

June 30, 1942.

M. T. GOETZ

2,287,793

CONTROL MECHANISM FOR LINECASTING AND COMPOSING MACHINES

Filed Dec. 29, 1939

2 Sheets-Sheet 1

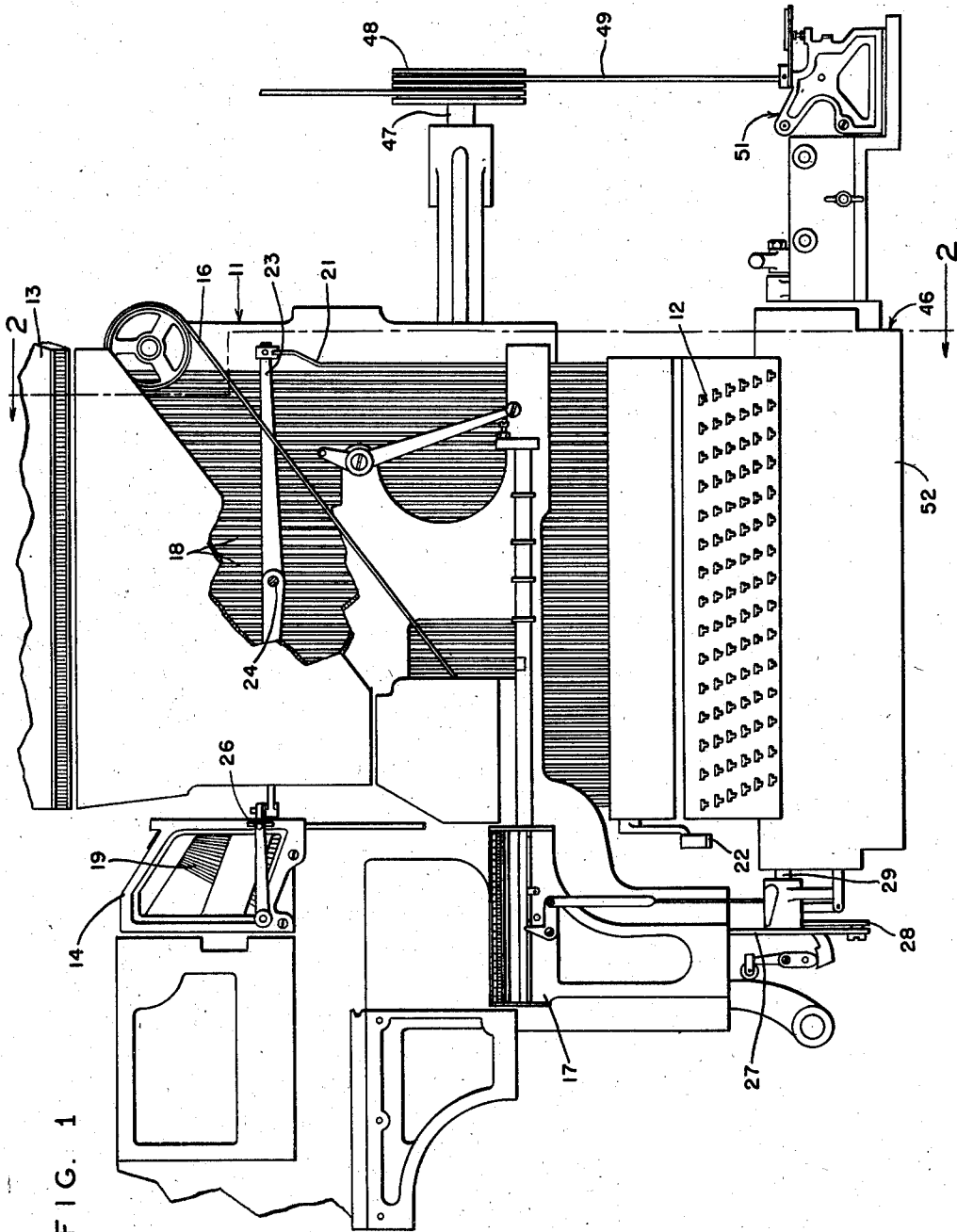


FIG. 1

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2 Sheets-Sheet 2

FIG. 6

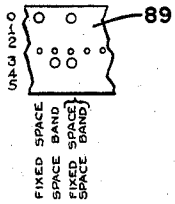


FIG. 3

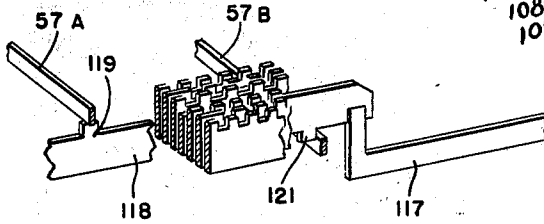
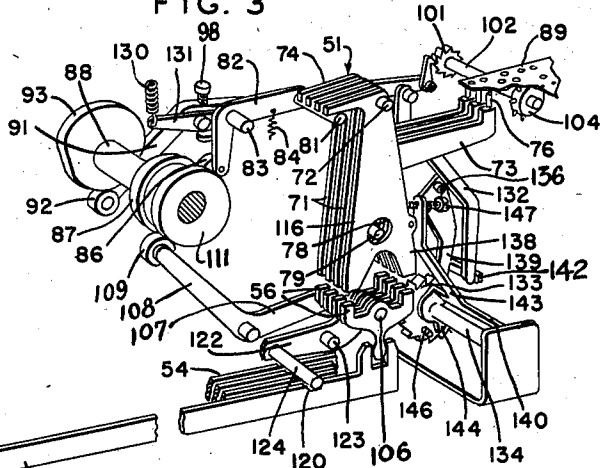


FIG. 5

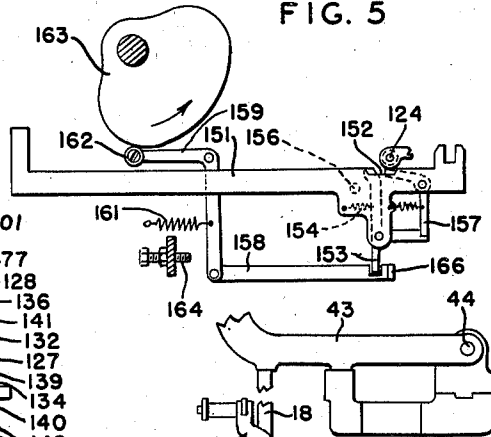


FIG. 4

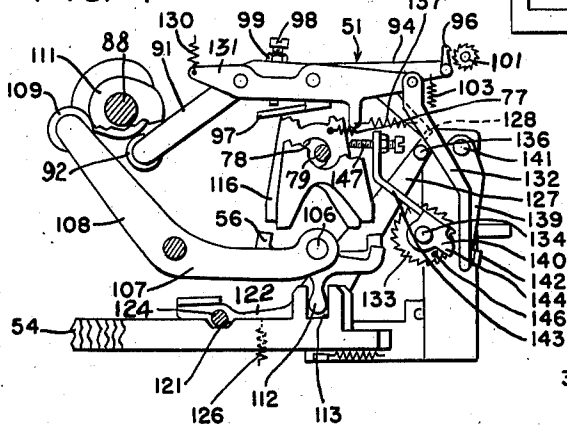
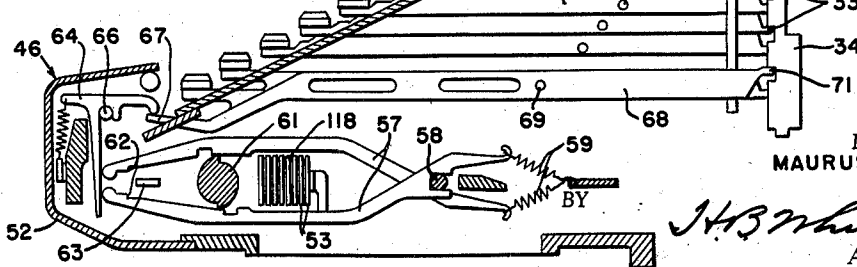


