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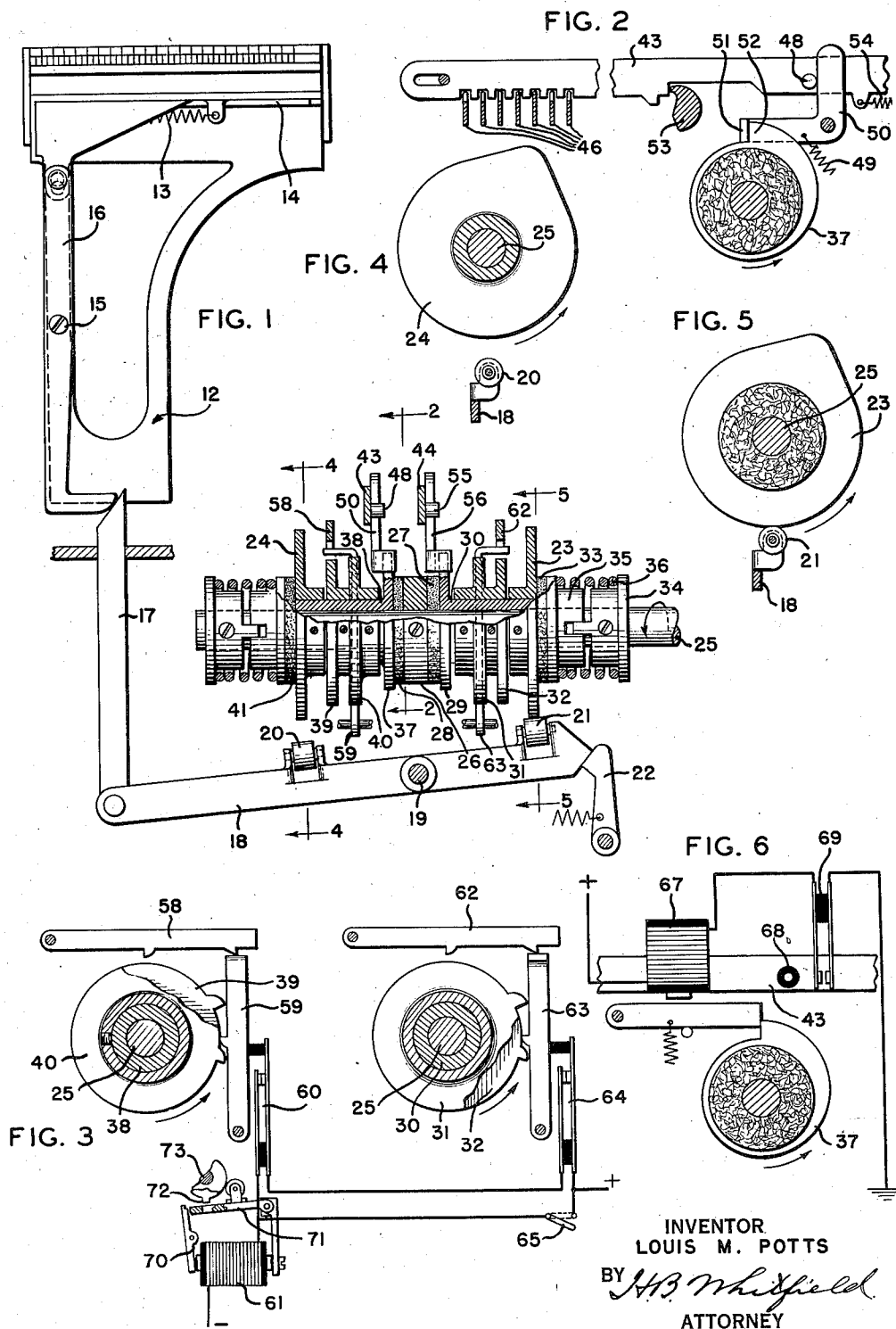
L. M. POTTS

2,102,127

DUPLEX RAIL SHIFT MECHANISM FOR LINE COMPOSING MACHINES

Filed Aug. 19, 1936

2 Sheets-Sheet 1



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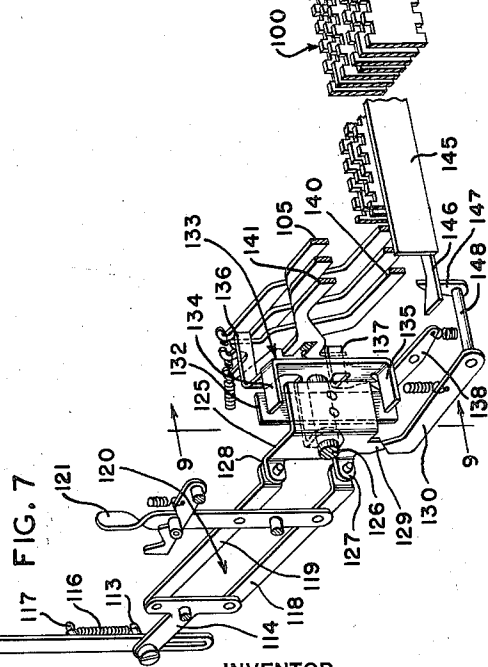
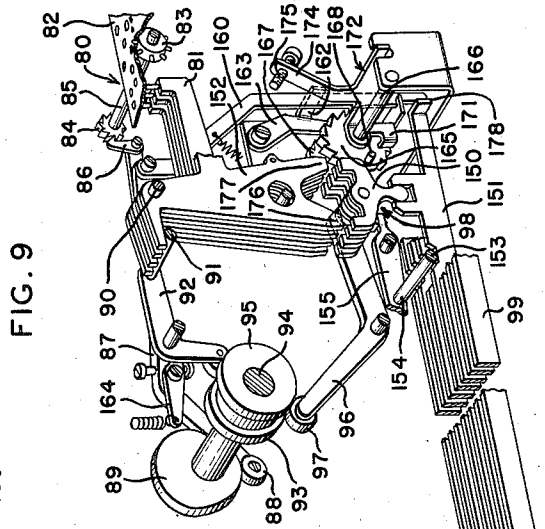
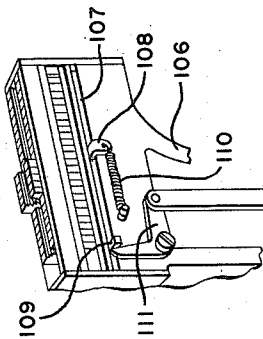
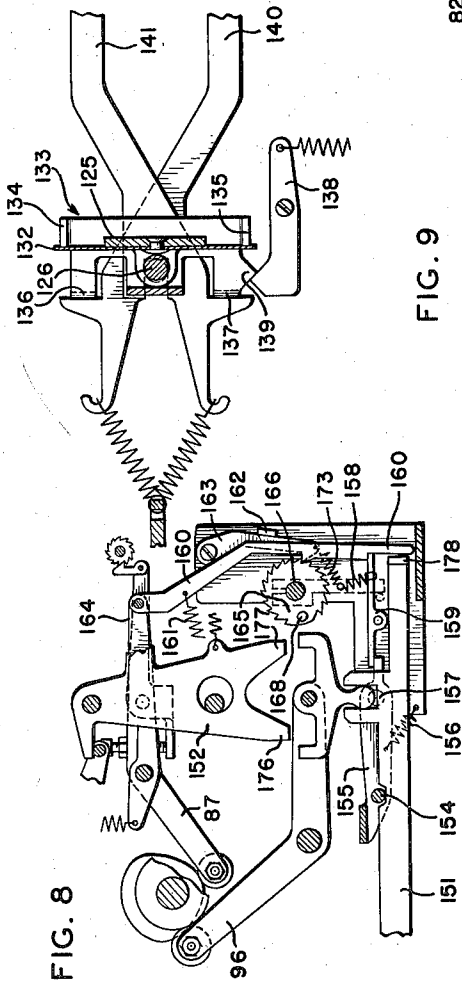
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DUPLEX RAIL SHIFT MECHANISM FOR LINE COMPOSING MACHINES

