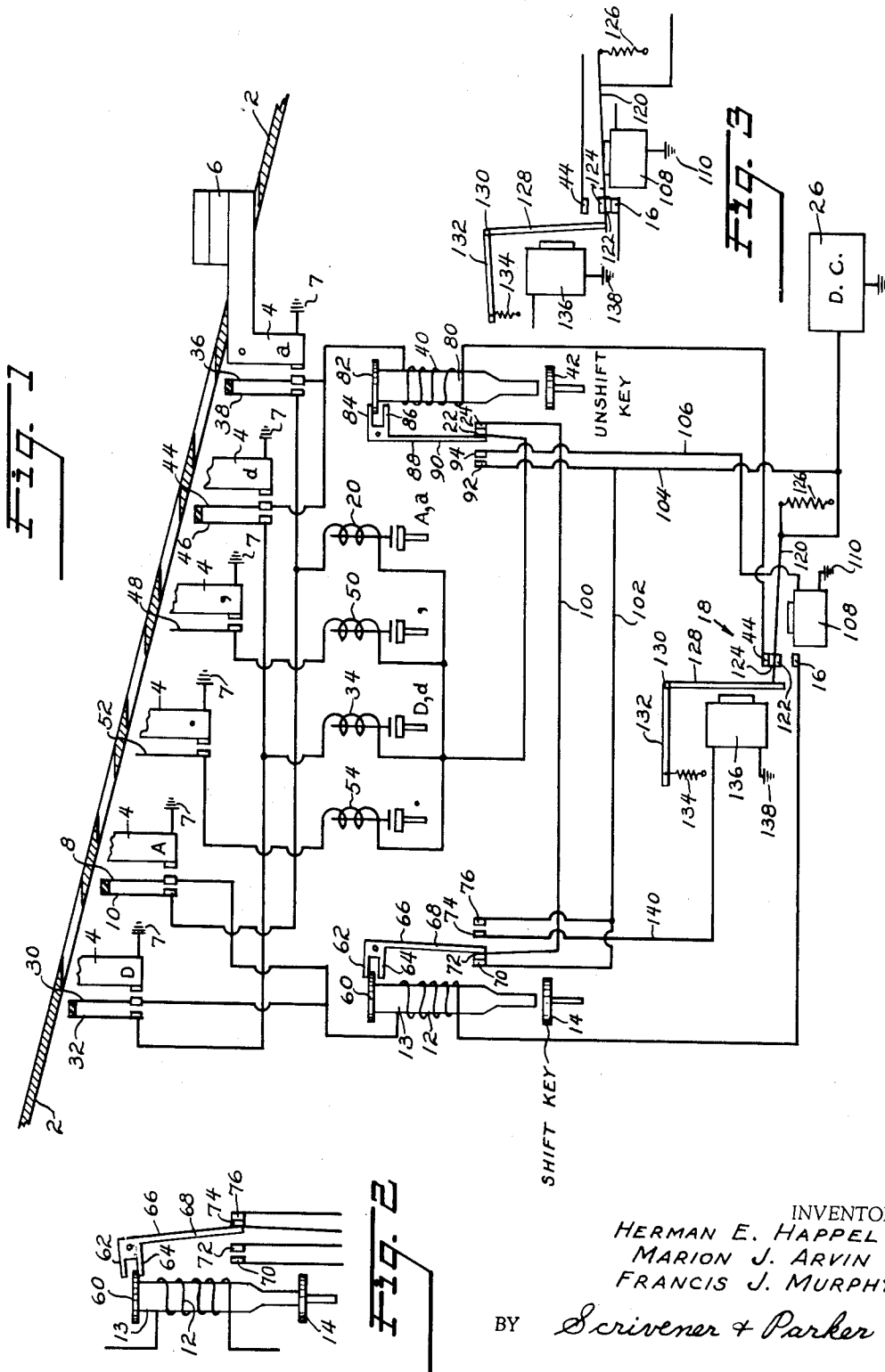


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 AUXILIARY KEYBOARD AND OPERATING MECHANISM
 FOR TYPESETTING, TYPECASTING, MESSAGE
 TRANSMISSION, TAPE PERFORATING
 AND SIMILAR MACHINES
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AUXILIARY KEYBOARD AND OPERATING MECHANISM FOR TYPESETTING, TYPECASTING, MESSAGE TRANSMISSION, TAPE PERFORATING, AND SIMILAR MACHINES

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8 Claims. (Cl. 164—113)

The invention disclosed in this application is an improvement on those described and claimed in United States Letters Patent No. 2,679,902, for Auxiliary Keyboard and Operating Mechanism for Typesetting, Typecasting, Message Transmission, Tape Perforating and Similar Machines and for Similar Purposes, and Serial No. 397,737, filed December 11, 1953, for Auxiliary Operating Mechanism for Typesetting, Typecasting and Similar Machines.