FIG. 2



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2,287,793

CONTROL MECHANISM FOR LINECASTING
AND COMPOSING MACHINESMaurus T. Goetz, Chicago, Ill., assignor, by mesne
assignments, to Teletypesetter Corporation, a
corporation of Delaware

Application December 29, 1939, Serial No. 311,483

23 Claims. (Cl. 199—51)

This invention relates to linecasting and composing machines, and particularly to apparatus for effecting the selective response of such machines to stored signal conditions.

An object of the invention is to actuate sequentially a plurality of ordinarily individually responsive instrumentalities in direct response to a single stored signal.

Another object of the invention is to actuate such instrumentalities sequentially in response to a single stored signal which is a modification of the signal to which one of said instrumentalities is invariably responsive.

A further object of the invention is to actuate such instrumentalities sequentially in response to the particular single signal to which one of said instrumentalities is invariably responsive.

The invention features an arrangement whereby a selectable element may be made to respond to either of two signal combinations after and only after having responded to one of the two signals.

In the composition of material to be printed, it is the custom to finish all lines except certain short ones on a fixed right-hand margin. In composing machines of the linecasting species, this operation, called justification, is accomplished through the use of expansible spacebands to provide interword spaces. As a line is concluded, if the expansibility afforded by the included spacebands is sufficient to expand the line until it fills the required column width, the line is said to be justifiable. It may sometimes happen that a composed line which is short of justifiable length will not accommodate the next word or the first syllable of that word. The compositor may increase the length of the line by inserting fixed spaces, which are blank matrices of uniform thickness, adjacent the spacebands.

The subjection of linecasting and composing machines to automatic control, such as, for example, in the manner disclosed in Patent No. 2,091,286 granted August 31, 1937, to Howard L. Krum et al., may necessitate special treatment with reference to nonjustifiable lines. Automatic control units of the type disclosed in the patent of Howard L. Krum et al. may be controlled by perforated strips which may be produced by means of a keyboard perforator, such as the one disclosed in Patent No. 2,059,250, granted November 3, 1936, to Howard L. Krum. The counting of the matrix thicknesses and minimum and maximum spaceband values cumulatively is accomplished concurrently with the application of

the signals to the strip representing the matrices and spacebands to be assembled. The deficiency of a line is discovered after the signals have been applied to the tape, but individual signals for the selection of fixed spaces cannot then be inserted conveniently because the already punched signals follow one another at closely spaced intervals. It has been a practice heretofore to render the series of signals representing a deficient line ineffective by rerunning the signals through the perforator and converting each to the so-called rub-out or all-perforated signal. This series of ineffective signals is then followed by a reperforation of the signals representing the line to be composed, with the fixed space signals included at the desired points. The sensing of the idle signals, when the control strip is run through the control unit for the linecasting and composing machine, accomplishes no useful purposes and results in a period of idleness of the composing machine.

In accordance with the present invention, it is proposed to control the release of fixed spaces to accompany a deficient line automatically, without the insertion of signals particularly associated with the release of fixed space matrices, and by the modification of one or more of the spaceband signals in the line. The modification comprises the perforation of an additional code hole or holes whereby the ordinary spaceband signal is converted into an extraordinary spaceband signal. It may be accomplished by backing the control strip through the perforator until that one or those of the spaceband signals that are to be converted from the ordinary to the extraordinary spaceband signal are aligned with the punches, and depressing the key lever assigned to the execution of an extraordinary spaceband signal, or by inserting the additional perforation or perforations by means of a hand punch or by an auxiliary punch block in the keyboard perforator provided for that purpose. No other modification of the signals in the tape is required, and none of the signals in the deficient line is destroyed.

Briefly, the preferred embodiment of the invention contemplates a signal responsive control unit for a linecasting and composing machine, such as the one disclosed in the above-mentioned patent of Howard L. Krum et al., and provided with a delay mechanism associated with its signal sensing apparatus according to the teachings of Patent 2,090,654, granted August 24, 1937, to L. M. Walden. The blocking bar, which is controlled by the delay mechanism, normally blocks

the selectable element assigned to control the release of fixed space matrices and is provided with a blocking lug which blocks the selectable element assigned to control the release of spacebands when the blocking bar has been moved to the position to unblock the selectable element for fixed space matrices. The code bars of the control unit for the linecasting and composing machine are coded to select and set in operation the delay mechanism in response to the extraordinary spaceband signal, and as the spaceband selectable element is unblocked, a spaceband is released concurrently with the selection of the delay mechanism. In the course of the operation of the delay mechanism, its blocking bar is caused to be shifted to block the spaceband selectable element and unblock the fixed space matrix selectable element. Thereupon, a fixed space matrix is released but no additional spaceband is released because the spaceband selectable bar is then blocked.

According to an additional feature of the invention, one of the code bars is provided at the point where it participates in the selection of the delay mechanism with a pivotally movable blocking section which is normally latched in position to block the selectable element for the delay mechanism in one of the two selective positions of the code bar, so that only when the code bar is in predetermined selective position can the selectable element for the delay mechanism be selected. The latch for the movable blocking member is tripped by the delay mechanism selectable element upon being selected, and the blocking section is moved by a spring to an ineffective position so that it can no longer block the selectable element for the delay mechanism. Thus, that particular code bar is deprived of control over the delay mechanism selectable element, and when the other code bars have been set in selective positions to present a selective alignment of notches to the selectable element for the delay mechanism, that element will be selected regardless of which of its two selective positions the code bar having the pivotally mounted blocking section occupies. The code bar which is provided with the pivotally mounted blocking section is the one corresponding to the signal element which is added to an ordinary spaceband signal to convert it to the extraordinary spaceband signal. Thus, upon the response of the selectable element for the delay mechanism to an extraordinary spaceband signal, the pivotally mounted blocking section will be unlatched and will be moved to ineffective position so that thereafter until the blocking section has been relatched in effective position, the delay mechanism will be selected in response to the ordinary spaceband signal, and will cause the sequential release of a spaceband and a fixed space matrix. The relatching of the blocking section of the code bar in effective position is accomplished by the mechanism which operates the elevator to deliver an assembled line of matrices to the line delivery slide in response to the elevator signal. It follows from this that the selectable element for the delay mechanism will respond to the ordinary spaceband signal only for the remainder of any line in which an extraordinary spaceband signal occurs.