Filed Aug. 19, 1936

2 Sheets-Sheet 2



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2,102,127

DUPLEX RAIL SHIFT MECHANISM FOR
LINE COMPOSING MACHINESLouis M. Potts, Evanston, Ill., assignor, by mesne
assignments, to Teletypesetter Corporation,
a corporation of Delaware

Application August 19, 1936, Serial No. 96,735

25 Claims. (Cl. 199—29)

This invention relates generally to typographical composing machines and more particularly to automatic control units for such machines.

5 The principal object of the invention is the provision of instrumentalities in an automatic control unit to enable the performance of certain auxiliary functions rapidly and efficiently.

10 A feature of the invention is the operation of the duplex rail for the assembly of the matrices either in accordance with roman or bold-face type with a minimum of delay in composition and thus an increase in the composition rate.

15 The above and other objects of the invention are accomplished by the arrangement of mechanism for the operation of the duplex rail of the assembler elevator in timed relation to the operation of other instrumentalities of the control unit, without arresting or delaying appreciably the matrix release operations and assembly. Under such conditions of operation, selection and discharge of the matrices continues with regularity regardless of the level at which the matrices are to be assembled, and the duplex rail is moved at an instant intervening the reception into the assembly block of the last matrix to be assembled, for example, at the lower level, and the arrival thereof of the next succeeding matrix intended to be assembled at the higher level.

20 The transit time of each released matrix from its point of release from the magazine until it is assembled in the assembler elevator coincides substantially with the time required to release several matrices. Accordingly, at the instant a rail shift signal is being sensed by a record reader, the matrix released by the signal sensed just prior to the signal identified with the rail shift operation and possibly several other matrices will be in transit toward the assembler elevator. If the rail shift operation occurred immediately after its signal was sensed, a condition would result wherein some of the matrices identified with signals preceding the rail shift signal would not have completed their travel prior to the shifting of the duplex rail, and consequently would not be assembled in the elevator at the intended level. To overcome such possibility, it has been proposed to so time the operations that the movement of the rail will occur after the lapse of a measured time interval and between the proper ones of the two consecutive matrices to be assembled at the respective levels but without suspending matrix release operations during the tolling of the measured time interval.

It is believed that the structure constituting the invention will be clearly understood from the following description, taken in conjunction with the accompanying drawings, wherein

Fig. 1 shows one embodiment of the invention as applied to a particular form of control unit;

Fig. 2 is a sectional view taken along the line 2—2 of Fig. 1;

Fig. 3 is a circuit diagram showing the control elements of the structure disclosed in Fig. 1;

Fig. 4 is a sectional view taken along the line 4—4 of Fig. 1;

Fig. 5 is a sectional view taken along the line 5—5 of Fig. 2;

Fig. 6 shows a modified form of the structure disclosed in Figs. 1 and 2;

Fig. 7 is a perspective view of structure embodying the present invention as applied to a different form of control unit;

Fig. 8 is a detail view of certain parts of the structure disclosed in Fig. 7 featuring an intermediate condition of operation; and

Fig. 9 is a sectional view taken along the line 9—9 of Fig. 7.

As disclosed in Patent No. 2,057,652 issued October 13, 1936 to Louis M. Potts, the automatic control and operation of typographical machines is effected through the use of a control unit including a plurality of permutation bars operated in permuted arrangement in accordance with control indicia or perforations appearing in a previously formed strip or tape, which serve to control a plurality of selectable bars. The permutation bars are set permutably in accordance with the control indicia or perforations in the tape to select and control the operation of the selectable bars, there being a selectable bar individual to each of the several control functions of the typographical or linecasting machine. Included among such functions is the operation of the duplex rail in the assembler elevator for determining the admission of the matrices either in the roman or bold-face position. Control of the duplex rail in accordance with the disclosure of the foregoing patent is effected through the operation of a pair of selectable members, following which the operation of the record reader, through which the permutation bars are operated, is arrested pending the completion of the operation of the duplex rail which must, in accordance with such disclosure, be delayed for a period sufficient to allow the discharge and the assembly of the matrices in accordance with selections occurring prior to the selection allocated to the duplex rail operation.

However, according to the present invention, the selection and operation of the selectable members continues uninterruptedly, notwithstanding the fact that the assembler rail is shifted.

Referring specifically to Fig. 1, the assembler elevator is indicated generally by the reference numeral 12. Slidably mounted in the assembler elevator 12 under the tension of a spring 13 which has one end secured to a spring post (not shown) carried by the elevator 12 and has the other end secured to an eyelet formed in a depending portion, is a duplex rail 14. When the duplex rail is in its extreme left-hand position as shown in Fig. 1, the matrices will be assembled at the lower level, whereas if the duplex rail 14 is in its extreme right-hand position, the matrices will be assembled thereon or at the upper level of assembly.

Pivoted to the frame of the elevator 12 at 15 is a lever 16 which has one end secured to a depending portion of the duplex rail 14 and which has its other end extended into the path of bar 17. Normally, lever 16 and bar 17 are in the position shown in Fig. 1 with the duplex rail 14 in its retracted position as urged by the spring 13. Movement of duplex rail 14 to its other position is dependent upon the operation of bar 17 which has its free end formed as a cam surface so that upon its engagement with the free end of lever 16, the latter lever will be rocked clockwise to cause duplex rail 14 to move to the right. Thereupon, subsequently delivered matrices will be assembled at the upper level of assembly.

Secured to bar 17 is a lever 18 which is pivoted at 19 and which carries intermediate its ends cam rollers 20 and 21. Cooperating with the free end of pivoted lever 18 is a spring-urged jockey 22 which holds lever 18 in either of its two operative positions. Movement of lever 18 into either of its operative positions is effected through the selective rotation of cams 23 and 24, Figs. 4 and 5, driven by power communicated from a continuously rotated shaft 25 through a friction clutch individual to each of the cams 23 and 24.