The inventions of this application and the co-pending applications relate broadly to the operation of typesetting, typecasting and similar machines and, while the invention is useful in the operation of the keyboards of all such machines, the invention will be particularly described in this application, as it is in the co-pending applications, in connection with, and as applied to, a machine which perforates tape which is used in the operation and control of a machine which sets or casts type or performs both operations, such as the Linotype, Intertype and Monotype machines.

Such machines as the Linotype machine are equipped with a special keyboard usually having ninety keys, although sometimes a greater and sometimes a smaller number of keys are provided, and these complex machines must be operated by highly skilled personnel who are able to operate the special keyboard and perform other duties essential to most efficient operation. It has heretofore been proposed to operate such typesetting and typecasting machines by means of a perforated tape prepared on a machine having a keyboard which corresponds to the standard typewriter keyboard with the addition of certain keys for performing operations and producing characters which are necessary in printing but not in typewriting. Such tape-perforating machines are now available commercially, a typical one being known as the Teletypesetter, and these machines produce a tape which is perforated with holes arranged in a characteristic pattern for each character key. The keyboard of such a machine has all of the character keys of the conventional typewriter keyboard, which may be in the same position, and also has additional keys which are required for printing but are not required for typewriting. In addition, the keyboard has a shift key and an unshift key, each of which, when operated, produces a characteristic tape perforation which causes the typesetting or casting machine operated and controlled by the tape to set or cast upper case or lower case characters corresponding to subsequent tape perforations, depending on which of the shift and unshift keys has been last operated. Thus, for example, operation of the "A" key will always produce the same characteristic tape perforation, but the typesetting machine controlled and operated by the tape will set an upper case "A" or a lower case "a" depending on whether the shift or unshift key was last operated prior to operation of the "A" key.

In the co-pending applications referred to above, there are described and claimed means, including an auxiliary keyboard having keys positioned and arranged substantially as in a standard Linotype machine keyboard, for

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association with a tape perforating machine such as the Teletypesetter which will, upon operation of the keys of such keyboard, actuate the keys of the tape perforating machine to perforate the tape in the normal manner of operation of the tape perforating machine, thus permitting operation of tape perforating machines such as the Teletypesetter by skilled Linotype operators who are able to perform the many and varied duties required in composing and printing. In this auxiliary keyboard there are separate keys for the upper and lower cases of each character instead of a single key for both cases as in the tape perforating machine. For example, there is an upper case "E" key and a separate lower case "e" key. In addition, there are separate keys for various characters such as punctuation marks, etc., some of which are lower case and some of which are upper case on the tape perforating machine and consequently, on that machine, require depression of the shift key or the unshift key before any of these may be operated to produce the desired character. In addition, there are other keys on the Linotype keyboard which correspond to keys on the tape perforating machine keyboard which cause the same character to be set and cast regardless of whether the shift key or unshift key has been previously depressed. These are referred to as the no-shift keys of the Linotype keyboard.

In the invention of this and the co-pending applications a vertically arranged solenoid is positioned above each character, shift and unshift key of the tape perforating machine with the lower end of its plunger sufficiently above the upper surface of the associated key of the tape perforating machine keyboard to permit the downward movement of the plunger of the solenoid to operate the key below it upon energization of the solenoid. The plunger of each solenoid is normally held by a spring in a raised position out of engagement with the key below it and upon energization of the solenoid winding is moved downwardly against the force of the spring into engagement with the key of the tape perforating machine which is below it to depress such key and cause a corresponding and predetermined perforation of the tape. Means are provided in this and the co-pending applications which are operable upon depression of any upper case character key of the Linotype keyboard to first cause the shift key of the tape perforating machine to be depressed and then immediately released, thus producing the characteristic "shift" tape perforation, and then, after a time delay, to cause the corresponding character key of the tape perforating machine keyboard to be depressed to produce its characteristic tape perforation. These means are also operable upon depression of any lower case character key of the Linotype keyboard to first cause the unshift key of the tape perforating machine to be depressed and then immediately released, thus producing the characteristic "unshift" tape perforation, and then, after a time delay, to cause the corresponding character key of the tape perforating machine keyboard to be depressed to produce its characteristic tape perforation. These means are also operable, upon depression of any no-shift key of the Linotype keyboard bearing a character corresponding to a key of the tape perforating machine which produces a tape perforation causing setting of the same character regardless of whether the shift or unshift key has been previously operated, to cause the corresponding key of the tape perforating machine keyboard to be operated.