A full and complete understanding of the invention may be gained by reference to the following detailed description to be interpreted in the light of the accompanying drawings in which,

Fig. 1 is a front elevational view of a portion of

a linecasting and composing machine having an automatic control unit applied thereto;

Fig. 2 is a vertical sectional view taken substantially on the line 2—2 of Fig. 1;

Fig. 3 is a perspective view partly broken away showing the record sensing apparatus including the delay mechanism for effecting the sequential release of spacebands and fixed space matrices;

Fig. 4 is an elevational view of the record sensing mechanism including the delay mechanism;

Fig. 5 is an elevational view showing the apparatus for depriving a code bar of effective control over a selectable element and for restoring effective control thereto; and

Fig. 6 is a plan view of a fragment of control tape containing signals for releasing a spaceband alone, a fixed space matrix alone, and for releasing both sequentially.

Referring now to Fig. 1, the reference numeral 11 indicates generally a linecasting and composing machine. The linecasting machine has a conventional keyboard mechanism 12, matrix storage magazine 13, spaceband storage magazine 14, assembler belt 15, and assembler elevator 17. The release of matrices from the matrix storage magazine 13 is effected by the lifting of release reeds 18, which may, if desired, be controlled from the keyboard 12, and the release of spacebands 19 from spaceband storage magazine 14 may be effected by the lifting of a special release reed 21, which may, if desired, be controlled by a manually operable spaceband key lever 22. A lever 23 pivoted intermediate its ends, as at 24, has one end connected to the spaceband release reed 21, and has the other end connected to the spaceband escapement mechanism 26. The assembler elevator 17 has depending therefrom a link 27 which is articulated at its lower end to a crank arm 28 carried by a rock shaft 29.

Fig. 2 shows the manner in which the release reeds are lifted to effect the release of a matrix or a spaceband. Referring to that figure, it will be noted that key levers 31, pivoted as at 32, have tongues 33 disposed in notches of individual weight bars 34, which are arranged to be lifted upon the rocking of a key lever 31 either manually or by automatic means. Each of the weight bars 34 is provided near its upper end with a notch in which is disposed one arm of a trigger bell crank 36, the other end of which normally supports a cam yoke 37 in such position that a keyboard cam 38, rotatably mounted in the cam yoke 37, is held out of engagement with a continuously rotating rubber roll 39. Each of the cam yokes 37 has a portion 41 disposed below a corresponding release reed 18 or 21. The release reeds 18 and 21 are notched to provide a shoulder which rests upon a supporting bar 42, and the notch permits lifting of the release reeds.

The lifting of a weight bar 34 by operation of a key lever 31 causes the rocking of the associated trigger bell crank 36 which frees the associated cam yoke 37 and permits it to drop until cam 38 engages rubber roll 39. Rotation is imparted to a cam 33 by rubber roll 39 which causes cam yoke 37 to be rocked counterclockwise (as viewed in Fig. 2) to lift the associated release reed 18 or 21. The lifting of cam yoke 37 by cam 38 returns it to the normal position where it is supported by trigger bell crank 36 in readiness for the next operation of the associated key lever 31 and weight bar 34.

Above each of the release reeds 18, there is a lever arm 43 pivoted as at 44 and having its free

end adjacent to and in operative alignment with the escapement mechanism of a matrix storage channel of magazine 13 in well-known manner. The lifting of one of the release reeds 18 causes its associated lever arm 43 to be rocked in clockwise direction (as viewed in Fig. 2) about its pivotal mounting 44 to cause its associated escapement mechanism to be operated and a matrix thereby released for transportation by assembler belt 16 to assembler elevator 17.

The present invention contemplates the operation of the keyboard mechanism 12 (Fig. 1) and of other instrumentalities of the linecasting machine, of which the assembler elevator 17, operable from rock shaft 29, is an example, under the control of an automatic control unit which is indicated generally by the reference numeral 46, and which may be constructed in accordance with the teachings of the hereinbefore mentioned patents of Howard L. Krum et al., and L. M. Walden. The automatic control unit 46 is attached to the linecasting machine 11 below and forward of the keyboard mechanism 12, and is arranged to be driven by power derived from any convenient continuously rotatable power shaft of the linecasting machine, such as the intermediate shaft 47 (Fig. 1). The power take-off for driving the automatic control unit may be a pulley 48 mounted on the intermediate shaft 47. Pulley 48 drives a belt 49 which engages a pulley (not shown) included in the record sensing mechanism indicated generally by the reference numeral 51 (Figs. 1, 3 and 4).

The record sensing unit 51 controls a selecting unit which is contained within the housing 52 (Fig. 1) and the structural details of which are shown in Fig. 2. The selecting unit comprises code bars 53 to which permutational settings in accordance with the signal conditions sensed by the record sensing mechanism 51 are transmitted. Permutation code bars 53 are flat bars placed side-by-side and mounted for individual endwise movement between two selective positions. Connecting bars, or code bar extensions 54, engage each of the code bars 53 and extend into the record sensing unit 51 where they are articulated to the transfer levers 56 (Figs. 3 and 4). Code bars 53 are permutationally notched along the upper and lower edges, so that for each permutational setting of the code bars there may be established an alignment of notches extending across the entire permutation unit, which alignment may be in the upper or lower edges of the code bars 53. Selectable bars 57 extend transversely of the code bars 53 and are alternately disposed above and below the code bars. As shown in Fig. 2, each of the selectable bars 57 is fitted to a supporting bar 58 by means of notches, and springs 59 urge the selectable bars 57 rightwardly (as viewed in Fig. 2) to seat the selectable bars upon rod 58. Springs 59 also bias those selectable bars which extend below the code bars 53 clockwise, and those which extend above the code bars counterclockwise, whereby the selectable bars are urged to rotate into engagement with the code bars, and when permitted to rotate by the stripper or spreader cam 61, they move into engagement with the code bars and that selectable bar 57, which finds an alignment of notches, rotates farther than do the other selectable bars and enters the alignment of notches.

Each of the selectable bars 57 is provided on the edge which is adjacent to the code bars 53 and near its forward end (left end, as viewed in Fig. 2) with a shoulder 62 which is presented in

the path of universal bail 63 upon selection of the selectable bar 57 by entrance of that bar into an alignment of notches. Universal bail 63 is shown in its normal or unoperated position in Fig. 2, and when it is actuated by the shaft which carries spreader cam 61, it is moved leftwardly (as viewed in Fig. 2) and engages the shoulder 62 of any selectable bar 57 which has been selected, and imparts endwise movement leftwardly to that bar.

