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3,028,944

WEB FEEDING MECHANISM FOR TABULATING AND LIKE MACHINES

Filed Nov. 20, 1959

6 Sheets-Sheet 1

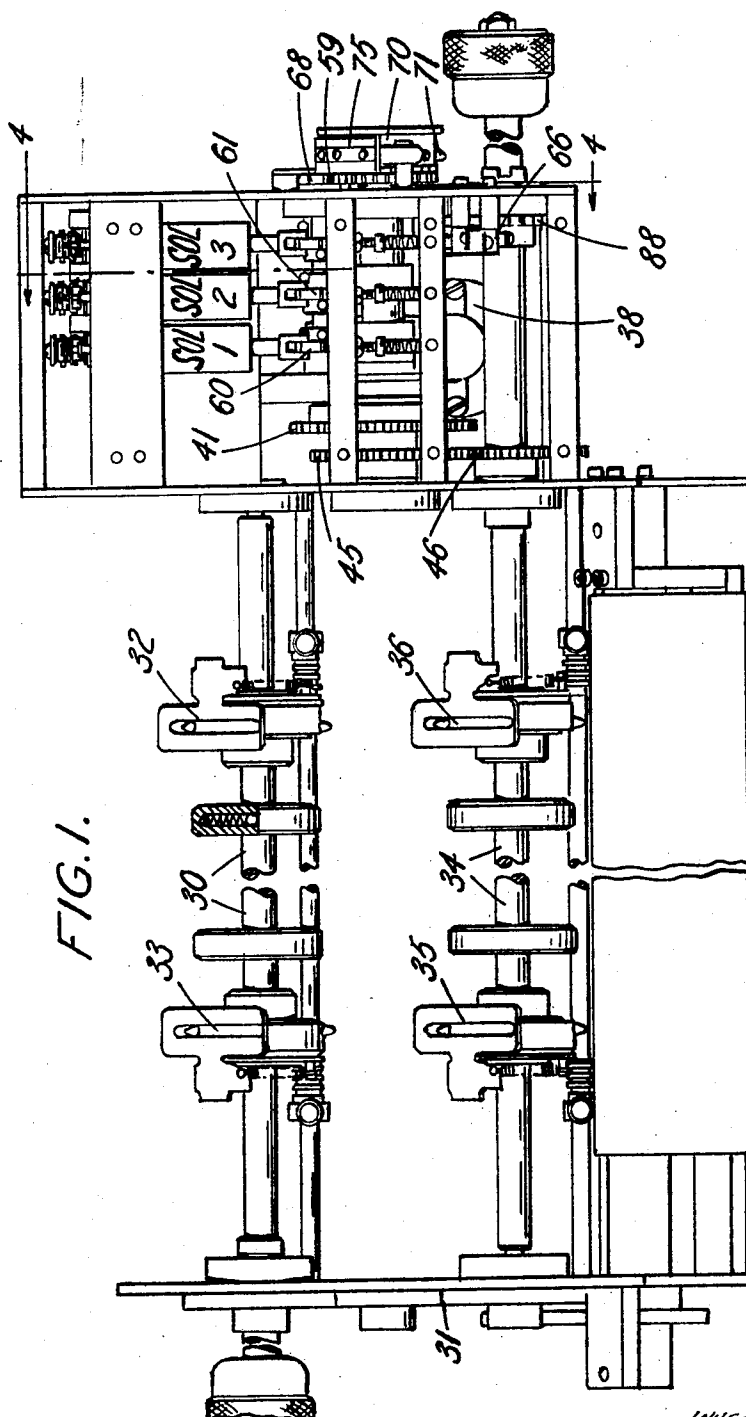


FIG. 1.