In accordance with the specific construction disclosed in Fig. 1, a collar 26 is secured to shaft 25, and on opposite sides thereof are discs 27 and 28 of friction material. In driving relation with respect to friction disc 27 is a stop disc 29 arranged with a hub 30 which is free upon shaft 25. Secured to the hub or sleeve 30 of stop disc 29 are cams 23, 31, and 32. Each of cams 23, 31, and 32 is angularly adjustable in order to regulate the time of operation of the respective cams.

To augment the driving relation of the several cams upon the release of stop disc 29, an additional disc of friction material 33 is arranged in contact with the adjacent surface of cam 23. Power for driving disc 33 is communicated from shaft 25 through a collar 34 secured thereto and a collar 35 driven by collar 34 through a tongue and groove connection. A spring 36 is positioned between the flanges on collars 34 and 35 in a manner well known in clutch construction.

In driving relation with friction disc 29 is a stop disc 37 which, like stop disc 29, has a hub or sleeve 38 on which is mounted cam 24 as well as cams 39 and 40. As was described in connection with cam 23, power is also communicated to cam 29 through a friction disc 41 in a manner similar to the construction described with reference to cam 23.

With the construction described above, when either stop disc 29 or 37 is released, the cams as-

sociated therewith will be driven by power communicated from shaft 25 through the friction discs 27, 33, 28, and 41, depending upon which of the stop discs is released for rotation.

The release of the stop discs for rotation is controlled by a selectable bar 43 or 44 individual thereto. As disclosed, selectable bar 43 is individual to stop disc 37 and selectable bar 44 is individual to stop disc 29. When either of these selectable bars is operated, the stop disc individual thereto will be released to make one complete revolution and the cams associated therewith will be rotated to perform their respective functions. After each revolution, the stop disc and the cams are arrested.

Referring now to Fig. 2, selectable bars 43 and 44 each are arranged to be selected for operation through the permuted setting of a plurality of permutation bars 46 in the manner more fully and comprehensively described in the foregoing patent. Upon an assigned setting of the permutation bars 46, selectable bar 43 will be selected due to the alignment of the notches in the permutation bars 46 and will be operated to actuate, through a pin 48 secured thereto against the action of a spring 49, a bell crank lever 50. Bell crank lever 50 is normally held by its spring 49 to cause its end 51 to lie in the path of stop shoulder 52 formed in stop disc 37, and thus hold the stop disc and its associated cams against rotation. However, the projection 51 is moved free of shoulder 52 on stop cam 37 due to the movement of selectable bar 43 upon the rotation of release bail 53 which normally prevents the selectable bar 43 from responding to its spring 54. Under such circumstance, when bail 53 is rotated to free selectable bar 43, spring 54, which is of sufficient tension to overcome the action of spring 49, will move selectable bar 43 to cause pin 48 to rotate bell crank lever 50. The disc 37 and its associated cams will thus be rotated by power communicated from shaft 25 through the friction clutch consisting of friction discs 23 and 41. Selectable bar 43 is operated only momentarily and upon its restoration by the action of bail 53, bell crank lever 50 will be rotated by its spring 49 to bring projection 51 into the path of shoulder 52 on stop disc 37 for arresting its rotation after it has completed one cycle or in this case a revolution, during which cams 24, 39, and 40 will perform their respective functions.

Likewise in the case of selectable bar 44, its pin 55 when the bar 44 is operated due to the permuted setting of permutation bars 46, will cause the rotation of bell crank lever 56 and thus release stop disc 29 for rotation. Inasmuch as power is communicated continuously from shaft 25 to stop disc 29 and its other associated cams through friction discs 27 and 33, stop disc 29 as well as cams 23, 31, and 32 will be rotated to perform their respective functions.

During the rotation of cams 23 and 24, rollers 20 and 21 individual to the respective cams will be engaged, depending upon the position of lever 18 which will be operated to change its position in accordance with the particular cam effective, and which will be held in such position by the action of jockey 22. Consequent movement of lever 18 will cause movement of bar 17 and in turn pivoted lever 16 for operating correspondingly duplex rail 14. If a signal is received, assuming a roman signal corresponds to the lower rail position and a bold signal is identified with the upper rail position, cam 24 will be rocked counterclockwise and the rail 14 will be retracted

if it is in the bold position. Upon the receipt of a bold signal, cam 23 is released, lever 18 will be rocked clockwise, and rail 14 will be moved to its right-hand position. Under such conditions of operation, the position of duplex rail 14 and the level at which matrices are assembled will be determined. For example, with the duplex rail 14 in its left-hand position, the matrices will be assembled at the lower level, whereas with the duplex rail 14 in its right-hand position, the matrices will be assembled thereon or at the upper level.

As noted in the foregoing description, cams 39 and 40 rotate with stop disc 37. Likewise, cams 31 and 32 rotate with stop disc 29 when their respective bell crank levers 50 and 56 are operated by their associated selectable bars 43 and 44. Cam 39 has its projection in rotative alignment with a projection formed on the underside of a pivoted lever 58 which acts as a latch for pivoted arm 59 designed to be operated by cam 40. Pivoted arm 59 controls a set of contacts 60 included in the energizing circuit of an electromagnet 61. When contacts 60 are closed, the circuit of the electromagnet 61 is completed and the magnet during the period in which contacts 60 are closed will be energized. Opening of contacts 60 occurs when the apex of cam 40 engages a projection on pivoted arm 59, which will be held in such position with contacts 60 open by pivoted lever or latch 58 until such lever is operated by the apex of cam 39. Cams 39 and 40 are positioned on sleeve 58 relative to each other in a manner to time the operation of contacts 60. For example, contacts 60 will be held open for a period dependent upon the spacing between the apexes of cams 39 and 40. However, the period the contacts are open will depend largely on the character of the typographical machine with which the control unit is associated and the type and size of the matrices.

Electromagnet 61 acts as a control magnet in accordance with the disclosure of the cited patent for controlling the effectiveness of the record reader. When the electromagnet 61 is energized, the record reader is in operative condition, whereas with the electromagnet deenergized, operation of the record reader is suspended during the period of such deenergization.

Like cams 39 and 40, cams 31 and 32, which rotate in timed relation to stop disc 29, are effective to operate a pivoted lever 62 and a pivoted arm 63 respectively. Pivoted arm 63 controls a set of contacts 64 included in a series circuit with contacts 60. Consequently, either contacts 60 or 64 serve to control the deenergization of electromagnet 61. Such contacts, of course, will be controlled by their respective cams as a result of their rotation through the release of the stop disc individual thereto; that is, usually one set of cams will be rotated while the other set of cams is idle. Under certain conditions, both sets of cams may be rotating at the same time as a result of their release before the other set has completed its revolution. Due to the fact that one set of cams can start to rotate before the other set has completed its cycle, it is possible to set a single bold-face character between two roman characters within the time occupied by the signals.