Each of the selectable bars 57 which is assigned to the release of a matrix or a spaceband has in alignment with it one arm of a bell crank lever 64 which is pivoted on mounting shaft 66. The other arm of each of the bell cranks 64 is disposed above and substantially in engagement with a forwardly extending portion 67 of an auxiliary key lever 68 pivoted on common pivot 69. There is an auxiliary key lever 68 for and below each of the manually operable key levers 31, and each of the key levers 68 has a tongue 71 which is disposed in a notch in one of the weight bars 34. It will be apparent from this that any one of the weight bars may be lifted to trip the associated cam yoke 37 by depressing the forward end of the associated key lever 31, or by depressing the foremost portion 67 of the associated auxiliary key lever 68. It will also be apparent that leftward movement of a selected one of the pull bars 57 by universal bail 63 will cause clockwise rocking of the associated bell crank lever 64, which will depress the forward end of its associated auxiliary key lever 68 to lift the corresponding weight bar 34. The patent of Howard L. Krum et al., hereinbefore identified, may be consulted for a fully detailed description and showing of the apparatus thus far described.

Referring now to Fig. 3, the reference numeral 71 indicates tape sensing levers rockably mounted upon common pivot rod 72. Levers 71 have oppositely extending arms 73 and 74, the former of which are provided at their outer ends with upstanding tape sensing pins 76. Tape sensing levers 71 are biased in counterclockwise direction, as viewed in Figs. 3 and 4, by springs 77 which have been omitted from Fig. 3 for the sake of clarity, and are provided in the body portions thereof with circular apertures 78 through which extends a fixed rod 79 to limit the movement of levers 71. Arms 74 of the tape sensing levers 71 are presented in the operating path of a bail 81 carried by bell crank 82 which is rockably mounted upon pivot rod 83. Bell crank 82 is biased in clockwise direction by tension spring 84 and is provided with a roller 85 which engages a cam 87 carried by record reader shaft 88. As shaft 88 rotates, cam 87 rocks the bell crank 82 in counterclockwise direction, and through bail 81 rocks tape sensing levers 71 in clockwise direction to withdraw tape sensing pins 76 from record tape 89 preparatory to advancement of the tape. Following withdrawal of the tape sensing pins 76, cam 87 permits bell crank 82 to return to its extreme clockwise position, thus lowering bail 81 and permitting those of the tape sensing levers 71, the sensing pins 76 of which find perforations in the tape to be rocked in counterclockwise direction to sense the signal combination in the tape.

Pivot rod 72 has mounted thereon one end of a lever arm 91, the other end of which carries a roller 92 which engages the periphery of a tape feed cam 93 carried by record reader shaft 88. A tape feed lever 94, also pivoted on rod 72, carries at its right-hand end, as viewed in Figs. 3

and 4, a tape feed pawl 96, and at its left-hand end a portion 97 extending under lever arm 91, as best seen in Fig. 4. An abutment screw 98 extending through lever arm 91, and having its relation to lever 91 adjustably fixed by means of lock nut 99, has its lower end disposed above the portion 97 of tape feed lever 94, so that when counterclockwise movement is imparted to lever 91 by cam 93, screw 98 will engage portion 97 of tape feed lever 94 and will impart counterclockwise movement to lever 94, thus lifting its pawl 96 to advance along ratchet 101 carried by tape feed shaft 102 to engage the next tooth preparatory to rotating shaft 102 in counterclockwise direction, as viewed in Figs. 3 and 4, when cam 93 permits lever 91 to return to its extreme clockwise position, thus releasing tape feed lever 94 which is restored to its extreme clockwise position by biasing spring 103 (Fig. 4). Tape feed shaft 102 has secured thereto a sprocket 104 which engages feed holes in tape 89 for imparting movement to the tape relative to the sensing position determined by the location of sensing pins 76.

When tape sensing levers 71 are released by bail 81 to sense the tape 89, those of the sensing levers 71, the sensing pins 76 of which encounter perforations in the tape are rocked by their springs 77 to their extreme counterclockwise or selected positions. The remaining tape sensing levers 71 are held in their clockwise or unselected positions by imperforate portions of the tape. Below the tape sensing levers 71, transfer levers 56, previously identified, are pivotally supported by a rod 106 carried by transfer bail 107. The tape sensing levers terminate at their lower ends in the spaced prongs, and below each is one of the T shaped transfer levers 56. The laterally extending arms of T shaped transfer levers 56 have upstanding abutments spaced apart a greater distance than the distance between the depending prongs of the sensing levers. The spacing of the abutments is such that when a tape sensing lever is presented in its extreme clockwise position, which occurs when its tape sensing pin encounters an imperforate portion of the tape, the left-hand prong of the tape sensing lever will be presented in alignment with and in the path of the left-hand abutment of the associated transfer lever. Conversely, when a tape sensing lever 71 is presented in its extreme counterclockwise position, which condition exists when its tape sensing pin encounters and projects through a perforation in the tape, the right-hand prong of the tape sensing lever is presented in alignment with and in the path of the right-hand abutment of the associated transfer lever 56.

Bail 107 has connected thereto an operating lever arm 108 which has at its free end a roller 109 engaging the periphery of an operating cam 111 carried by record reader shaft 88. As cam 111 is rotated, it rocks lever arm 108 and, therefore, bail 107 in counterclockwise direction and thus elevates T shaped transfer levers 56 with respect to the tape sensing levers 71. The distance through which transfer levers 56 are lifted exceeds that required to bring one of the abutments of each of the transfer levers 56 into engagement with one of the prongs of those of the tape sensing levers 71 which have been set under the control of a signal combination in the tape in positions different from those in which they were presented according to the preceding signal combination. Thus, a transfer lever 56, upon coming into engagement with a prong of a tape

sensing lever 71, before the transfer lever reaches its limit of travel, will be rocked clockwise, or counterclockwise, about the rod 106, depending upon the position in which the tape sensing lever is presented. It will be evident from this that when the tape sensing levers have been set in accordance with a signal combination in the tape, and the transfer bail 107 has been operated, the T shaped transfer levers will be set in extreme clockwise or counterclockwise positions in accordance with the signal combination in the tape.

The intermediate or vertical depending arms of the transfer levers 56 are formed at their lower extremities with disc-like portions 112. These disc-like portions are disposed in parallel sided notches 113 formed in the upper edges of link bars or extensions 54 of code bars 53. Thus, as each of the T shaped transfer levers 56 is set in its extreme clockwise position under the control of its tape sensing lever 71, the code bar extension 54 and code bar 53 articulated to it are set in extreme left-hand position. Conversely, each of the transfer levers 56 that is rocked to extreme counterclockwise position effects the presentation of its associated code bar 53 and extension or link bar 54 in extreme right-hand position. The disc-like portions 112 of the transfer levers 56, and the notches 113 of the code bar extension 54 are so proportioned that the disc-like portions 112 are not lifted out of the notches 113 when the transfer levers 56 travel upwardly due to the operation of the transfer bail 107.