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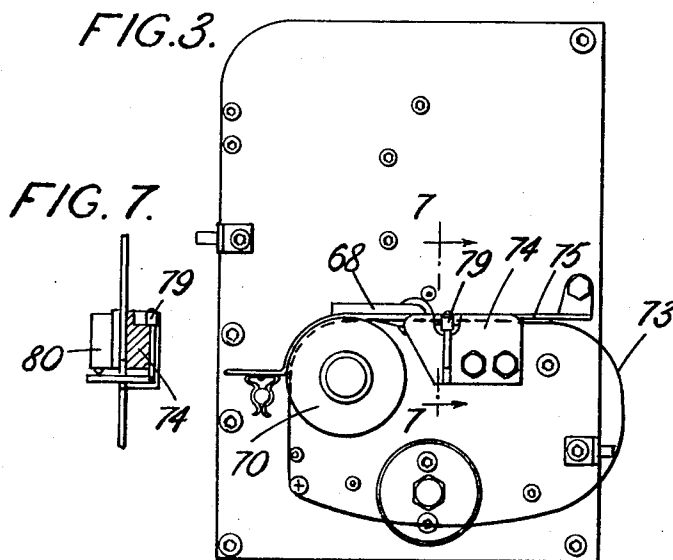
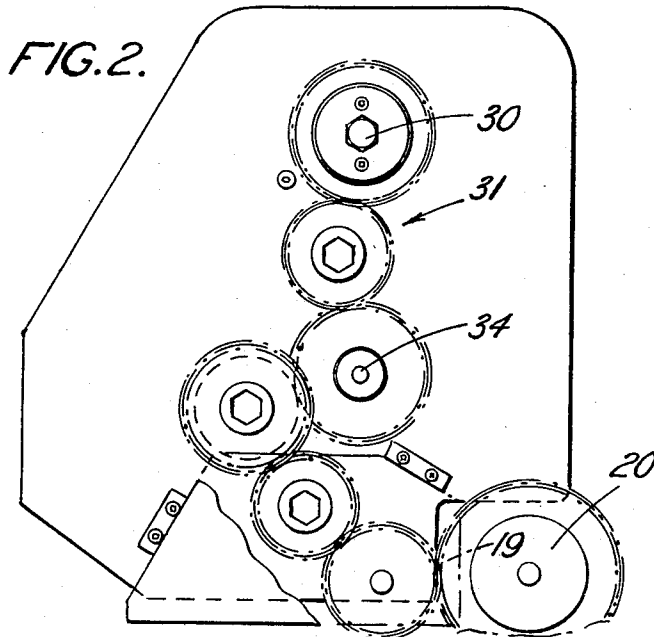
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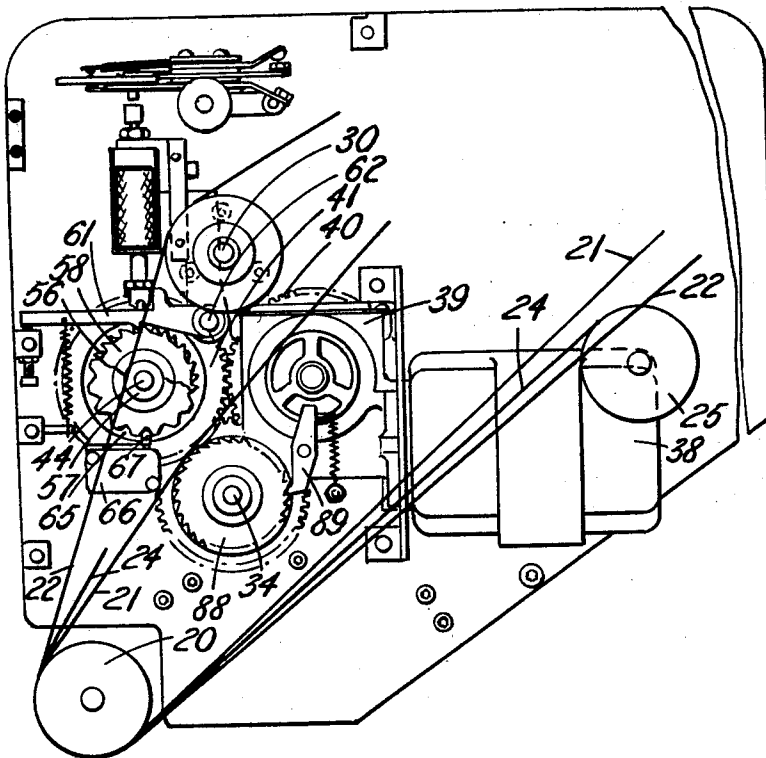
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FIG. 4.



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FIG. 5.