Fig. 6 discloses a modification of the control arrangement for the stop discs shown in Fig. 2, wherein they are released as a result of the energization of an electromagnet individual thereto, such as electromagnet 67. Each of the se-

lectable bars 43 and 44 carries a pin 68 of insulating material which is designed to engage a set of contacts such as 69 upon the operation of the selectable bar to which the pin is secured. When pin 68 engages its set of contacts; for example 69, an energizing circuit is completed for the electromagnet 67 individual thereto which, upon being energized, attracts its armature free of the stop projection on stop disc 37 and thus releases the disc, together with its associated cams, for rotation in a manner similar to that previously described in connection with the mechanical operation of bell crank lever 50. A similar condition prevails for each of bars 43 and 44.

Operation

Assume, for the purpose of further explanation of the structure disclosed in Figs. 1-5, that matrices are being assembled at the lower level which will occur with the duplex rail 14 in its left-hand position as in the illustration and that it is desired to assemble subsequently discharged matrices at the upper level or on the duplex rail 14. Under such circumstances the permutation bars 46 will be positioned to select for operation selectable bar 44. Upon the operation of selectable bar 44, its pin 55 engages bell crank lever 56, causing it to be moved to a position to free stop disc 29. Stop disc 29 normally tending to rotate by power communicated from continuously rotating shaft 25 through friction discs 27 and 33 will thereupon be rotated and since cams 23, 31, and 32 are rotated therewith, will likewise be rotated. Through the rotation of cam 23, roller 21 will be engaged and lever 18 will be rocked about its pivot 19, lever 17 will be raised, and pivoted lever 16 will be rotated about its pivot 15 for moving duplex rail 14 against the action of spring 13 to its right-hand position or to a position to cause subsequently released matrices to be assembled thereon or at the upper level of assembly.

Highly significant is the fact that cam 23 is adjusted with respect to roller 21 such as to regulate the operation of pivoted lever 18 in timed relation to the discharge of previously released matrices which are to be assembled at the lower level, such that the duplex rail 14 will assume its right-hand position during the interim between the assembly of the last matrix at the lower level and the assembly of the immediately succeeding matrix which is to be assembled at the upper level. Under such conditions of operation it is not necessary to arrest the record reader, but with such an embodiment, the record reader continues to function uninterruptedly, the permutation bars 46 will be set successively in accordance with the perforations in the control tape, and the matrices will likewise be released uninterruptedly.

Thus there is effected a composition qualifying operation which is designed to intervene between a definite and predetermined pair of matrices during their transit from the storage magazine to the ingress end of the assembler, by accurately anticipating the instant at which said pair of matrices reach their destination in the assembler and timing the execution of said qualifying or matrix routing operation (the rail shift) so that it occurs "in flight" and without having to interrupt appreciably the continuous flow of the matrices.

With the duplex rail 14 in its right-hand position and desiring to return it to its left-hand position for the assembly of matrices at the lower

level, the permutation bars 46 will be set in a manner to select and effect the operation of selectable bar 43. Selectable bar 43 in operating, causes its pin 43 to rotate bell crank lever 50 against the action of spring 49 to move projection 51 free of stop shoulder 52 on stop disc 37. Stop disc 37 will now rotate by power communicated thereto from shaft 25 through friction discs 28 and 41. Cams 24, 39, and 40 will thus be rotated to perform their respective functions.

Conditions prevailing in typographical machines to which the present invention may be applied might possibly be such as to require a momentary interruption in the operation of the record reader. In order to take care of such a condition and to increase thereby the margin of operation, cams 31, 32, 39, and 40 are provided. Cams 31 and 40 serve to open contacts 60 and 64 respectively and cause the deenergization of electromagnet 61, which will thus arrest the operation of the record reader. The operation of the record reader, however, is arrested only momentarily, for cams 32 and 39 function through pivoted levers 62 and 58 respectively to release contact arms 63 and 59 respectively to cause the closure of the associated contacts. The period during which the contacts are open and thus the period during which the record reader is arrested may, of course, be governed by the position of cam 32 with respect to cam 31 and likewise the position of cam 39 with respect to cam 40. Under such conditions of operation it may be necessary to interrupt the operation of the record reader for only a very small interval of time, whereas under other conditions of operation, such period of interruption may be considerably longer.

In accordance with the disclosure of the foregoing copending application, when electromagnet 61 is deenergized, its armature 70 is moved to a position to move pivoted arm 71, which cooperates with stop lug 72 on shaft 73 to a position for causing the arresting of such shaft. Through such action the operation of the record reader is arrested. Specifically, when electromagnet 61 is deenergized as the result of the opening of either contacts 60 or 64, pivoted arm 71 will be cammed into a position wherein the aperture therein lies in the path of the stop projection on shaft 73. When the stop projection engages the wall of such aperture, shaft 73 is arrested, it of course being understood that shaft 73 is rotated by power communicated thereto from a continuously rotating shaft through a suitable friction clutch. When shaft 73 is arrested, the advancement of the perforated strip for controlling the setting of the permutation bars 46 is discontinued temporarily until electromagnet 61 is again energized upon the closure of either contact 60 or 64 as a result of the operation of latch members 58 and 52.

Under certain conditions of operation, it will be found desirable to maintain electromagnet 61 energized continuously, for under such circumstances it is not desired to arrest the operation of the record reader. For example, under certain conditions it is not necessary to provide extra time for settling of the matrices and for other purposes, and under such conditions the record reader can run continuously. Switch 65 will be closed, completing an energizing circuit for electromagnet 61 independently of contacts 60 and 64. Consequently, even though contacts 60 and 64 may be open in consequence of the action of their associated arms 59 and 63, start control electromagnet 61 is maintained energized.

Another embodiment

Referring now to Figs. 7-9 which disclose an embodiment of the invention as applied to a control unit of the construction disclosed in copending application Serial No. 600,606, filed March 23, 1932, numeral 80 indicates generally the record reader. The record reader as more fully exemplified in the cited copending application of H. L. Krum et al., includes a plurality of sensing fingers or levers 81 arranged to be operated in accordance with transverse rows of perforations or control indicia appearing in a record strip 82 which has been prepared previously in accordance with the matter to be composed through the automatic operation of the linecasting and composing machine. The perforated strip 82 is advanced step by step through the cooperation of a pin wheel 83 with the feed perforations in the strip 82. Step-by-step rotation of wheel 83 is accomplished by the corresponding movement of a ratchet wheel 84 secured to shaft 85, to which pin wheel 83 is secured. Cooperating with ratchet wheel 84 is a stepping pawl 86 carried by one end of a pivoted operating lever 87 which carries at its opposite end a roller 88. Roller 88 cooperates with a cam 89 formed to cause the rotation of lever 87 to cause pawl 86 for each cycle of rotation to engage the next succeeding tooth of ratchet wheel 84 and cause the advancement of such ratchet wheel together with pin wheel 83 a distance determined by the distance between succeeding teeth, and thus cause the advancement of strip 82 to present the next transverse row of perforations in alignment with the tape sensing pins 81. Thus for each rotation of cam 89, ratchet wheel 84 will be rotated through a distance determined by the spacing between its teeth for causing a corresponding rotation of pin wheel 83.