It may be noted by reference to Figs. 3 and 4 that six tape sensing levers 71 with arms 73 and tape sensing pins 76 have been provided, and that between the third and fourth of the tape sensing levers 71 is a lever 116 also pivoted upon pivot rod 72, and similar in all respects to tape sensing levers 71 except that it has no arm corresponding to arms 73 and no tape sensing pin. Centrally positioned lever 116 has depending prongs similar to the depending prongs of the tape sensing levers 71, and intended for co-operation with a central one of the T shaped transfer levers 56. The center one of the transfer levers 56 is articulated to a link bar 117, which in turn is connected to a special bar 118 centered in the group of code bars 53. Bar 118 is provided with lugs 119 and 121 for controlling the selection of certain of the selectable bars 57. In the preferred embodiment of the invention the lug 119 blocks a particular one of the selectable bars, designated 57—A, when bar 118 is in its normal or extreme left-hand position, and unblocks the selectable bar 57—A when bar 118 is moved to its extreme right-hand position. The lug 121 normally blocks none of the selectable bars 57, but moves into blocking relation to another special selectable bar, designated 57—B, when bar 118 moves to its extreme right-hand position. The fact that blocking bar 118 has a normal position and code bars 53 do not have a normal position is due to the absence of a tape sensing pin on the lever 116 associated with the tape sensing levers. The lever 116 is biased in counterclockwise direction, as are the tape sensing levers 71 so that lever 116 always moves counterclockwise, after having been retracted by bail rod 81, with any tape sensing levers 71 that are selected, and assumes its extreme counterclockwise position as determined by stop rod 79.

As shown in Fig. 4, code bar extensions 54 are provided with notches 121 and link bar 117 has a similar notch. A lever 122 pivoted at 123 supports at its left-hand end a rod 124 which ex-

tends across the code bar extensions 54 and the link bar 117 directly above the position occupied by the notch in the link bar 117 when that bar is presented in its normal or extreme left-hand position. Notches 121 of code bar extensions 54 are so positioned that for certain permutational settings of code bars 53 and extensions 54, notches 121 will be presented in alignment below rod 124, whereupon lever 122 will be permitted to respond to the biasing effect of tension spring 126 and will rock counterclockwise. The right-hand arm of lever 122 is indicated 127 and extends upwardly obliquely and terminates adjacent to and in alignment with a downwardly obliquely extending arm 128 carried by tape feed lever 94. The operation of tape feed lever 94 by its operating lever 91, under the control of the tape feed cam 93, is such that lever 94 is normally held in extreme counterclockwise position, and at the proper time is permitted by the cam to rock clockwise under the influence of spring 163 to effect feeding of the tape, and is immediately restored to extreme counterclockwise position. Arm 128 of the tape feed lever 94 is thus normally presented in its uppermost position and does not interfere with the presentation of the arm 127 of lever 122 in blocking relation to arm 128 upon the selection of rod 124 and consequent rocking of lever 122 counterclockwise. When arm 128 has thus been blocked, the tape feed lever 94 is prevented from effecting feeding of the tape when tape feed cam 93 rotates into position for permitting lever 91 to operate. Tape feed operating lever 91 may continue to operate under the control of its cam which tape feed lever arm 128 is blocked without interference by block lever 94, the lever 91 merely lifting screw 98 out of engagement with tape feed lever 94.

The tape feed operating lever 91 has secured thereto a plate 131, to the left-hand end of which the biasing spring 130 for the tape feed operating lever 91 is connected. At its extreme right-hand end, as viewed in Figs. 3 and 4, the plate 131 has pivotally depending therefrom a pawl 132. This pawl is normally held out of engagement with a ratchet 133, carried by stub shaft 134, by a laterally extending rod 136 carried near the upper end of arm 127 of lever 122. Upon the counterclockwise movement of lever 122 to bring its arm 127 into blocking position with reference to tape feed lever arm 128, pawl 132 becomes free to rock clockwise about its pivotal mounting by means of spring 137, and thus to come into engagement with ratchet 133. Stub shaft 134 also carries a check ratchet 138 with which is aligned a check pawl 139 pivoted at 141 to a frame member. Pawl 139 is also biased in clockwise direction by a tension spring (not shown) and is provided near its lower end with a laterally extending arm 142 which is presented in engagement with pawl 132 on the opposite side to that which engages ratchet 133. Pawl 139 thus follows the leftward and rightward movements of pawl 132, and when the latter is permitted by obliquely extending arm 127 to move into engagement with ratchet 133, pawl 139 moves into engagement with check ratchet 138 and becomes a holding pawl for ratchets 133 and 138 and thus for stub shaft 134. A torsion spring (not shown) arranged around stub shaft 134, and having one end secured to a stationary portion of the machine and the other end secured to one of the ratchets, rotates them clockwise when they are free of pawls 132 and 139 into a predetermined stop position.

Stub shaft 134 has rockably mounted thereon a bail shaped lever 140 which has arm 143 extending upwardly in alignment with lever 116 associated with the tape sensing levers 71, and which also has downwardly extending arm 144 presented in the path of a pin 146 projecting laterally from once face of ratchet 133. The free end of arm 143 of lever 140 carries an adjustable abutment screw 147 which is aligned with lever 116. Lever 140 is adapted to be rotated counterclockwise, as viewed in Figs. 3 and 4, by the engagement of pin 146 with arm 144 as ratchet 133 is rotated counterclockwise by pawl 132. When the end of screw 147 has been brought into engagement with lever 116, the next step through which ratchet 133 is rotated will cause movement to be imparted to lever 116 to its extreme clockwise position. Upon the next cyclic operation of bail 107 by cam 111, the central one of the transfer levers 56 will be rocked in counterclockwise direction due to the encountering of the lever 116 in a new position, and the blocking bar 118 will be shifted to its right-hand position. Blocking lug 119 will be moved out of registry with selectable bar 57—A so that bar 57—A can enter the alignment of notches which is then presented to it by code bars 53 and can be actuated by universal bail 63 to effect the release of a fixed space matrix. Simultaneously with the unblocking of selectable bar 57—A, lug 121 moves into blocking relation with selectable bar 57—B so that that bar is prevented from again entering the alignment of notches which is presented to it.

The shifting of blocking bar 118 and its link bar 117 rightwardly causes its selecting notch 121 for rod 124 of delay selecting lever 122 to be moved out of registry with rod 124, and such movement causes rod 124 to be cammed out of the alignment of notches 121 to its normal or unselected position. Lever 122 is thus rocked to its extreme clockwise position, the upper end of arm 127 of lever 122 is withdrawn from blocking engagement with depending arm 128 of tape feed lever 94, so that tape feed lever 94 is restored to responsive condition, and pawl 132 is moved counterclockwise by rod 136 of delay selection lever arm 127. Pawl 132 disengages check pawl 139 from ratchet 138 through the laterally extending arm 142 of pawl 139, and the biasing spring associated with ratchet shaft 134 restores the shaft to normal position, thus releasing lever 140 which is moved in clockwise direction by lever 116, the latter being returned to its extreme counterclockwise position by its biasing spring. In the next cycle of operation of transfer bail 107, the central one of the transfer levers 56 is actuated by lever 116, now restored to normal position, to shift link bar 117 and blocking bar 118 to their normal or extreme left-hand positions.