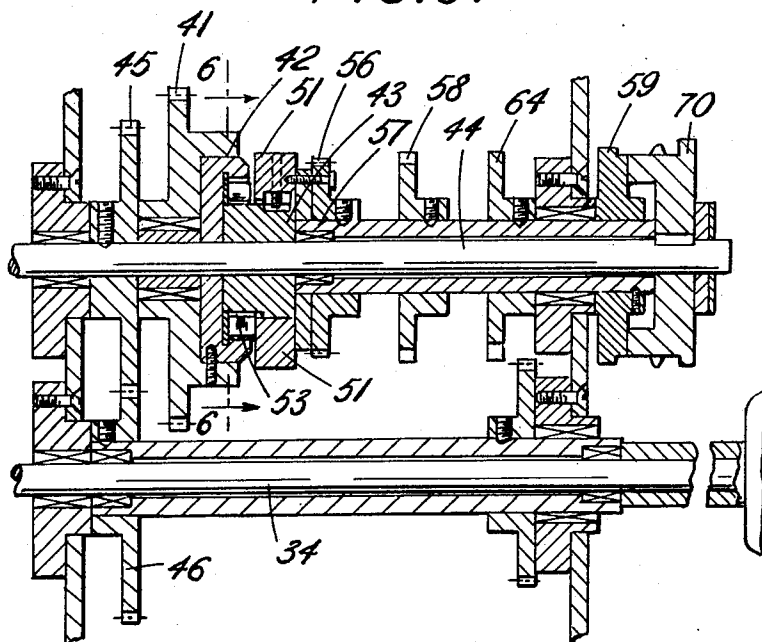
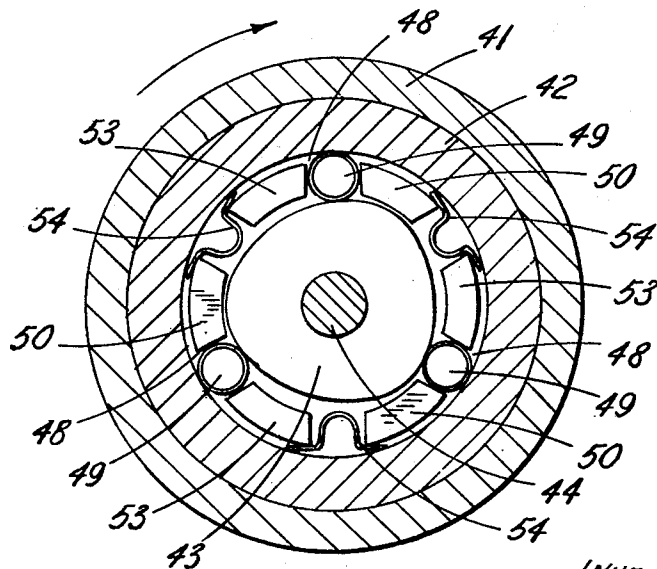


FIG. 6.



