England, a British company

Filed Nov. 21, 1957, Ser. No. 697,975

Claims priority, application Great Britain Nov. 22, 1956

7 Claims. (Cl. 197—133)

This invention relates to machines for manipulating sheets or webs of stationery or other material such as paper or magnetic tapes according to a predetermined repetitive programme.

According to the invention a machine for the above purpose has the programme represented by notches cut in, or by projections from, one edge or face of an endless flexible belt, band, chain or like element and the machine includes a sensing device for the notches or projections, means for effecting relative movement between the sensing device and the edge or face of the flexible element and means responsive to the sensing device for controlling the operation of the machine.

More specifically the invention relates to typewriting, tabulating, accounting, adding, calculating, addressing, and like recording machines of the kind operable to type or print line-by-line or section-by-section at a printing station on sheets or webs of paper or other record material, with or without carbon or other transfer material, traversed or advanced past the station.

It is frequently desirable that in recording machines of the above kind the sheets or webs in their traverse through the machine shall be stopped with preselected separated positions on the sheets or webs at the printing station according to a predetermined repetitive programme, whether or not the sheets or webs are also stopped for the making of entries at other (e.g. intermediate) positions. For example, in the insertion of typed or printed matter in a succession of similarly pre-printed invoice forms it may be desirable to stop each form with the first line of an address space at the printing station, then, after entering the address, to skip a portion of the form and to stop with a line for the insertion of reference data (e.g. order numbers, dates, and despatch particulars) at the printing station, then to stop with the first line of a space for the insertion of particulars of the items being invoiced and then to stop at a position for the insertion of a total and/or other information. Some or all of the insertions may require more than one line of type or print and the number of lines may vary from form to form in the succession and accordingly the amount of the form to be skipped in advancing to the next pre-selected stopping position after completion of an entry may be different on different forms in a succession. Various ways in which webs or sheets may be stopped according to a predetermined programme with or without intermediate stops have been proposed and used and it is an object of this invention in a more specific form to provide a simple and improved construction for the purpose.

The invention provides for this purpose a recording machine of the above kind having means automatically operable to stop the traverse of the record material according to a predetermined programme characterised in that the programme is represented by depressions or apertures in, or projections from, an endless flexible belt, band, chain or like element.

The invention, in its more specific form, provides a

2

recording machine of the above kind having means automatically operable according to a predetermined repetitive programme to stop the traverse of the record material when each of a succession of pre-selected positions spaced apart along the material arrives at the printing station which means comprise an endless flexible belt, band, chain or like element having in or on one or each side edge notches or projections at intervals corresponding to the spacings between said positions on the record material, means for effecting lengthwise movement of the flexible member in such synchronism with the movements of the record material that a notch or projection arrives at a sensing station when a said position arrives at the printing station and means for sensing the arrival of a notch or projection at the sensing station and, when a notch or projection so arrives, for effecting directly or indirectly the stopping of the record material.

Preferably the machine has positive means for feeding the record material. Thus in one preferred form of the invention the machine includes pin or sprocket feeding devices having pins engaging in perforations in the record material and further pin or sprocket feeding devices arranged to run in synchronism with the first mentioned pin feeding devices and engaging in perforations or apertures in the flexible member.

According to a modification of the form of the invention just mentioned the same pin feeding devices engage in and feed both the record material and the flexible member.

The flexible member may be constructed in endless form as a unit or by joining the ends of a strip.

The machine may include means (e.g. power operated) for traversing or advancing the record material step-by-step (e.g. line-by-line) until the material is stopped as aforesaid. The advancing means may comprise a solenoid operable to advance the record material at each energisation or on each return stroke and means for supplying a succession of electric pulses to the solenoid.

The sensing means may comprise an electric sensing switch (e.g. a so-called micro-switch) controlling energisation of the solenoid and operable by engagement with a notch or projection in or on the flexible member to prevent operation of the solenoid. The solenoid, the impulse supplying means and the sensing switch may all be in series in an electric circuit and the circuit may include a manually operable control switch by which the operation of the solenoid may be controlled, subject to the over-riding stopping control of the sensing switch.