In this and the co-pending applications there are disclosed and claimed means for controlling the circuits of the shift, unshift and character keys of the tape perforating machine keyboard. In a typical sequence of operation of these means, assuming that the unshift key was last operated, such means are operative to maintain closed the circuit of the operating solenoid of the shift key in order to permit its subsequent operation, then after de-

pression of an upper case character key of the auxiliary keyboard and the resulting operation of the shift key, to open the circuits of the operating solenoids of the character keys, then to open the circuit of the operating solenoid of the shift key to permit that key to return to normal position and simultaneously to close the circuit of the operating solenoid of the unshift key, and lastly to close the circuits of all of the operating solenoids of the character keys to permit energization of any of them on further depression of any upper case key of the auxiliary keyboard. This sequential operation provides a time delay between operation of the shift key and operation of the character key of the tape perforating machine which is necessary to permit full and proper operation of the shift key mechanism of the tape perforating machine. Our invention has had for its object, which is achieved by the means described and claimed in this application, to provide improved, fully electrical means for performing these described functions of the apparatus described and claimed in the co-pending Brewer applications.

The improved means provided by our invention are described in the following specification and illustrated in the drawings forming part of this application, in which:

Fig. 1 is a circuit diagram of a preferred embodiment of the invention;

Fig. 2 shows the plunger and associated switch-operating mechanism of the shift key solenoid in operating condition, in which the plunger engages the shift key, and

Fig. 3 shows the latching relay of Fig. 1 in operative, latching position.

The improved means according to the present invention for operating the keyboard of the tape-perforating machine through the medium of the superimposed auxiliary keyboard are disclosed in the drawings of this application, in which there is disclosed a section of the auxiliary keyboard base 2, beneath which are shown the depending lower arms 4 of six of the keys 6, only one of which keys is fully shown in Fig. 1. Two of these arms, which are marked with the letters A and D, form part of the "A" and "D" keys of the Linotype keyboard of this invention and are both upper case letters. Two of the arms 4 are respectively marked by a comma and a period and form part of the "comma" and the "period" keys of the keyboard of the tape-perforating machine and, when operated, will produce tape perforations which will cause the typesetting machine to set a comma or period regardless of whether the shift or unshift key has been previously operated. These keys of the auxiliary keyboard are therefore referred to as no-shift keys. The two remaining arms 4 shown in Fig. 1 form part of the lower case "a" and "d" keys of the auxiliary keyboard and are, respectively, marked with these letters and are lower case letter keys.

The arms 4 marked A and D in Fig. 1 represent the arms 4 of all of the upper case character keys of the auxiliary keyboard which are operated when it is desired to set an upper case character through the medium of the tape perforating machine. The arms 4 marked with a comma and a period are representative of all of the arms 4 of all of the keys of the auxiliary keyboard which bear a character corresponding to one of the keys of the tape perforating machine keyboard which when operated produce a tape perforation causing the same character to be set regardless of whether the shift or unshift key has been previously operated. The arms 4 marked with the lower case letters a and d are representative of all the arms 4 of all the keys of the auxiliary keyboard which are operated when it is desired to set and cast a lower case character through the medium of the tape perforating machine. All of the keys of the superimposed keyboard 2 are operative in the same manner and through the same circuits as will be now described with reference to the representative

keys which are actually illustrated in Fig. 1 of the drawings.