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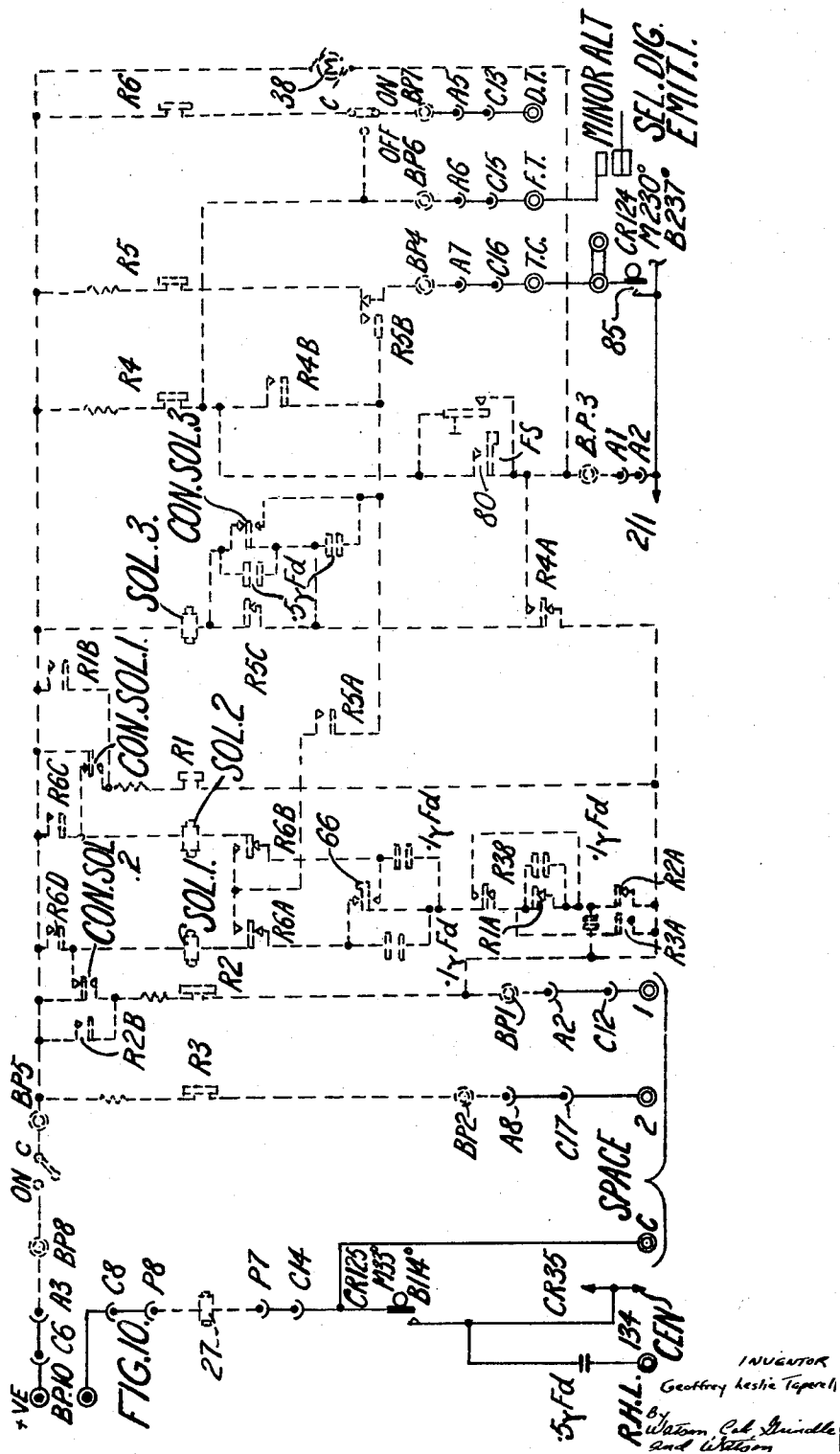
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WEB FEEDING MECHANISM FOR TABULATING AND LIKE MACHINES

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3,028,944

WEB FEEDING MECHANISM FOR TABULATING AND LIKE MACHINES

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12 Claims. (Cl. 197—133)

The invention relates to web feeding mechanism for use in, or as an attachment for, a tabulating or like type-writing or printing machine, to feed a paper web past the writing position of the machine by steps of different lengths. Such a mechanism is required, for example, when it is desired, in making entries on forms pre-printed along a web, that a number of entries are first made in a form line-by-line and then a long throw is required to skip the remainder of the form and the heading of the next form to bring the first writing line of the next form to the writing position. The number of lines entered on the forms may vary from form to form in which case the length of the long throws will also vary or the number of lines entered on successive forms may be constant in which case the long throws will be of constant length. Moreover, in some cases, it may be desired to skip portions of each form according to a predetermined programme. For instance after the form has been advanced several line steps during the entry of an address, a longer step or throw may be required to bring the first line of a writing space on the form to the writing position. The invention is particularly, but not exclusively, concerned with mechanisms for use when the web is one of two (or more) of which one is used to receive duplicate entries, in condensed form, of entries made on the other web.

It is an object of the invention to provide an improved feeding mechanism for the above purpose.

The invention provides web feeding mechanism for the above purpose and comprising a driving member for rotating web-feeding means, escapement mechanism operable to restrain rotation of the feeding means to step-by-step movements for line feeding in response to signals from the tabulating or like machine, means for releasing the restraint of the escapement mechanism to permit continuous long-throw rotation of the web-feeding means, and a programme member for stopping the web at predetermined positions after continuous long-feed operations.

It is preferred that the programme member is a flexible band or tape which is advanced with the web and has, at one or more positions along its length appropriate to the desired programme, an aperture, notch, depression, projection or other irregularity which is arranged to engage a switch or other trip device to stop the long-throw operations of the feeding means. The band or tape may be endless and be advanced past the trip device in a closed path so that the aperture or other irregularity or each of them engages the device repeatedly at intervals appropriate to a desired repetition of the programme (e.g. for each of a succession of forms). The band or tape may have a succession of irregularities appropriate to two or more successive similar or dissimilar programmes.