The flexible member may be, for example, of metal strip or of rubber but is preferably of a flexible plastic material, the material having sufficient lateral stiffness to operate the sensing device.

The flexible member may be advanced at the same speed as the record material or at a speed having some predetermined ratio therewith, the spacings of the notches or projections having a like ratio to the spacings of the positions aforesaid on the record material.

The invention also provides a recording machine of the above kind having a solenoid for advancing directly or indirectly, the record material step-by-step, means for producing a succession of electric impulses for effecting successive energisations of the solenoid to advance the record material and means automatically operative when a predetermined position on the record material arrives at the printing station for stopping the feeding operation of the solenoid. The last named means may comprise a flexible band or the like having a notch or aperture therein or a projection therefrom at a position corresponding to the said position of the record material, means for moving the band relative to a sensing device for the notch, aperture or projection and means responsive to the sensing device for stopping the feeding operation of the

3

solenoid. The sensing device may be an electric switch.

A specific application of the invention to an electric typewriter will now be described by way of example and with reference to the accompanying drawings in which:

Figure 1 represents somewhat diagrammatically a perspective exploded view of the relevant parts of the machine;

Figure 2 is a circuit diagram;

Figures 3-7 show diagrammatically various arrangements for the flexible member;

Figure 8 is a view showing a form which constitutes a separable portion of a continuous length of stationery and the relationship between the form and the notches in the flexible member;

Figure 9 is an end view, with a partition removed, of the mechanism shown in Figure 1;

Figure 10 is a front view, partly broken away, of the mechanism shown in Figure 9, and

Figure 11 is a circuit diagram showing an alternative circuit arrangement.

The present example is applied to an electric typewriter of the kind in which many of the operations of the machine are effected under the control of the operator's keys by means of a constantly running electric motor and in which the platen 10 is automatically rotated one line space at the end of each return movement of the carriage. The platen has, in well known manner (see for example British Patent No. 408,125), feeding pins which are not shown but engage in marginal perforations 11 in the record material. This material is in the form of a continuous web of paper pre-printed with separable forms each as indicated in Figure 8, the web being reversely folded to form a zig-zag pack. There may, if desired, be two or more superimposed record webs with inter-leaved carbon paper.

The shaft 12 of the platen 10 is extended through a cover 13 and carries a ratchet wheel 15 fixed to the shaft. Within the cover 13 there is a solenoid 16 of which the armature is connected by a link 17 to a lever 18 free on the shaft 12. This lever carries a pawl 20 urged by spring 19 into engagement with the teeth of the wheel 15. The arrangement is such that when the solenoid is energised the lever 18 is moved upwardly and the pawl makes an idle stroke over a tooth of the wheel 15. On release of the solenoid a spring 21 acting through an arm 22 secured to lever 18 effects a return stroke of the pawl which rotates the ratchet wheel one tooth and hence rotates the platen to advance or traverse the paper web one line space. If desired the stroke of the solenoid may be made so adjustable that the wheel and platen can be advanced by two or more teeth at each operation.

Secured to the extension 12 of the platen shaft there is a pinwheel 25, this wheel being on the outside of a partition 26 held within the cover 13. The partition 26 carries three rollers 27 on spindles fixed to the partition and a roller 28 on a spindle which is releasably held within a slot 29 in the partition whereby the position of the roller 28 in relation to the wheel 25 and rollers 27 may be adjusted.

Running over the pinwheel 25 there is an endless flexible band 30 of the plastic material referred to above, the band having considerable lateral stiffness. The band has perforations 31 which are at the same intervals as the perforations 11 in the record web. The band has a length equal to, or a multiple of, the form length of the record material and Figures 1 and 3-7 show how, using the rollers 27, 28, various lengths of band may be accommodated. The width of the band is a little greater than the width of the pinwheel 25 so that the band protrudes beyond the rear side (as viewed in Figure 1) of the wheel.

Secured within the cover 13 adjacent the inner edge 33 of the band 30 there is a micro-switch 35 having an operating roller 36 which runs on the edge 33 of the band.