From the foregoing description, it will be apparent that selectable bar 57—B is always in condition to respond to its selection by the code bars 53, since bar 57—B is normally unblocked. Also, it will be apparent that selectable bar 57—A is never responsive immediately to a selective condition established for it by the code bars 53, but must first be unblocked by operation of the delay mechanism. With the exception of the tape feeding operation, all functions and operations in the record sensing and selectable bar operating mechanisms are performed cyclically for each cycle of operation of the ratchet feed mechanism in the delay apparatus. It follows from this that the selectable bar 57—B would be operated for each cycle of the apparatus. As will presently ap-

pear, the selectable bar 57—B controls the release of spacebands. It would be undesirable to have more than one spaceband released in response to one spaceband signal combination in the tape. Accordingly, the bail shaped lever 140 is back-stopped so that its normal position shall be only one ratchet step from its extreme counterclockwise position. Thus, the end of screw 147 normally engages or nearly engages lever 116, and when lever 122 is selected by rod 124 simultaneously with the selection of selectable bar 57—B, ratchet 133 is advanced one step, lever 116 is thereby rocked to extreme clockwise position, and blocking bar 118 is shifted rightwardly to block selectable bar 57—B before it can be operated a second time by universal bail 63. Selectable bar 57—A, now unblocked, is selected and is operated by universal bail 63, so that the two selectable bars 57—A and 57—B are selected and operated in two successive cycles, and as the delay mechanism is restored to normal when bar 57—A is unblocked, the tape is advanced, signals are sensed, and matrices are released without the introduction of even one idle cycle.

Tape for controlling the apparatus shown in Figs. 1 to 4, inclusive may be prepared in a keyboard perforator, such as that shown in Patent 2,059,250, granted November 3, 1936, to H. L. Krum. Signals representing matrices and spacebands are perforated in the tape successively in proper order, and when the counting mechanism of the perforator indicates that sufficient material has been composed to fill the column measure by expansion of the spacebands or that the next word or the first syllable of the next word is too long to be included in the line, even though the spacebands will not expand sufficiently to fill the column measure, the line is terminated by the perforation of an elevator signal which will cause the assembler elevator 17 to be operated to deliver the assembled line to the line delivery slide. Under the second condition outlined in the foregoing sentence, it is necessary to provide for the addition of fixed space matrices to be assembled adjacent to some or all of the spacebands. This may be accomplished by bringing back into registry with the punch pins in the perforator those of the spaceband signals representing spacebands with which fixed space matrices are to be assembled, and converting them from the ordinary spaceband signal indicated in Fig. 6 as a single perforation in the code element 3 position to an extraordinary spaceband signal by the addition of a perforation in the code element 0 position. When fixed space matrices are required as a regular part of the composition without reference to spacebands or the filling out of a deficient line, they are represented by a code having a single perforation in the code element 0 position.

When apparatus according to Figs. 1 to 4, inclusive is being controlled by tape 89 and an ordinary spaceband signal is sensed by the tape sensing pins 76, the number 3 code bar is presented in its left-hand position, all other code bars are presented in their extreme right-hand position, and the spaceband pull bar 57—B is immediately selected because it is not blocked by lug 121 on blocking bar 118. Delay selector lever 122 is not selected because the code bar extension 54 for the 0 code bar is so notched that its notch is out of registry with the delay selector rod 124 when the 0 code bar and its extension are in their extreme right-hand position.

When the extraordinary spaceband signal 0—3

is presented to the tape sensing pins 76, the 0 code bar and the number 3 code bar are presented in their extreme left-hand positions and alignments of notches are presented to selectable bars 57—A and 57—B and to delay selector bar 124. Selectable bar 57—B is selected and operated immediately to effect the release of a spaceband. Delay selector rod 124 is also selected immediately and sets in operation the ratchet feed mechanism comprising pawl 132 and the ratchet 133 which in its first step shifts the lever 116 to provide, through the operation of transfer bail 107, for the shifting of blocking bar 118 to its right-hand position. Selectable bar 57—A is thus unblocked and is selected to effect the release of a fixed space matrix. The selectable bar 57—B is at this time blocked by lug 121. The delay selector rod 124 is thereafter cammed to unselected position, the ratchet feed mechanism is disabled, and the tape feed mechanism is reactivated.

When a fixed space matrix is to be released by direct selection, the fixed space code 0 is presented to the tape sensing pins 76. This causes the 0 code bar to be presented in its left-hand position, and all other code bars to be presented in their right-hand position. An alignment of notches is presented to selectable bar 57—A and also an alignment of notches is presented to delay selector rod 124. From this, it is apparent that the selectable bar 57—A and the delay selector rod 124 are responsive to the 0 and also the 0—3 code combination, and, therefore, that the number 3 code bar and its code bar extensions have double notches with reference to the selectable bar 57—A and the delay selector rod 124, wherefore the number 3 code bar and code bar extension are deprived of selective control over the selectable bar 57—A and delay selector rod 124. The response of the apparatus to the 0 code combination differs from the response to the 0—3 or extraordinary spaceband signal only in that there is no alignment of notches presented to selectable bar 57—B and, therefore, it remains unoperated during the setting in operation of the delay mechanism, even though it is not then blocked by the lug 121 of blocking bar 118. When the lever 116 has been operated by the delay mechanism, blocking bar 118 is shifted to the right to unblock the fixed space selectable bar 57—A which is selected and operated to effect the release of a fixed space matrix.

A modification of the invention is shown in Fig. 5 by means of which the record sensing and pull bar selecting apparatus will be conditioned, upon responding to an extraordinary spaceband signal, for releasing a fixed space matrix in response to each subsequent spaceband signal in a line whether such subsequent spaceband signal is the ordinary spaceband signal or has been converted to the extraordinary signal. Referring to Fig. 5, the reference numeral 151 designates the 0 code bar extension which corresponds to the rearmost of the extensions 54, shown in Figs. 3 and 4. The code bar extension 151 is provided with a double length notch 152 with reference to the delay selector bar 124 which would render the delay selector rod 124 selectable with the code bar extension 151 in either of its two possible positions and, therefore, would deprive code bar extension 151 of selective control over delay selector rod 124. The code bar extension 151 has pivoted on a downwardly extending portion thereof, a three-armed lever 153 consisting

of an upwardly extending arm, a downwardly extending arm, and a rightwardly extending arm. A tension spring 154 urges lever 153 to rotate counterclockwise to bring its upwardly extending arm into engagement with a fixed stop pin 156 carried by code bar extension 151. A spring biased latch 157 normally engages the rightwardly extending arm of lever 153 and restrains it from rotating counterclockwise into engagement with stop 156.

When lever 153 is latched in normal position, which is the position shown in Fig. 5, its upper end is flush with the upper edge of code bar extension 151, and it extends across approximately one-half of the double notch 152 in the upper edge of code bar extension 151 so that notch 152 is effectively reduced to the proportions of a single selective notch, and code bar extension 151 permits delay selector rod 124 to respond only when the code bar extension is in extreme left-hand position, the selector rod 124 being blocked by the end of the upwardly extending arm of lever 153 when code bar extension 151 is in its right-hand position. The latch 157 has an arm which is engaged by delay selector rod 124 when the rod is selected and it drops into an alignment of notches, the latch being tripped as the rod 124 moves into its selected position to release the three-armed lever 153. The lever 153 rocks counterclockwise into engagement with stop 156, thus withdrawing its upper end entirely clear of the double length notch 152. Thereafter, until such time as lever 153 is reset, code bar extension 151 will have no control over the selection or nonselection of delay selector rod 124, and the delay selector rod will be responsive either to the 3 code combination or the 0-3 code combination to cause a spaceband and then a fixed space to be released in response to either of the two code combinations, the ordinary spaceband combination or the extraordinary spaceband combination.