More specifically the invention provides web-feeding mechanism for the above purpose comprising rotatable web-feeding means for making feeding engagement with the web and operable by rotation to effect feeding thereof, a motor or means for making a driving connection to a motor, drive transmitting means between the motor or the connection means and the web-feeding means, said transmitting means including a releasable clutch having driving, driven and release members rotatable by the

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motor and the clutch being releasable by stoppage of the rotation of the release member, a solenoid-operated escapement mechanism for holding the release member against rotation and responsive to line feed signals from the tabulating or like machine to free the release member for rotation by a step for each signal whereby on receipt of a line feed signal the clutch is permitted to engage and transmit the drive to the feeding means for a line advance of the web, a control or programme member movable in synchronism with the release member, means responsive to a long-throw signal from the tabulating or like machine or from the programme member for rendering the escapement mechanism ineffective to stop rotation of the release member so that the drive through the clutch becomes continuous during a long-throw, a pawl and ratchet device operable when engaged to hold the release member against rotation, said pawl being held by the programme member out of engagement with the ratchet during both line and long-throw advance of the web and being permitted by the programme member to engage the ratchet at the end of a long throw to stop further feeding of the web and a solenoid for disengaging the pawl from the ratchet on receipt of the first line signal after a long throw.

A specific construction of a paper-web feeding attachment according to the invention will now be described by way of example, and with reference to the accompanying drawings in which:

FIGURE 1 is a front view of the attachment,

FIGURE 2 is a side view of the attachment, looking at the left-hand end of FIGURE 1,

FIGURE 3 is a view looking at the other end of the attachment,

FIGURE 4 is a view on the line 4—4 of FIGURE 1,

FIGURE 5 is a detailed view showing part of the driving mechanism,

FIGURE 6 is a section on the line 6—6 in FIGURE 5 showing the clutch construction,

FIGURE 7 is a section on the line 7—7 in FIGURE 3 showing a constructional detail,

FIGURE 8 is a perspective diagram showing a control belt and associated parts,

FIGURE 9 shows a part of the belt,

FIGURE 10 is a circuit diagram, showing in full lines parts of the circuit existing in the machine and in chain lines parts of the circuit embodied in the attachment,

FIGURE 11 is a perspective diagram showing an additional control belt and associated parts, and

FIGURE 12 shows a part of the belt used in the construction of FIGURE 11.

The attachment forming the subject of this example is intended for use with a punched card controlled Hollerith 902 tabulating machine with a UPF carriage indicated at 19. The rotatable platen of the machine is shown at 20.

The present attachment serves to draw two superposed webs 21, 22 of marginally perforated paper around the machine platen 20 at different overall speeds. The outer or top web 22 consists of a succession of forms on each of which individual entries or groups of entries will be made line by line and the web advanced, in known manner, by a long throw to bring a new form to the writing line of the machine. The inner or lower web 21 is intended to provide a summary or condensed record of the entries on the top web. That is, the entries made in widely spaced relation on a number of the individual forms of the top web 22 are duplicated in line-by-line relation on a form printed on the summary web 21 until on a signal, derived from the tabulating machine or from a programme member as later described, the summary web 21 is itself given a long-throw to bring a predetermined position of a fresh form thereon to the writing line of the machine, the amount of the long-throw required

varying according to the number of entries made on the first summary form.

Between the webs 21, 22 there is a web 24 of carbon paper which advances at an average speed which is less than that of either of the webs 21, 22. The web 24 is supplied from a reel 25 which is released for rotation by small amounts by a pawl and ratchet mechanism, in a manner well-known in itself. The mechanism is operated by a solenoid 27 (FIGURE 10) energised from the tabulating machine.

To effect the feeding of the top web 22 there is a shaft 30 which is driven by a train of gearing 31 from the platen 20 of the machine. This shaft carries pin-wheels 32, 33 which make feeding engagement with the marginal perforations in the web 22.

To effect the feeding of the lower, summary, web there is a second shaft 34, parallel to the shaft 30, which carries pin-wheels 35, 36 engaging the marginal perforations in the summary web 21. The summary web-feeding shaft 34 is driven by the means about to be described.