The switch 35 is connected, as shown in Figure 2, in a

4

circuit containing the solenoid 16, a push-button switch 38 which may be a key of the typewriter or an additional switch, and a cam-operated switch 39. The circuit is in parallel with the typewriter motor 40 and a master switch 41 controlling the circuit and the motor, is provided. The cam 42 of switch 39 is constantly rotated by the motor 40 or other convenient means at a speed suitable to operate the solenoid mechanism at each making of the switch.

The band 30 has notches 44 cut in its inner edge at positions as later described. The engagement of the roller 36 with the edge of the band serves to maintain the switch closed (see Figure 2) but when the roller enters one of the notches the switch is permitted to open.

As may be seen from Figure 8 notches 44 are cut in the band at positions which correspond with positions on the form at which typing is to start. Thus in the example shown there are notches corresponding to lines on the form for the insertion of a reference, for the first line of an address, for particulars of the invoice, for the first item invoiced and the total cost. The notches, which are cut by a suitable punch, are spaced, in this example, by distances which are multiples of one sixth of an inch (i.e. multiples of a line space) and the perforations 11 and 31 are both spaced at half-inch intervals. The band and the record web are so assembled in the machine that a notch is at the sensing station where it will be engaged by the roller 36 at the same time that the corresponding line on the form is at the printing position. In the actual construction forming the subject of this example and as a matter of constructional convenience, the roller is at an angular position relative to the writing line equivalent to a lead of about one line space and the pinwheels for the band and record webs have the corresponding angular positions to enable assembly in this manner to be effected. To enable a fine adjustment of the record material relative to the writing line to be effected the platen roll and its pinwheels are rotatable on the platen shaft to a small extent.

In the operation of the machine, when after the typing of the first line on the form the carriage returns to the left, the platen is automatically rotated to advance the record web one line space in the usual way and by the normal typewriter mechanism. Assuming that this first line was in the reference space on the form shown in Figure 8 then no further lines are to be typed until the first line of the address so that several line spaces are to be skipped. To effect this operation the operator merely presses the button or key to close switch 38. The switch 35 being closed—the abovementioned rotation of the platen will have moved the band 30 to disengage the roller 36 from the "reference space" notch 44 of the band—the solenoid 16 will then be energised each time the switch 39 is closed by cam 42 and on each return stroke of the solenoid the platen will be rotated a further line space by spring 21. Accordingly the record material will be rapidly and automatically advanced until the next notch 44 (i.e. that relating to the first line of the address) reaches the sensing roller 36. The roller will drop into the notch thereby permitting switch 35 to open which will temporarily prevent further energisation of solenoid 16 and so stop the advance of the record material with the first line of the address space at the writing station. Assuming that the address requires several lines of type then the platen will be rotated a line space by the typewriter mechanism in the usual way when the carriage is returned after each line. After the return at the end of the last line, depression of the button or key 38 will cause advance of the record web until the line for invoice details reaches the writing station when the movement will stop by engagement of the roller 36 with the appropriate notch 44. The typing of the remainder of the form and the advance to the first line of the next form is effected in similar manner. It will be appreciated that disengagement of the roller from the

notches is effected by operation of the normal typewriter advance mechanism and that engagement of the roller with a notch stops the automatic advance.

The band in the above example has a length equal to two forms and the notches are duplicated so that the band has in effect two similar sections and alternate forms are controlled by the two sections of the band respectively.

In order that the record web may be moved in the reverse direction (e.g. for the making of corrections), means are included for disengaging the pawl 20 from the ratchet wheel 15. These means comprise a spring blade 50 acting on a push-button 52 on the outside of the cover 13. The button is connected to slide bar 53 which is pivotally connected at 54 to an upright member 55 which is pivoted at 56 to a rear wall of the lower cover 13. The lower end of member 55 is joggled away from the cover (see Figure 10) and is engageable with an extension of the anchor pin 51 on pawl 20 of spring 19. Inward movement of the button rocks member 55 to the right as viewed in Figure 9 which brings the member into engagement with pin 51 and by pressure on the pin disengages the pawl 20 from wheel 15.