Tape sensing fingers 81 are pivotally supported on a rod 90 and are arranged to be moved to bring the pins carried thereby free of strip 82 by a bail 91 carried by a bell crank lever 92. Bell crank lever 92 also carries a follower roller which engages a cam 93 mounted on shaft 94. Cams 89 and 93 are positioned with respect to each other on shaft 94 in a manner to perform their respective functions in proper timed relation.

There is also secured to shaft 94 a cam 95 which operates on a lever 96 through a cam follower roller 97 to raise, in timed relation to the operation of the tape sensing fingers or levers 81, a plurality of transfer levers 98. Transfer levers 98 cooperate, as is more fully described in the Krum et al. application, with depending portions of the sensing levers 81 to cause, through connecting members 99, the permuted setting of permutation bars 100. Permutation bars 100 will thus be set through the operation of the transfer levers 98 in accordance with the setting of the tape sensing levers 81 which will be positioned in accordance with the perforations appearing in the control strip 82.

The permutation bars 100 have their upper and lower edges notched. When the notches therein are aligned opposite one of a plurality of selectable bars 105, it will be selected for operation. The selection and operation of a bar such as 105 will cause the performance of a function of the linecasting and composing machine to which such bar is allocated. For example, certain of the bars 105 are allocated to the release of matrices, whereas other bars are assigned to the performance of auxiliary functions of the

linecasting and composing machine; that is, certain of the bars 105, specifically bars 140 and 141, are assigned to the performance of duplex rail operation.

5 In Fig. 7, a portion of an assembler elevator 106 is disclosed. Slidably mounted in the elevator 106 is a duplex rail 107, which has two projections 108 and 109. To projection 108, a spring 110 is attached for returning the duplex rail 107 to its normal or unactuated position. Of course, the other end of spring 110 is secured to a spring post in the elevator 106.

10 The duplex rail 107 may be moved against the action of spring 110 to its right-hand position as viewed in Fig. 7, wherein the matrices will be assembled thereon or at the upper level of assembly by the rotation of bell crank lever 111, which has one end in engagement with projection 109 formed on the duplex rail 107, and which has its other end attached to one end of a link 112. The opposite end of link 112 is slotted to receive a pin 113 carried by a T-shaped lever 114. Secured to pin 113 is a spring 116 which has its other end secured to a pin 117 mounted on link 112. T-shaped lever 114 has its other extremities secured to a pair of links 118 and 119 which form a parallelogram assembly 120.

30 Movement of the links 118 and 119 as is fully described in the Krum et al. application, may also be effected through a hand-operated lever 121. However, such operation does not form a part of the present invention and further description thereof is not being included here.

35 Cooperating with links 118 and 119 is a member 125 pivoted on a shaft 126 and arranged with lugs 127 and 128, which engage the end of links 118 and 119 respectively. Member 125 is also arranged with a depending portion 129 which cooperates with a pivoted detent lever 130 whereby it is held in its set position. Secured to member 125 is a reed spring 132 through which the member 125 is moved when detent 130 is operated by instrumentalities to be later described, whereby either link 118 or 119 will be operated for causing a corresponding operation of the duplex rail 107 through link 112 and bell crank lever 111.

40 Pivoted on shaft 126 is a member 133 provided with arms 134, 135, 136, and 137, and a projection 139. Arms 134 and 135 cooperate with opposite ends of reed spring 132. Arm 136 lies in the path of the upturned end of a selectable bar 140 included in the group of selectable bars 105. Like arm 136, arm 137 of member 125 lies in the path of a projection on selectable bar 141. Selectable bars 140 and 141 are assigned to the two rail shift operations; that is, selectable bar 140 when selected and operated, will shift the duplex rail through the mechanism just described to its right-hand position wherein the matrices will be assembled thereon at the upper level. Selectable bar 141 serves to control the restoration of the duplex rail 107 to its left-hand position or the position disclosed in Fig. 7.

45 The selection of selectable bars 140 and 141 is determined by the permuted setting of the permutation bars 100 in accordance with the perforations in the control strip 82. If the control strip 82 bears perforations assigned to the operation of the duplex rail either to its left- or its right-hand positions, the permutation bars 100 will be set to select either selectable bar 140 or selectable bar 141 through the alignment of the notches individual to such bars. However, the

manner of selecting and operating the bars 140 and 141 is fully and completely disclosed in the Krum et al. application referred to and for a more complete understanding of such operation, reference should be made to such application.

5 The selectable bars 140 and 141 will be immediately selected upon the alignment of the notches in the permutation bars 100 assigned thereto and upon their operation through arms 134, 135, 136, and 137, the reed spring 132 will be flexed 10 in a direction dependent upon the particular selectable bar operated, and member 133 will be rotated about shaft 126 in which position it will be held by the engagement of detent 138 with projection 139. Member 125, however, will not be operated immediately, since detent 130 continues to press against projection 129.

15 The operation of detent 130 is controlled by a bar 145 having at one end an extension 146 formed with a cam surface to engage an arm 147 carried by rod 148 to which detent 130 is secured. When arm 147 is rotated by the action of the cam surface of extension 146, detent 130 will likewise be rotated and member 125 will be freed for action by the energy stored in reed spring 132 as a result of the operation of either selectable bar 140 or 141.

20 Included in the group of transfer bails 98 is a transfer bail 150 which is individual to member 151 operatively associated with bar 145. Also individual to transfer bail 150 is a member 152 pivoted on rod 90 and operated by bail 91 upon the operation of bell crank lever 92. Member 152, however, is not arranged to sense, as is true of levers 81, perforations in the strip 82.

25 The upper edges of bar 98 are notched as at 153. When the notch in each of the bars is aligned, a bail 154 secured to a lever 155 drops therein under the action of a spring 156 which has one end secured to lever 155 and its other end secured to the frame of the control unit. When the permutation bars 100 are set in accordance with either duplex rail operation, the notch 153 in each of the bars 99 is aligned and bail 154 falls therein under the action of spring 156, 30 whereupon lever 155 is rotated about its pivot 157 sufficiently to cause lever 159 to be rotated against the action of spring 158. By the proper arrangement of the signal codes for the respective rail shift operation, the notches in the bars will be aligned for each such signal and bail 154 consequently will be operated on each rail shift signal. Lever 159, with lever 155 in its normal or unactuated position, engages the lower end of a stepping pawl 160 which is constantly under the tension of a spring 161 but which is held against the action of such spring by lever 159. However, when lever 159 is operated against the tension of its spring 158, pawl 160 is released and its spring 161 causes it to move sufficiently far to bring 35 its tooth into engagement with ratchet wheel 165 which is secured on shaft 166. Stepping pawl 160 is pivoted on and movable with lever 87 operated by cam 89.