To drive the shaft 34 there is a constantly running motor 38, which has a driving connection to the shaft 34 which includes a reduction gear drive comprising a gear box 39 and gears 40, 41 to a driving clutch member 42. The driven member 43 of the clutch is secured to a lay-shaft 44 which in turn has a gear connection 45, 46 to the summary web-feeding shaft. The clutch is of the jamming ball or roller type. It comprises the outer driving clutch member 42 which is internally of cylindrical form and the driven clutch member 43 which is within the outer member and is externally shaped to provide between the two members three equally spaced, similar, wedge-shaped throats 48 within which the balls or rollers 49 are received. The balls or rollers are urged, as later described, towards the smaller ends of the throats, which ends lead in the direction of rotation, and as the driving member 42 rotates it tends to draw the balls or rollers further into the smaller ends and so, by a wedging action, to transmit the drive to the driven member 43. Between each ball or roller and the smaller end of its throat, there is a prong 50 and the three prongs are secured to a hub 51 which surrounds the driven member 43 and is rotatable thereon. If, as is about to be described, the sleeve 51 is held against rotation, the prongs 50 hold back the balls or rollers and the clutch is released, the driving member 42 being free to rotate and the driven member 43 held, the balls or rollers being retained in the larger parts of their throats. The hub 51 accordingly constitutes a release member for the clutch and also stops the driven member 43. Also secured to the hub 51 there are three further prongs, 53, which extend parallel to the prongs 50 and are spaced apart therefrom. Supported between each pair of prongs 50, 53 there is a U-shaped spring 54 which rubs on the driving member 42. The friction of the springs on the driving member has the effect that when the hub 51 is released it is carried round by the driving member and the balls or rollers are urged into the throats to engage the clutch. If it is necessary or desirable to augment the friction of the springs 54 there may be provided a friction pad which rubs on the outside of hub 51 and is attached by a spring blade to the adjacent hub of wheel 41. The hub 51 is secured to a ratchet wheel 56 which, in turn, is secured to a release sleeve 57, both the wheel 56 and the sleeve being rotatable on the shaft 44.

Secured to the release sleeve there are two further ratchet wheels 58 and 59. The wheels 56 and 58 have their ratchet teeth set fully out of phase with one another and co-operating with these teeth are two pawls 60, 61 freely pivoted on a rock shaft 62 parallel to the sleeve 57 and lay-shaft 44. The pawls 60, 61 are spring-urged into engagement with the teeth of the ratchet wheels 56 and 58 and are disengageable therefrom by means of two solenoids, Sol. 1 and Sol. 2. The arrangement constitutes an escapement motion. Alternate energisation of the two solenoids permits rotation of the sleeve

57 by half a tooth space at a time, with corresponding engagement of the clutch and transmission of the drive from the motor to the summary sheet-feeding shaft 34 to advance the sheet by one line. The solenoids are energised by pulse signals from the tabulating machine and to obtain alternate energisation the following device is adopted.

Rotatable with the sleeve 57 there is a wheel 64 having one notch 65 for each tooth of one of the escapement ratchet wheels 56 or 58. That is, there is a notch aligned with each tooth of one wheel and a land aligned with each tooth of the other wheel. Co-operating with the notched wheel is a change-over switch 66 having an operating roller 67 which, when it drops into a notch, operates the switch to connect one solenoid in the circuit and when it rides on a land connects the other solenoid in the circuit.

The ratchet wheel 59 on the sleeve is engageable by a pawl 68 which is fixed to the rock shaft 62 and there is a third solenoid, Sol. 3, which is operable to rock the shaft and to disengage the pawl 68 from the wheel 59.