In the construction as above described it is necessary, in order to complete the automatic advance, to maintain the button or key which closes switch 38 depressed until the advance is stopped by opening of switch 35. Figure 11 shows a circuit arrangement in which the automatic advance will continue to completion if the switch 38 is closed only momentarily. In this circuit the switch 38 is in a parallel circuit with the solenoid 16 and cam switch 39 and containing a relay coil 60. The relay has two sets of contacts which are both closed on energisation of the coil. One set 61 completes a holding circuit for the relay and the other set 62 closes the solenoid circuit. Opening of switch 35 releases the relay and so stops the advance.

The construction forming the subject of the above example has the advantages over prior constructions of simplicity, including the absence of elaborate gearing, and lightness of weight. The latter permits the construction to be mounted on the typewriter carriage without undue addition to the weight thereof.

The invention has many applications in addition to those described above and is capable of numerous modifications. For instance the principle of an endless notched band and sensing means for the notches may be applied to the control of many form-handling machines such as collating or decollating machines, and machines, known as form bursters, for separating printed webs into their constituent forms. The principle may be applied to a manually-operated typewriter in which the platen is manually rotated, a mechanical stop or detent engaging with a notch when the record material has been advanced to the next position required. Alternatively a solenoid and a motor-driven cam switch as described above may be incorporated in an otherwise manual machine. The principle may be applied to a card reading typewriter of the kind in which the keys and other parts are operated by solenoids in response to perforations in a card or web, the above described push-button or the equivalent also being operated in accordance with perforations in the card. The closing of a switch equivalent to the above-described pushbutton may be effected automatically in other kinds of punched-card-controlled machines in which the invention is incorporated. The band and cam-switch may be embodied in a master automatic typewriter (e.g. tape-controlled) which controls one or more slave machines each having a solenoid energised through the master cam-switch to rotate the platen as above-described and controlled by the master sensing switch.

The invention may be applied to the independent control of two or more sheets or webs passing through the same machine. For example the band may have notches in its opposite side edges allocated to the control of two sheets or webs respectively. Alternatively there may be

notches of different shapes or depth in the same edges and allocated to different sheets or webs. In each case the band may be used in conjunction with two or more sensing devices. The several sheets or webs may be fed by independent pin feeding means. For example the arrangement disclosed in British Patent No. 707,879 may be used or there may be pins on a platen for one web and pinwheels or tractor chains on another shaft or shafts parallel to the platen for another web and the two webs may be advanced at different speeds and according to different programmes. Thus the webs may be superposed at the platen and one web, which moves at a slower rate than the other, be used to make a record only of the entries made on the other web. In another arrangement the webs move side by side through the machine over separately rotated platens.

The same band may be used to control two or more alternative programmes. For instance sets of notches for two different programmes may be cut in opposite edges of a plastic band and the set of notches in use may be changed either by turning the band around or by turning it inside out.

The form of the band disclosed in the above example is susceptible to modifications. For example the band may carry feeding pins and be used both to feed its record material and to control the stopping programme. It is not essential that a pin or sprocket drive be employed for the band. The band may, for instance, have internal or external moulded bosses or bars engageable in sockets or recesses in a driving pulley. The band may be employed to transmit a drive to the platen or a pinwheel shaft of the machine. The band, when of plastic or like material, may have inserts of metal or other hard material, for example, at the notches or at the driving perforations. The notches may be replaced by projections (e.g. tags secured to the band) with corresponding changes in the mode of operation of the sensing switch.

Modifications may be made in the means for driving the platen or other record material advancing member. For example the member may be driven from a constantly rotating motor by means of a releasable clutch (e.g. a magnetic clutch) and the notched band may be employed to stop the drive by releasing the clutch.

The notches or projections on the band may be used to control the starting of printing or other operations which follow upon the stopping of the record material at the writing position.

In the above example the band and its driving mechanism, the sensing switch and the solenoid mechanism are all carried on the machine carriage at the right-hand end. They may however be located at other positions on the carriage—with suitable modifications in the means for transmitting the drive to and from the platen—or they may be located on a stationary part of the machine with a splined drive to and from the platen. In some instances it may be preferable to locate them at the left hand side of the carriage.