A resetting mechanism for restoring lever 153 to the position shown in Fig. 5 comprises a link 158 pivoted to the free end of one arm of a bell crank lever 159. Bell crank 159 is biased in clockwise direction by tension spring 161 and has at the free end of its other arm a roller 162 which engages the periphery of elevator operating cam 163. Cam 163 is set in operation in response to an elevator signal and is power driven through one revolution to lift the assembler elevator 17 so that the assembled line which it contains can be transferred to the line delivery slide. The location of cam 163 in the apparatus and its mode of operation are fully disclosed in the previously identified Patent 2,091,286. Cam 163 has a considerable throw and it is desirable that bell crank lever shall not be permitted to rock clockwise farther than necessary to relatch lever 153 in the position shown in Fig. 5. Accordingly, an adjustable stop screw 164 is provided for limiting the clockwise movement of bell crank 159, and when the bell crank lever has come into engagement with stop screw 164, the periphery of cam 163 becomes disengaged from roller 162, re-engaging the roller when the point of minimum radius of the cam has passed the roller and the radius has increased. At its right-hand end, the link 158 is provided with a laterally bent arm 166 which engages the downwardly extending arm of lever 153 when link 158 is moved leftwardly and rocks lever 153 into retained engagement with latch 157.

In the assembling of matrices for the composi-

tion of a line under the control of a tape, spacebands alone are released in response to the ordinary spaceband signal until an extraordinary spaceband signal is encountered. The extraordinary spaceband signal will cause the selection of delay selector rod 124 and the consequent unlatching of lever 153. From that point to the end of the line, when the elevator signal will cause cam 163 to operate, and thus relatch lever 153, the code bar extension 151 will be unable to distinguish between the ordinary and the extraordinary spaceband signals and will cause the delay mechanism to be selected and a fixed space to be released sequentially with a spaceband in response to every spaceband signal whether modified or unmodified. In the preparation of tape for controlling apparatus according to Fig. 5, it is not necessary to modify each spaceband signal in order to effect the release of a fixed space matrix sequentially therewith, but it is only necessary to modify one spaceband signal in order to effect the release of a fixed space matrix with that spaceband and with all following it in the line.

With the apparatus according to Fig. 5, it is possible to provide for the release of fixed space matrices directly and alone without the introduction of a delay interval, by providing two channels of fixed space matrices, one of which is controlled by a pull bar responsive to the 0 combination, and not being at any time blocked by the blocking bar 118, and the pull bar for the other channel being responsive to the 3 and 0-3 code combinations, and being normally blocked by the blocking bar 118, such as the pull bar 57-A (Fig. 3). The pull bar for the first mentioned channel, being responsive to the 0 code combination, will be operated immediately upon selection to release a fixed space, and the delay selector bar will not be selected because it responds only to the 0-3 code combination and to any 3 code combination subsequent to an 0-3 combination in a line. The pull bar for the second mentioned channel is operated only after the delay selector bar has been selected and has activated the delay mechanism to effect unblocking of the pull bar. It is operated only to release a fixed space matrix to accompany a spaceband, and is not independently selectable and operable. The spaceband pull bar responds to the 3 and 0-3 code combinations, and is never blocked.

It is to be understood that the various code combinations set forth in the foregoing description are given by way of illustrations only, and are not intended as limitations upon the scope of the invention. Various other code combinations could be employed for accomplishing operation of the apparatus in the same manner.

It is to be noted that the invention is of broader scope than the control of the addition of fixed space matrices to fill a composed line to the column width. There are certain combinations of letters which occur in many different words. Examples of such combinations are *e* followed by *a*, *e* followed by *i*, *i* followed by *e*, and *o* followed by *u*. Under certain circumstances, much time could be saved in the preparation of the record tape if combinations of letters frequently occurring in given sequence could be represented by a single code combination with the assurance that they would be assembled in the proper order by the automatically controlled linecasting and composing machine. It is not ordinarily feasible without the sequence controlling apparatus here-

inbefore described, to release two such matrices simultaneously in response to one code combination, as the order in which the matrices are received into the assembler elevator will be dependent upon several uncontrollable factors. The apparatus according to Figs. 3 and 4 could, however, be employed for controlling the release, in known sequence, of two character matrices in response to one signal combination, while permitting either of the character matrices to be selected independently.

Although specific embodiments of the invention have been shown in the drawings and described in the foregoing specification, it is to be understood that the invention is not limited to such specific embodiments but is capable of modification and rearrangement without departing from the spirit of the invention and within the scope of the appended claims.

What is claimed is:

1. In a selector mechanism, a plurality of selectable elements, a set of selectors coded to select three of said elements simultaneously, means for normally blocking one of said three elements against response with the other two elements to said selectors, and means controlled by one of said other two elements upon response thereof to said selectors for retracting said blocking means from blocking relation to said normally blocked element.

2. In a selector mechanism, a plurality of selectable elements, a set of selectors coded to select three of said elements simultaneously, means for normally blocking one of said elements against response with the other two of said elements to said selector, means controlled by one of said two elements for retracting said blocking means from blocking relation to said normally blocked element, and means associated with said blocking means for blocking the other of said two elements upon the retraction of said blocking means.

3. In a selector mechanism, a plurality of selectable elements including principal selectable elements and a subordinate selectable element, a set of selectors coded to select a plurality of said principal elements and said subordinate element simultaneously, means for normally blocking one of said simultaneously selectable principal elements against response to said selectors, and means controlled by said subordinate element upon response thereof to said selectors for retracting said blocking means from blocking relation to said normally blocked principal element.

4. In a selector mechanism, a plurality of selectable elements including principal selectable elements and a subordinate selectable element, a set of selectors coded to select a plurality of said principal elements and said subordinate element simultaneously, means for normally blocking one of said simultaneously selectable principal elements against response to said selectors, means controlled by said subordinate element upon response thereof to said selectors for retracting said blocking means from blocking relation to said normally blocked principal element, and means associated with said blocking means for blocking another of said simultaneously selectable principal elements upon the retraction of said blocking means.

5. In a selector mechanism, a plurality of selectable elements including principal selectable elements and a subordinate selectable element, a set of selectors coded to select a plurality of said

principal elements and said subordinate element simultaneously, means for normally blocking one of said simultaneously selectable principal elements against response to said selectors, means controlled by said subordinate element upon response thereof to said selectors for retracting said blocking means from blocking relation to said normally blocked principal element, and means associated with said blocking means for restoring said subordinate element to unselected position upon retraction of said blocking means.

6. In a selector mechanism, a plurality of selectable elements including principal selectable elements and a subordinate selectable element, a set of selectors coded to select a plurality of said principal elements and said subordinate element simultaneously, means for normally blocking one of said simultaneously selectable principal elements against response to said selectors, counting means controlled by said subordinate element, and means controlled by said counting means for retracting said blocking means from blocking relation to said normally blocked principal element.