Fixed to the shaft 44 and alongside the ratchet wheel 59 is a drum 70 having radial feeding pins 71 which engage in perforations 72 in an endless flexible plastic programme belt 73. Guide means 74, 75 support the belt in a straight line path to the drum 70. One edge portion 73a of the belt overlies the ratchet wheel 59 between the pawl 68 and the wheel and normally holds the pawl off the wheel. The edge has however, a notch or notches 76 which, when it, or each notch in turn, arrives under the pawl 68 (as shown in FIGURE 8) permits the pawl to engage the wheel and so to stop the release sleeve 57 and disengage the clutch. The notch or each notch is at a position corresponding to the end of a long feed. The other edge of the belt has a notch 78 (or notches) for co-operation with an operating member 79 for a micro-switch 80 (later referred to as the "long-throw switch"), the notch being in position to engage the switch operating member when a long-throw is to begin (i.e. when a predetermined position on a form such as the end of the writing space reaches the writing position of the machine). This switch, when the member 79 is engaged by a notch 78, closes a separate supply circuit to both of the two escapement solenoids Sol. 1 and Sol. 2, the circuit containing a relay R4 which is self-holding through R4A and R4B. Accordingly engagement of the switch releases the escapement completely and permits a long-throw to take place. In parallel with the switch 80 there is a circuit (from B.P. 6) operable by a signal from the tabulating machine to energise R4 to begin a long-throw at any time. The end of a long-throw is determined by engagement of the pawl in the ratchet wheel as above described. The movement of the pawl into the wheel also opens contacts Con. Sol. 3 in the holding circuit of the relay R4 and so effects de-energisation of the escapement solenoids. Relay R5, energised through machine operated contacts 85, is provided to prevent a long-throw beginning until the machine is ready.

Summarising the operation of the mechanism, line-by-line feed of the summary web is effected by momentary engagements of the clutch which occur when the two escapement solenoids Sol. 1 and Sol. 2, are energised in turn. At the same time the belt 73 is progressively advanced. When a long-throw signal is received (either from the tabulating machine or by engagement of a notch in the belt with the long-throw switch operating member 79) the escapement solenoids are both energised so that the clutch engages continuously until the release sleeve is stopped by engagement of the long-throw pawl 68 in the ratchet, which occurs when a notch in the belt arrives at the pawl.

The signal from the tabulating machine which energises either of the escapement solenoids also, each time, energises the solenoid, Sol. 3, of the long-throw pawl. Accordingly, the first "line" signal after a long-throw

withdraws the long-throw pawl from its ratchet wheel, the pawl thereafter being held disengaged by the belt until the arrival at the pawl of the next notch in the belt.

To avoid the possibility that a single "line" signal of undue length will energise both escapement solenoids in turn, resulting in the feeding of two or more lines, the signal is fed through circuits which are de-energised by contacts Con. Sol. 1 and Con. sol. 2 operated by the two pawls as they are disengaged so that disengaging movement of one pawl prevents the same signal reaching the other solenoid.

Fixed to the pin-wheel shaft 34 for the summary sheet is a non-return ratchet wheel 88 which is engageable by a spring-urged non-return pawl 89. This helps in the correct positioning of the lines, but may be omitted if desired.

In Hollerith machines of the construction mentioned above, the movements of the platen and accordingly the shaft 30 are fully controlled by the machine itself. In other constructions of Hollerith machines, however, this is not so and for such machines there may be provided the device shown in FIGURES 11 and 12. This device comprises a pindrum 90 which is attached to the exposed end of shaft 30. The pin-drum feeds a belt 91 in a manner analogous to the pin-drum 70 and belt 73 described above. Carried on a guide block 93 for the belt are two switch operating members 94, 95 similar to the member 79. These members co-operate with notches 96 and 97 on opposite sides of the belt respectively. The notches 96 are cut at a predetermined programme of positions and engagement of a notch by the member 94 operates a switch to stop the platen rotation at the end of a tabulator control change throw, i.e. the tabulator having completed a group of lines, the platen starts to rotate and is then stopped at a position determined by engagement of a notch 96 with operating member 94. The notch 97 is cut in a position corresponding to the last available printing line on the form and operates a switch through member 95 to cause the platen to rotate until the member 94 engages in a notch 96 to stop the platen on the first writing line of the following form.

It is within the invention to transpose the drives to the two shafts 30 and 34. That is to say, the drive from the platen may be taken by gearing to shaft 34 and the drive from the shaft 44 may be taken, by gearing, to shaft 30.

Either or both of the webs may have two or more parts interleaved with carbon paper.

It is also within the invention to provide a stationary flexible apron between the two webs around the lower part of the platen for the purpose of facilitating the relative movements of the webs.