Referring first to the "A" key of the superimposed keyboard 2, the arm 4 of which is shown in Fig. 1, it will be seen that this arm is grounded to the machine frame at 7, as are all of the arms 4. Two spaced, insulated, flexible contact members 8, 10 are supported adjacent the A arm 4 in the direction in which the arm will move when the key is depressed, whereby the arm, in so moving, will first engage contact member 8 and then move the same into engagement with the contact member 10. Contact member 8 is electrically connected to one terminal of the winding of solenoid 12 the plunger 13 of which is positioned above and operates the shift key 14 of the tape perforating machine, the other terminal of such winding being connected to one fixed contact 16 of a latching relay 18. The second contact 10 is electrically connected to the winding of solenoid 20 which is positioned above and the plunger 21 of which is operative to depress the "A, a" key of the tape perforating machine, the other terminal of this winding being connected to a contact member 22 which is associated with and spaced from a second contact member 24. Contacts 22 and 24 form part of a switch arrangement associated with the operating solenoid for the unshift key which will be fully described hereinafter.

Each upper case letter key of the keyboard 2 has associated with it two contact members corresponding in position and function to the contact members 8, 10 which are associated with the "A" letter key, the first of such contact members being connected in every case to the winding of shift key solenoid 12 and the second being connected to the winding of the solenoid which is positioned above and operates the corresponding letter key of the tape perforating machine. Thus, two spaced, flexible, insulated contact members 30, 32 are positioned in the path of movement of arm 4 of the upper case "D" key and are engaged in the same manner as described above in connection with the "A" key. Contact member 30 is connected to one terminal of the winding of shift key operating solenoid 12 and the second contact member 32 is connected to one terminal of the winding of the solenoid 34 which is positioned above and operates the "D, d" letter key of the tape perforating machine, the other terminal being connected to the contact member 22.

Referring now to the lower case letter key "a" of the keyboard 2, it will be seen that the arm 4 of this key has associated with it two spaced, flexible, insulated contact members 36, 38 which are arranged in the path of movement of the arm to be successively engaged as the "a" key is depressed. The contact 36, which is nearest the arm 4 of the "a" key, is connected to the winding of the solenoid 40 which is positioned above and operates the unshift key 42 of the tape perforating machine, the other terminal of the winding being connected to a second fixed contact 44 of the latching relay 18. The second contact 38 is connected to the winding of the solenoid 20 which is positioned above and operates the "A, a" key of the tape-perforating machine, the other terminal of the winding being connected to contact member 22 which has been described before.

Each lower case letter key of the keyboard 2 has associated with it two contact members corresponding in position and function to the contact members 36, 38 which are associated with the lower case "a" letter key of such keyboard, the first being connected in every case to the winding of the unshift key solenoid 40 and the second being connected to the winding of the solenoid which operates the corresponding letter key of the tape perforating machine. Thus, two spaced, flexible insulated contact members 44, 46 are positioned in the path of movement of arm 4 of the lower case "d" key and are engaged in the same manner as the con-

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tact members 36, 38 are engaged by the arm 4 of the "a" key. Contact member 44 is connected to one terminal of the winding of the unshift key operating solenoid 40 and the second contact member 46 is connected to one terminal of the winding of the solenoid 34 which is positioned above and operates the "D, d" key of the tape-perforating machine, the other terminal of the winding being connected to the contact member 22.

Referring now to the "comma" key of the keyboard 2, it will be seen that the arm 4 of this key has associated with it a single contact member 48 which is normally spaced from the arm 4 and is positioned to be engaged by it upon operation of the key of which arm 4 forms a part. Contact 48 is connected to the winding of solenoid 50 which is positioned above and the plunger of which operates the "comma" key of the tape-perforating machine, the other terminal of the winding being connected to contact member 22.

Each no-shift key of the keyboard 2 has associated with it one contact member corresponding in position and function to the contact member 48 which is associated with the "comma" key, and each such contact member is connected directly to the solenoid which is positioned above and the plunger of which operates the corresponding key of the tape perforating machine. Thus, a contact member 52 is associated with the arm 4 of the "period" key of the keyboard 2 and is normally spaced from it but is positioned to be engaged by the arm on operation of the "period" key. This contact member 52 is connected to the winding of solenoid 54 which is positioned above and the plunger of which operates the "period" key of the tape-perforating machine, the other terminal of the winding being connected to contact 22.