The arrangement of the driving and idler wheels or rollers shown in Figures 3-7 above is an important feature of the invention. If desired the roller 28 may be spring urged in the direction to tension the band and any or all of the rollers 27 and 28 may have pins for engaging in the perforations.

Means other than the cam-operated switch described above may be employed for producing the electrical impulses for energising the solenoid.

I claim:

1. In a web-manipulating machine, the combination of electrically operated means for feeding a web lengthwise past an operating station, a control circuit for said means, a flexible endless belt having lateral stiffness and having at least one notch in one of its side edges, means for guiding and feeding the belt past a sensing station in synchronism with the feeding of the web whereby said notch arrives at the sensing station at intervals corresponding

to the feeding of equal lengths of the web past the operating station, and a switch at said sensing station, said switch having an operating member and a pair of switch contacts relatively movable under the control of said operating member into and out of engagement, said operating member being spring pressed into engagement with the said edge of the belt and movable by the spring pressure into the notch when the notch arrives at the sensing station, and said switch contacts being in said control circuit and being operable in response to movement of the operating member into the notch to stop the feed.

2. In a web-manipulating machine, the combination as claimed in claim 1 in which the web and belt have perforations along their lengths and in which the web-feeding means include pin-feeding devices having feeding pins for engagement in the perforations in the web and the belt feeding means include further pin-feeding devices driven in synchronism with the first mentioned devices and having feeding pins engageable in the perforations in the belt.

3. In a web-manipulating machine arranged for feeding a web having feeding perforations, the combination as claimed in claim 1 in which the belt has feeding perforations along its length and the web and belt feeding means include a pin-feeding device common to both means and having feeding pins each engageable in the perforations in the web and in the belt.

4. In a web-manipulating machine, the combination as claimed in claim 1 in which the web-feeding means comprise a rotatable member operable as it rotates to feed the web, a solenoid connected in said control circuit and having a mechanical connection to said member for effecting rotation of the member by a step each time the solenoid is energized, and means for supplying a succession of electric pulses to the solenoid.

5. In a web-manipulating machine, the combination as claimed in claim 4 in which there is included in said control circuit a switch which is manually operable to close the circuit for energization of the solenoid.

6. In a web-manipulating machine the combination as claimed in claim 1 in which the means for guiding and

feeding the belt include four rollers located at the corners of a four sided figure, one being a driving roller, and a fifth roller adjustable within the compass of the figure.

7. In a typewriter having a platen incorporating pin wheels rotatable to effect feeding around the platen of continuous webs of stationery having feeding perforations by engagement of the pins with the perforations in the stationery, the combination of a ratchet wheel rotatable with the platen, a pawl engaging the ratchet wheel, a solenoid with an operative connection to the pawl whereby successive energizations and de-energizations of the solenoid will operate the pawl to effect step-by-step rotation of the wheel and platen, a motor, a rotatable contact breaker connected to said motor for rotation thereby, an electric circuit including said solenoid, said contact breaker and a source of electricity whereby successive energizations and de-energizations as aforesaid of the solenoid may be effected, a manually operable starting switch in said circuit, a mechanically operable stopping switch in said circuit, an endless flexible belt having feeding perforations along its length and at least one notch in one side edge and said belt being laterally stiff, and pin type feeding means rotatable with the platen for driving said belt in synchronism with the stationery by engagement in the perforations in said belt, said stopping switch having an operating member which is spring pressed against the said side edge of the belt and is engageable in the notch and is operable when running on the edge to close the switch and when in the notch to open the switch so that entry of the member into the notch stops rotation of the platen by the solenoid.

References Cited in the file of this patent

UNITED STATES PATENTS

2,564,580	Pentecost et al. _____	Aug. 14, 1951
2,615,551	Mills et al. _____	Oct. 28, 1952
2,684,746	Bakelaar et al. _____	July 27, 1954
2,747,717	Cunningham et al. _____	May 29, 1956
2,842,250	Furman et al. _____	July 8, 1958