40 Stepping pawl 160 is designed to engage the teeth of ratchet wheel 165 which will be rotated step by step for each cycle of rotation of cam 89 through pawl 160, and thus in timed relation with the step-by-step advancement of the strip 82. Also secured to shaft 166 is a ratchet wheel 167 which is engaged by a projection formed on a holding pawl 163 to hold the shaft 166 and the ratchet wheel 165 in its advanced position during the period pawl 160 is in its extreme left-hand position, as viewed in Fig. 8.

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Ratchet wheel 165 carries a pin 168 which, upon its rotation, engages depending portion 171 of member 172 pivotally mounted on shaft 166. Member 172 has an arm 174 in which is secured an adjustable screw 175. Screw 175 when member 172 is rotated as a result of the engagement of pin 168 with depending portion 171, moves member 152 so that one of its legs 176 lies in the path of upturned end of transfer member 150 which, as previously described, is individual to bar 151.

With member 152 moved in the manner described, bar 151, which is connected to bar 145, will, upon the next following operation of transfer bail 150 through bell crank lever 96 which is operated by cam 95, be moved to the right as viewed in Fig. 7. Such movement of bar 151 performs three functions; namely, the disassociation of pawl 160 with ratchet wheel 165, the removal of pawl 163 from ratchet wheel 167, and the operation of detent 130. The movement of stepping pawl 160 free of ratchet wheel 165 is accomplished by projection 178 on one end of bar 151, which engages the lower end of member 160 which is moved about its pivot and against the action of spring 161 out of engagement with stepping ratchet wheel 165 and which, in its movement, engages projection 162 carried by holding pawl 163. Holding pawl 163 is thus moved free of ratchet wheel 167 against the action of spring 173. Further rotation of ratchet wheel 165 regardless of the operation of arm 87 cyclically by cam 85 and the movement of pawl 160 is prevented under such conditions. The removal of holding pawl 163 and stepping pawl 160 from engagement with their respective ratchet wheels permits the restoration of such ratchet wheels to their normal or starting position under the action of a spring not shown.

Through bar 151, bar 145 is moved to the right as viewed in Fig. 7, and carries with it extension member 146. Through the movement of extension member 146, lever 147 is operated to rotate detent 130 free of projection 129 on member 125 and thus allow the energy stored in reed spring 132 to be exerted on member 125 for rotating it about shaft 128. Such rotation will cause the movement of either levers 118 or 119 and a corresponding rotation of T-shaped lever 114 which, through link 112, will cause the rotation of bell crank lever 111 to move duplex rail 107 from its former position to the position determined by the operation of either selectable bar 140 or 141. Of course, as described in the previously referred to Krum et al. application, the duplex rail 107 will be retained in its set position due to the detent action on lever 121.

Operation

Let it be assumed, in connection with the description of the operation of the embodiment disclosed in Figs. 7, 8, and 9, that the duplex rail 107 is in its left-hand position as viewed in Fig. 7, and that it is desired to assemble subsequently released matrices at the upper level or on the duplex rail 107. Under such conditions of operation, the permutation bars 100 will have been operated previously to select and control the operation of selectable bars 105 through which the release of matrices to be assembled at the lower level is controlled. Following the last group of perforations in tape 82 identified with the last matrix to be assembled in the elevator 106 at the lower level, a transverse row of perforations identified with the rail shift operation

appears in the control tape 82. Transverse rows of perforations appearing after the transverse row of perforations identified with the rail shift signal being identified with matrices to be assembled at the upper level or on the duplex rail 107, the duplex rail must be operated at an instant just prior to the time at which the first matrix is to be assembled at the upper level but subsequent to the time of assembly of the matrix at the lower level preceding the rail shift operation. It is also desirable to accomplish such operation without arresting the advancement of the perforated control strip 82. The structure disclosed in Figs. 7, 8, and 9 achieves such a result.

When the bars 99 are set in response to the sensing of the transverse row of perforations in tape 82 identified with the duplex rail operation, permutation bars 100 will be set to align the notches therein for the selection of selectable bar 141 and the consequent operation of the duplex rail 107 to its right-hand position to receive the subsequently released matrices. The notch 153 in each of the bars 99 will be aligned and bail 154 will be depressed by the action of its spring 156. Arm 155 will operate pivoted lever 159 against the action of its spring 158, which will be moved free of the lower end of stepping pawl 160 or to the position shown in Fig. 8. Pawl 160 is thereupon moved by the action of its spring 161 to a position where its projection engages ratchet wheel 165. Holding pawl 163, as previously described, cooperates with ratchet wheel 167 which is mounted on the same shaft as ratchet wheel 165 to hold the ratchet wheels in their advanced position, and thus simultaneously with the noted movement of pawl 160, the restraint against the action of spring 173 is removed and pawl 163 will be caused to engage ratchet wheel 167.

With stepping pawl 160 cooperating with ratchet wheel 165, the latter will be advanced a distance of one tooth for each cycle of rotation of cam 89 through the action of lever 87. Pin 168, carried by ratchet wheel 165, will engage portion 171 of member 172 shortly after the operation of bail 154 and before the next subsequent transverse row of perforations is sensed, for causing screw 175 to operate member 152 and move its leg 176 into the path of transfer arm 150. Upon the operation of the transfer arm 150, bar 151 will be moved to the right as viewed in Fig. 7, for moving bar 145 and rotating pawls 160 and 163 out of cooperative relation with ratchet wheels 165 and 167, whereupon the ratchet wheels are restored to their normal or starting position by the action of a spring not shown. Likewise, bail 154 will be restored to its normal position and pivoted lever 159 will assume its normal position where it holds pawl 160 out of engagement with ratchet wheel 165, and through projection 162 on pawl 163 the latter pawl is held out of engagement with ratchet wheel 167.

The selection and operation of selectable bar 141 causes the rotation of member 133 and the flexing through arm 135 of the lower end of reed spring 132. Member 133, together with the reed spring 132, is held in its set position by the action of detent 139 on projection 138. Movement of member 125, however, cannot be effected at that instant due to the action of detent 130. However, through the movement of bar 145 to the right as viewed in Fig. 7, extension 146 cooperates with arm 147, causing the rotation of shaft 148 and the movement of detent 130 free of projection 129 on member 125. Under such

conditions, member 125 is moved immediately, due to the energy stored in reed spring 132 which is also sufficient to overcome the action of the jockey cooperating with lever 121, and thereupon through projection 128, lever 118 is operated and the duplex rail 107 is moved to the right against the action of spring 110, which will occur at an instant following the assembly of the last preceding matrix at the lower level and prior to the arrival of the next succeeding matrix.