Two pairs of contact members are associated with the plunger of the operating solenoid of each of the shift and unshift keys and are operated into and out of engagement on movement of the associated plunger. These contact members and their positioning and operation will now be described. The plunger 13 of the shift key operating solenoid has a lateral projection 60 on the upper end thereof which is positioned between upper and lower lateral projections 62, 64 on the upper end of a pivoted lever 66 which has a downwardly projecting arm 68 which is positioned between two sets of spaced contacts 70, 72 and 74, 76. The spring (not shown) which constantly urges the plunger 13 to its uppermost position normally maintains the lateral projection 60 on the plunger in engagement with the upper lateral projection 62 on lever 66, thus urging the lever arm 68 into engagement with contact members 70, 72 and maintaining these in engagement with each other. Upon energization of solenoid 12 the plunger 13 is moved downwardly, releasing the lateral projection 60 from engagement with lateral projection 62 on lever 66. Contact 72 is mounted on a spring arm which normally biases this contact away from its associated contact 70 and, when the plunger projection 60 moves away from lever projection 62, contact 72 immediately moves away from contact 70. At the downward limit of the stroke of plunger 13, at which it operates the shift key 14, the projection 60 engages lever part 64 and rocks the lever about its pivot, causing the lever arm to move contact 74 into engagement with contact 76. On de-energization of the solenoid the plunger returns to its normal, raised position and, as it moves to this position, the lever arm 68 first releases contact 74, allowing it to move away from contact 76 and, at the limit of upward movement of the plunger, the lever arm engages contact 72 and moves it back into engagement with its associated contact 70. The positions of the lever 68 and associated contacts in the normal, raised condition of plunger 13 are shown in Fig. 1 and their positions when the plunger is in its operating, downward position are shown in Fig. 2.

The plunger 80 of the unshift key operating solenoid

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has associated with it switch operating means which are exactly the same in construction, arrangement and operation as those described in connection with the shift key. These switch operating means include the lateral projections 82 on plunger 80, the upper and lower lateral projections 84, 86 on lever 88 and the downwardly projecting lever arm 90. The plunger 80 is normally held in its uppermost position by spring means (not shown) and lever arm 90 therefore normally holds contact members 22, 24 in closed position. A second pair of spaced contact members 92, 94 is positioned to be engaged and moved to closed position by the lever arm 90 at the limit of downward movement of the plunger. Contacts 22, 24 are separated, by movement of lever arm 90 away from them, immediately upon any downward movement of the plunger, while contacts 92, 94 are moved into engagement with each other at the end of the downward stroke of the plunger. The positions of the parts of the shift key solenoid plunger and its associated contacts, as shown in Fig. 2, are typical of the positions of the plunger of the unshift key solenoid and its associated contacts.

As stated hereinbefore, contact 22 of the switch means operated by the unshift key operating solenoid is connected to one terminal of the winding of each of the operating solenoids for the character keys of the tape perforating machine. Contact 24 is connected by lead 100 to contact 72 of the switch means operated by the shift key solenoid. Contacts 70 and 76 of the switch means operated by the shift key operating solenoid and contact 92 of the switch means operated by the unshift key operating solenoid are connected to a source of direct current 26 by leads 102 and 104. Contact 94, which is associated with contact 92, is connected by lead 106 to one terminal of the winding of an electromagnet 108, which preferably has a slow action and the other terminal of which is grounded at 110, which electromagnet forms part of a latching relay 18.

The latching relay 18 has the two fixed spaced contact members 16, 44 which are respectively connected to the windings of the shift and unshift key operating solenoids, and between these is a pivoted arm 120 which is connected to the source of power 26 and which has contacts 122, 124 on its opposite faces which are respectively adjacent contacts 16 and 44. A spring 126 constantly urges arm 120 in a direction to bring contacts 44 and 124 into engagement and to maintain contacts 16 and 122 out of engagement. Electromagnet 108 is positioned adjacent arm 120 and, when energized, is operative to move arm 120 against the force of spring 126 to move contact 124 out of engagement with contact 44 and contact 122 into engagement with contact 16.

The end of pivoted arm 120 protrudes beyond contact members 122, 124 and is in proximity to the end of one arm 128 of a lever which is pivoted at 130 and the other arm 132 of which is engaged by a spring 134 which constantly urges the end of arm 128 toward and into engagement with the protruding end of arm 120 when arm 120 is in its raised position in which contacts 44 and 124 are in engagement with each other. Arms 120 and 128 are substantially at right angles to each other and when arm 120 is moved by energization of electromagnet 108 the end of arm 128 snaps over the end of arm 120 and engages the upper surface thereof, thus holding the arm 120 in the position to which it is moved by the electromagnet. A second electromagnet 136 which preferably has a slow action, is provided adjacent arm 128 and, when energized, moves arm 128 away from arm 120 thus releasing arm 120 and permitting it to be moved to its normal position by spring 126, in which position contacts 44 and 124 are engaged. One terminal of the winding of electromagnet 136 is grounded at 138 and the other terminal is connected through lead 140 to contact 74 of the switch means controlled by the shift key operating solenoid. The latching relay is illustrated in Fig. 1 in position after operation of

the shift key and in Fig. 3 after operation of the unshift key.