I claim:

1. Web-feeding mechanism for use in, or as an attachment for, a tabulating or like typewriting or printing machine, to feed a paper web past the writing position of the machine by steps of different lengths, comprising rotatable web-feeding means, a driving member for rotating said web-feeding means, escapement mechanism operable to restrain rotation of the feeding means to step-by-step movements for line feeding in response to signals from the tabulating or like machine, means for releasing the restraint of the escapement mechanism to permit continuous long-throw rotation of the web-feeding means, and a programme member for stopping the web at predetermined positions after continuous long-throw operations, said escapement mechanism comprising an escapement member rotatable with the feeding means and carrying two sets of ratchet teeth, two pawls located for alternate rotation-preventing engagement with ratchet teeth of the respective sets at positions which are angularly separated around the axis of rotation of the escapement member by an amount different from an exact multiple of the angular pitch of the teeth whereby disengagement of one pawl from a tooth permits rotation

of the escapement member through an angle less than a tooth pitch and until the rotation is stopped by engagement of a tooth by the other pawl, and means responsive as aforesaid to signals from the machine for effecting such disengagement of the pawls alternately.

2. Mechanism as claimed in claim 1 in which the rotatable escapement member embodies two ratchet wheels, each having ratchet teeth, and the two pawls are engageable with the teeth on the two wheels, respectively.

3. Mechanism as claimed in claim 1 in which the said angle is half the angular pitch of the teeth.

4. Mechanism as claimed in claim 1 in which the means for releasing the restraint of the escapement mechanism are operative to disengage both pawls from the ratchet teeth.

5. Mechanism as claimed in claim 1 in which the means for effecting disengagement of the pawls comprise solenoids.

6. Mechanism as claimed in claim 1 in which there is a trip device operable to stop the web and the programme member is a flexible element which is advanced with the web and has, at at least one position along its length appropriate to the desired programme, an irregularity which is arranged to engage and operate the trip device to stop the long-throw operations of the feeding means.

7. Mechanism as claimed in claim 6 in which the flexible element is endless and is advanced past the trip device in a closed path so that the irregularity engages the device repeatedly at intervals appropriate to a desired repetition of the programme.

8. Mechanism as claimed in claim 7 in which the flexible element has a succession of irregularities appropriate to successive programmes.

9. Web-feeding mechanism for use in, or as an attachment for, a tabulating or like typewriting or printing machine, to feed a paper web past the writing position of the machine by steps of different lengths comprising rotatable web-feeding means for making feeding engagement with the web and operable by rotation to effect feeding thereof, a motor, drive transmitting means between the motor and the web-feeding means, said transmitting means including a releasable clutch having driving, driven and release members rotatable by the motor and the clutch being releasable by stoppage of the rotation of the release member, a solenoid-operated escapement mechanism for holding the release member against rotation and responsive to line feed signals from the tabulating or like machine to free the release member for rotation by a step for each signal whereby on receipt of a line feed signal the clutch is permitted to engage and transmit the drive to the feeding means for a line advance of the web, a programme member movable in synchronism with the release member, means responsive to a long-throw signal from the tabulating or like machine or from the programme member for rendering the escapement mechanism ineffective to stop rotation of the release member so that the drive through the clutch becomes continuous during a long-throw, a pawl and ratchet device operable when engaged to hold the release member against rotation, said pawl being held by the programme member out of engagement with the ratchet during both line and long-throw advances of the web and being permitted by the programme member to engage the ratchet at the end of a long-throw to stop further feeding of the web, and a solenoid for disengaging the pawl from the ratchet on receipt of the first line signal after a long-throw.

10. Web-feeding mechanism as claimed in claim 9 and including means operable by the machine to feed a second paper web past the writing position at an over-all rate different from that of the first web.

11. Web-feeding mechanism as claimed in claim 10 and including means for controlling the feeding of the second web comprising a switch controlling the web-feeding operations of the machine and an endless flexible

band which is advanced in synchronism with the second web and has, at at least one position along its length, an irregularity which is arranged to engage and operate the switch.

12. Web-feeding mechanism as claimed in claim 11 in 5
which the irregularity is a notch in the edge of the band and the switch has an operating member which runs on the edge and is engageable in the notch and contacts which

are operable by the operating member as it moves into and out of the notch.

References Cited in the file of this patent

UNITED STATES PATENTS

2,138,646	Scharr	Nov. 29, 1938
2,684,746	Bakelaar et al.	July 27, 1954