Highly significant in the operation of the duplex rail in accordance with the preceding description is the fact that the selectable bar 140 or 141 will be selected during a cycle of operation of cam 89 and will operate member 133 preparatory to the operation of member 151 occurs during a succeeding cycle of operation of cam 95 or the cycle of operation identified with the third transverse row of perforations appearing after the shift operation of the duplex rail. It is thus apparent that by conditioning the mechanism through which the duplex rail is operated during one cycle and effecting its operation during a subsequent cycle, the previously discharged matrices will have sufficient time to be assembled at the lower level prior to shifting the duplex rail 107 to a position to receive the released matrices. Noted further is the fact that two signal periods have been found sufficient to allow all previously released matrices to be assembled in the elevator prior to shifting the rail. Consequently, the ratchet and pawl mechanism is designed to develop such condition without arresting the record reader 80. When the rail signal is presented, the ratchet and pawl mechanism 165 and 160 operates and the tape sensing fingers continue to sense the tape to set the permutation bars 100. In the interim between the second and third row of perforations following the row identified with the rail operation bar 151 will be operated and detent 130 rocked about its pivot to allow spring 132 to act and move the duplex rail 107. Such movement will occur just prior to the time the matrix identified with the row of perforations immediately following the row for the rail shift signal reaches the assembler elevator which is to be assembled at the new level. Of course, too, the matrices preceding the rail shift signal will have ample time to reach the assembler elevator prior to shifting the rail due to the signal period for the rail shift during which no matrices will be released.

Although the invention has been disclosed and described with reference to a particular type of mechanism, it is, of course, obvious that various departures and modifications may be made without departing from the spirit and scope of the present invention.

What is claimed is:

1. In a linecasting and composing machine, a control unit including a plurality of elements arranged to be set permutably, selectable bars controlled by said elements for performing auxiliary functions, an assembler elevator, a duplex rail therein, mechanism for operating said duplex rail comprising a member operative upon the operation of one of said selectable bars, means for holding said member in its operated position, and means responsive after a predetermined time interval following the operation of the selectable bar for utilizing the action of said member to effect the corresponding movement of said duplex rail.

2. In a linecasting and composing machine, a control unit including a plurality of elements arranged to be set permutably, selectable bars controlled by said elements for performing auxiliary functions, an assembler elevator, a duplex rail therein, mechanism for operating said duplex rail comprising a member operative upon the operation of one of said selectable bars, means for holding said member in its operated position, and means responsive after a predetermined time interval following the operation of the selectable bar and after the operation of another selectable bar for utilizing the actuation of said member to effect the corresponding movement of the duplex rail.

3. In a linecasting and composing machine, a control unit including a plurality of elements arranged to be set permutably, selectable bars controlled by said elements for performing auxiliary functions, an assembler elevator, a duplex rail therein, mechanism responsive to the operation of said bars allotted to the operation of said duplex rail, and means controlled by said mechanism during the setting of the elements for the selection and operation of other selectable bars for shifting said duplex rail.

4. In a linecasting and composing machine, a control unit including a plurality of elements settable permutably in accordance with predetermined conditions, selectable bars responsive to the setting of said elements for controlling the performance of functions of the linecasting and composing machine, an assembler elevator, a duplex rail for determining the level at which matrices are to be assembled, and mechanism controlled by certain of said bars for operating said duplex rail including means conditioned for operation during the continued setting of said elements for the selection and operation of other selectable bars.

5. In a linecasting and composing machine, a control unit including a plurality of elements settable permutably in accordance with predetermined conditions, selectable bars responsive to the setting of said elements for controlling the performance of functions of the linecasting and composing machine, an assembler elevator, a duplex rail for determining the level at which matrices are to be assembled, mechanism controlled by certain of said bars for operating said duplex rail including means conditioned for operation during the continued setting of said elements, and means for operating the duplex rail during the interim of operation of selectable members identified with other functions.

6. In a linecasting and composing machine, a control unit including a plurality of elements settable permutably in accordance with predetermined conditions, selectable bars responsive to the setting of said elements for controlling the performance of functions of the linecasting and composing machine, an assembler elevator, a duplex rail therein for determining the level at which matrices are to be assembled, mechanism for operating said duplex rail comprising a member operated upon the operation of one of said selectable bars, means for retaining said member in its operated position preparatory to operating said mechanism, means selected upon the selection of said selectable bar identified with said member, and means controlled by said last mentioned means for utilizing the setting of said member to actuate said duplex rail operating mechanism.

7. In a linecasting and composing machine, a

control unit including a plurality of elements settable permutably in accordance with predetermined conditions, selectable bars responsive to the setting of said elements for controlling the performance of functions of the linecasting and composing machine, an assembler elevator, a duplex rail for determining the level at which matrices are to be assembled in said elevator, mechanism for operating said duplex rail comprising a member operated upon the operation of one of said selectable bars and retained in its operative position preparatory to operating said mechanism, means selected upon the selection of said selectable member identified with said member, a ratchet and pawl mechanism rendered effective by said last mentioned means, and means operated through the action of said ratchet and said pawl mechanism for utilizing the setting of said member to actuate said duplex rail operating mechanism.

8. In a linecasting and composing machine, a control unit including a plurality of elements arranged to be set permutably, selectable bars controlled by said elements for performing functions of the linecasting and composing machine with certain bars allotted to auxiliary functions thereof, an assembler elevator, a duplex rail therein, mechanism for operating said rail including a lever through the action of which the rail is shifted, a cam for each of the two positions of the rail, and means responsive to the operation of certain of said bars for applying power to said cams individually whereby said lever is operated.

9. In a linecasting and composing machine, a control unit including a plurality of elements arranged to be set permutably, selectable bars controlled by said elements for performing functions of the linecasting and composing machine with certain bars allotted to auxiliary functions thereof, an assembler elevator, a duplex rail therein, mechanism for operating said rail including a lever through the action of which the rail is shifted, a cam for each of the two positions of the rail, means responsive to the operation of certain of said bars for applying power to said cams individually whereby said lever is operated, and means operative with said cams for momentarily suspending the setting of the permutation elements.

10. In a linecasting and composing machine, a control unit including a plurality of elements arranged to be set permutably, selectable bars controlled by said elements for performing functions of the linecasting and composing machine with certain bars allotted to auxiliary functions thereof, an assembler elevator, a duplex rail therein, mechanism for operating said rail including a lever through the action of which the rail is shifted, a cam for each of the two positions of the rail, means responsive to the operation of certain of said bars for applying power to said cams individually whereby said lever is operated, an electrical circuit, and means operative with said cams for controlling said circuit to suspend momentarily the setting of the permutation elements.