7. In a selector mechanism, a plurality of selectable elements including principal selectable elements and a subordinate selectable element, a set of selectors coded to select a plurality of said principal elements and said subordinate element simultaneously, and means controlled by said subordinate element upon the response thereof to said set of selectors for limiting said simultaneously selectable principal elements to sequential response to said selectors.

8. In a selector mechanism, a plurality of selectable elements, a set of selectors coded to select said elements, means associated with one of said selectors and operable upon the selective response of one of said elements for depriving said one selector of control over said one element, and means for restoring to said one selector control over said one element.

9. In a selector mechanism, a plurality of selectable elements, a set of notched selectors positionable to present selective alignments of notches to said elements, and means associated with one of said selectors and operable upon the selective response of one of said elements for increasing the effective length of the notch in said one selector which is presented to said one element whereby to deprive said one selector of selective control over said one element.

10. In a selector mechanism, a plurality of selectable elements, a set of notched selectors positionable to present alignments of notches to said elements selectively, one of said selectors having a double length notch presented to one of said elements, means carried by said one selector for blocking one of the selecting portions of said notch to said one element, means for retracting said blocking means from blocking position, and means actuated by said one element upon entry thereof into the unblocked portion of said notch for initiating the operation of said retracting means.

11. In a selector mechanism, a plurality of selectable elements, a set of notched selectors positionable to present alignments of notches to said elements selectively, one of said selectors having a double length notch presented to one of said elements, means carried by said one selector for blocking half of said notch against selection of said one element, means for retracting said blocking means from blocking position, means for latching said blocking means against

retraction, and means associated with said latching means extending along the unblocked portion of said notch to be engaged and operated by said one selectable element for releasing said latch.

12. In a selector mechanism, a plurality of selectable elements, a set of notched selectors positionable to present alignments of notches to said elements selectively, one of said selectors having a double length notch presented to one of said elements, means carried by said one selector for blocking half of said notch against selection of said one element, means for retracting said blocking means from blocking position, means for latching said blocking means against retraction, means associated with said latching means extending along the unblocked portion of said notch and in the path of said one selectable element to be engaged and operated thereby for releasing said latch, and means controlled by another of said selectable elements upon response thereof to said selectors for restoring said blocking means to latched condition.

13. In a linecasting and composing machine, means for releasing variable thickness space elements, means for releasing fixed thickness space elements, a selectable member for controlling each of said means, a set of selectors coded to select said selectable members simultaneously, means for blocking against response to said selectors the selectable member controlling the release of fixed thickness space elements, a selectable element selectable simultaneously with the above recited selectable members, and means controlled by said selectable element for withdrawing said blocking means.

14. In a linecasting and composing machine, means for releasing type composition elements, a selectable member for controlling each of said means, a set of selectors coded to select certain of said selectable members simultaneously, means for blocking against response to said selectors one of said simultaneously selectable members, a selectable element selectable with said simultaneously selectable members, and means controlled by said selectable element for withdrawing said blocking means after the operation of the member which is simultaneously selectable with said blocked member.

15. In a linecasting and composing machine, means for releasing type composition elements, a selectable member for controlling each of said means, a set of selectors coded to select certain of said selectable members simultaneously, means for blocking alternatively said simultaneously selectable members, a selectable element selectable with said simultaneously selectable members, and means controlled by said selectable element for actuating said blocking means.

16. In a linecasting and composing machine, means for releasing type composition elements, a selectable member for controlling each of said means, a set of selectors coded to select certain of said selectable members simultaneously, means presentable in either of two positions for blocking one of said simultaneously selectable elements when in one position and for blocking another of said simultaneously selectable members when in the other position, a selectable element selectable simultaneously with said simultaneously selectable members, and means controlled by said selectable element for shifting said blocking means from one to the other of said positions and for restoring said element to the initial position.

17. In a selector mechanism, a plurality of

selectable elements, means for selecting three of said elements simultaneously, means for normally blocking one of said three elements against response with the other two elements, and means controlled by one of said other two elements for retracting said blocking means from blocking relation to said normally blocked element.

18. In a linecasting and composing machine, means for releasing variable thickness space elements, a selectable member for controlling said means, means for releasing fixed thickness space elements, a selectable member for controlling said fixed space element releasing means, a set of selectors coded to select said selectable members individually or simultaneously, and means effective when simultaneous selection of said members occurs for causing them to respond and be effective sequentially.

19. In a linecasting and composing machine, means for releasing type composition elements, selectable members for controlling said means individually, means for selecting certain of said selectable members individually or simultaneously, and means effective when simultaneous selection of said members occurs for causing them to respond and be effective sequentially to effect the release of type composition elements in predetermined order.

20. In a linecasting and composing machine, means for releasing variable thickness space elements, means for releasing fixed thickness space elements, selectable members for controlling said means individually, selecting means effective when responsive to predetermined different signals for selecting the selectable members individually and effective when responsive to a signal including the attributes of both said predetermined signals for selecting said elements simultaneously, and means selectable by said selecting means when responsive to the last mentioned signal for causing said selectable members to respond and be effective upon said space element releasing means sequentially.

21. In a linecasting and composing machine, means for releasing variable thickness space elements, means for releasing fixed thickness space elements, means for conveying an assembly of type composition elements and space elements, means for actuating said conveying means, selectable members for controlling said space releasing means and said actuating means for said conveying means individually, selecting means effective when responsive to predetermined different signals for selecting the selectable members for said space elements individually and effective when responsive to a signal including the attributes of both said predetermined signals for selecting said space element selectable members simultaneously, means selectively operable upon response of said selecting means to the last mentioned signal for rendering said selectable members for said space elements selectable simultaneously by said selecting means when thereafter responsive to signals assigned to the selection of the selectable member for said variable thickness space element releasing means, and means controlled by the actuating means for said conveying means for restoring said selectively operable means to unoperated condition.

22. In a linecasting and composing machine, means for releasing variable thickness space elements, means for releasing fixed thickness space elements, selectable members for controlling said space releasing means individually, selecting means effective when responsive to predeter-

mined different signals for selecting the selectable members for said space elements individually and effective when responsive to a signal including the attributes of both said predetermined signals for selecting said space element selectable members simultaneously, and means selectively operable upon response of said selecting means to the last mentioned signal for rendering said selectable members for said space elements selectable simultaneously by said selecting means when thereafter responsive to signals assigned to the selection of the selectable member for said variable thickness space element releasing means.

23. In a linecasting and composing machine, means for releasing variable thickness space elements, fixed thickness space elements, and type composition elements to be assembled in lines, selectable members for controlling said space ele-

ment releasing means and said type composition element releasing means individually, selecting means effective when responsive to predetermined different signals for selecting the selectable members for said space elements individually and effective when responsive to a signal including the attributes of both said predetermined signals for selecting said space element selectable members simultaneously, and means selectively operable upon response of said selecting means to the last mentioned signal for rendering said selectable members for said space elements selectable simultaneously by said selecting means when thereafter responsive during the assembly of the remainder of the line to signals assigned to the selection of the selectable member for said variable thickness space element releasing means.

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