11. In a linecasting and composing machine, a control unit including a plurality of elements arranged to be set permutably, selectable bars controlled by said elements for performing functions of the linecasting and composing machine with certain bars allotted to auxiliary functions thereof, an assembler elevator, a duplex rail therein, mechanism for operating said rail including a lever through the action of which the

rail is shifted, a cam for each of the two positions of the rail, means responsive to the operation of certain of said bars for applying power to said cams individually whereby said lever is operated, an electrical circuit, a contact arm therefor, and means for operating said arm to open said circuit and thereafter release said arm to close said circuit whereby the setting of the permutation elements is momentarily suspended.

12. In a linecasting and composing machine, a control unit including a plurality of elements settable permutably in accordance with predetermined conditions, selectable bars responsive to the setting of said elements for controlling the performance of functions of the linecasting and composing machine, an assembler elevator, a duplex rail therein for determining the level at which matrices are to be assembled, mechanism for operating said duplex rail including a member set immediately in response to the operation of one of said selectable bars, means for holding said member in its set position, and means operated after the lapse of a predetermined time interval for releasing said member whereby said duplex rail is operated accordingly.

13. In a linecasting and composing machine, a control unit including a plurality of elements settable permutably in accordance with predetermined conditions, selectable bars responsive to the setting of said elements for controlling the performance of functions of the linecasting and composing machine, an assembler elevator, a duplex rail therein for determining the level at which matrices are to be assembled, mechanism for operating said duplex rail including a pair of links, a member comprising a reed spring set immediately in response to the operation of either of two of said selectable bars and retained in said position, and means operated after the lapse of a predetermined time interval for releasing said member and rendering said spring effective to operate one of said links and thus the duplex rail while the elements are being set permutably.

14. In a linecasting and composing machine, a control unit including a plurality of elements, selectable bars controlled by said elements for performing auxiliary functions, an assembler elevator, a duplex rail, means for operating said duplex rail comprising a member operative upon the operation of one of said selectable bars, means for holding said member in its operated position, and means responsive after a predetermined time interval following the operation of the selectable bar for utilizing the action of said member to effect the corresponding movement of said duplex rail.

15. In a linecasting and composing machine, a control unit including a plurality of elements, selectable means controlled by said elements for performing auxiliary functions, an assembler elevator, a duplex rail therein, mechanism responsive to the operation of said means allotted to the operation of said duplex rail, and means controlled by said mechanism during the setting of the elements for shifting said duplex rail.

16. In a line composing machine, a matrix assembler, a duplex rail therein having two positions, mechanism to move said rail to either of its positions, means responsive to one control signal of a sequence to release a matrix intended for one position of the rail, means responsive to a succeeding code signal of said sequence to condition the rail shift mechanism for operation preparatory to shifting it to its other position, and

means to operate said conditioning means after said matrix is received by said assembler.

17. In a line composing machine, an assembler, a duplex rail therein having two positions, means to release matrices at substantially uniform intervals for assembly in said assembler, mechanism for shifting said rail means to condition said means for operation during an interval between the release of successive matrices, and means operated by said conditioned means after the assembly of the matrix released immediately prior to the actuation of the mechanism conditioning means and before the assembly of the matrix released during the interval immediately following the actuation of the mechanism conditioning means.

18. In a line composing machine, an assembler, a duplex rail therein having two positions, mechanism for shifting the rail means to condition the mechanism for operation, means effective after the operation of the conditioning means for operating said mechanism, means to release matrices during the interval of conditioning an operation of the shifting mechanism, and means to coordinate the operation of the shift mechanism and the arrival of the matrix at the assembler.

19. In a line composing machine, a sensing device controlled by a control strip, a matrix assembler, a duplex rail therein, mechanism for shifting said rail in accordance with a condition sensed by said device, means to interrupt the operation of the sensing device following the sensing of a rail shift condition, means for regulating the interval between sensing the rail shift condition and the interruption of the sensing device, and means to regulate the duration of the interruption interval of the sensing device.

20. In a line composing machine, an assembler, a duplex rail therein, power operated shift mechanism for shifting the rail in one direction, a second power operated mechanism for shifting the rail in the reverse direction, and timing means carried by each mechanism to regulate the delay between the release of the power operated mechanism and the corresponding operation of the duplex rail.

21. In a line composing machine, a signal supervised control unit for directing matrix release functions and matrix routing functions including a selector, a plurality of control elements individually conditionable by said selector, matrix release mechanism under the control of certain of said elements, matrix routing mechanism under the control of others of said elements, and means for timing the performance of said matrix routing mechanism including a device initiated by said others of said elements and effective during the operation of said matrix release mechanism after the lapse of a time interval corresponding to the transit time of said matrices from their point of release to a point of routing determination.

22. In an automatic control system, the method of performing a delayed supervision automat-

ically upon a succession of moving elements in transit without suspending the progress of said succession which comprises the procedure of initiating a timing agency following the instant at which an element is introduced into said succession, tolling a time interval corresponding to the time interval occupied by said element in transit from the point of its introduction into the succession to a predetermined point at which said qualifying supervision is to be established, and executing said supervision during the movement of said succession under the control of said timing agency upon its attainment of said predetermined point.

23. In a system of automatic composition, a control unit comprising a selector mechanism and a plurality of selectable composition and supervision elements, a magazine for storing a plurality of composing elements, an assembler constituting a destination for assembling composing elements released from said magazine, means for routing composing elements in flight of travel from said magazine to said assembler for thereby qualifying the manner of their reception into said assembler comprising a delayed response mechanism initiated by a signal following a particular release composing element signal, and consummated during the travel of composing elements and after the lapse of a time interval corresponding to the time occupied during transit by a composing element from its point of release in said magazine to a predetermined point of routing determination.

24. In an automatic control system, the method of performing a delayed supervision automatically upon a succession of moving elements during their transit and retaining the sequence characteristics of said succession, which comprises the procedure of initiating a timing agency following the instant at which an element is introduced into said succession, relaying for a measured time interval corresponding to the period occupied by said element during its transit from the point of its introduction into said succession to a point at which a qualifying supervision is to be established, and executing said supervision under the control of said timing agency at an instant when said element is approaching said last mentioned point.

25. An automatic control apparatus for assembly and composition comprising a storage record sensing mechanism, a plurality of composition elements under the supervision of said record sensing mechanism, a routing mechanism for directing composition assembly means for moving a storage record through said sensing mechanism at a regular periodicity, a timing agency for actuating said routing mechanism, and means responsive to certain signals in said storage record for initiating said timing agency to actuate said routing mechanism during the continued operation of said record moving means and following the lapse of a predetermined time interval.

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CERTIFICATE OF CORRECTION.

Patent No. 2,102,127.

December 14, 1937.

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It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 6, first column, line 38, for "staring" read starting; page 9, second column, line 41, claim 24, for the word "relaying" read delaying; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 1st day of March, A. D. 1938.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.