The operation of this system will now be described, it being assumed that the parts are in the positions and conditions shown in Fig. 1, it being noted that the shift and unshift key solenoids are in their uppermost positions, which is the position they occupy at all times except when being actually operated. In this condition contacts 70, 72 are held in engagement with each other by lever arm 68, contacts 22, 24 are held in engagement with each other by lever arm 90, and contacts 44, 124 are held in engagement with each other by spring 126.

If an upper case character key, such as the "A" key, of the auxiliary keyboard 2 is now operated, the arm 4 of the key will move first into engagement with contact 3 which is connected to the shift key solenoid winding 12, but as this winding is connected to the contact 16 which is not in engagement with its associated contact 122, no circuit will be completed and the tape perforating machine mechanism will continue to produce perforations preceded by an upper case perforation. As the arm 4 of the key continues its movement it will engage contact 10 and a circuit will be completed from the grounded arm, through contact 10, the winding of solenoid 20 which operates the "A" letter key of the tape perforating machine, through closed contacts 22, 24, through closed contacts 70, 72 and through leads 102, 104 to the source of energy 26, thus energizing the solenoid winding 20 and operating the "A" key of the tape-perforating machine to produce a characteristic tape perforation which will, in turn and when the tape operates a type-setting machine, cause an upper case "A" to be set by reason of the fact that a shift key perforation was the last shift or unshift key perforation to be made.

If a lower case character key, such as the "a" key, of the keyboard 2 is now operated, the arm 4 of the key will first move into engagement with contact 36, thus completing a circuit from the grounded arm 4, through contact 36, unshift key solenoid winding 40, and the closed contacts 44, 124 to the source of energy 26, thus energizing the winding 40 and operating the unshift key 42 which thereupon moves downwardly. The downward movement of the solenoid plunger 80 causes the projection 82 on the plunger to leave the projection 84 on lever 88, thereby immediately separating contacts 22, 24 and disconnecting the character key operating solenoids 54, 34, 50, 20 from the source of power 26. At the end of the downward stroke of the plunger 80 the projection 82 engages the arm 86 on lever 88 and causes lever arm 90 to engage contact 94 and move it into engagement with contact 92, thus energizing electromagnet 108 by connecting it to the source 26 through lead 104, contacts 92, 94 and lead 106. Energization of electromagnet 108 pulls arm 120 downwardly against the force of spring 126 and as this occurs the end lever arm 128 is moved over the protruding end of arm 120 by the force of spring 134 and rests on the upper surface of the end of arm 120, thus holding arm 120 in its depressed position in which contacts 44, 124 are separated and contacts 16, 122 are engaged. Separation of contacts 44, 124 opens the circuit of the winding of unshift key operating solenoid 40 and the plunger 80 is returned to its uppermost position, which is shown in Fig. 1. Connection of contact members 16, 122 closes the connection between the winding of the shift key solenoid 12 and the source of power 26 to permit energization of this solenoid on depression of any upper case key of the auxiliary keyboard 2. The return of the solenoid plunger 80 to its uppermost position separates contacts 92, 94, thus disconnecting the electromagnet 108 from the source of power, but this will not effect the downward position of arm 120 which is held in such position by arm 128. The return of the solenoid plunger 80 to its uppermost position brings contacts 22, 24 into engagement, thus connecting the character key operating solenoids to the source of power

26 through contacts 22, 24, lead 100, contacts 70, 72 and leads 102, 104 to permit energization of any one of these solenoids upon depression of any lower case character key of the auxiliary keyboard.

If an upper case key of the auxiliary keyboard, such as the "A" key, is now depressed a circuit will be completed from ground at 7, through the key 4, contact 3, the winding of shift key operating solenoid 12, contacts 16, 122 and arm 120 to the source of power 26, thereby energizing the shift key operating solenoid and causing it to depress the shift key to produce the characteristic shift tape perforation to cause subsequent tape perforations to set in upper case. Downward movement of the plunger 13 of the shift key operating solenoid causes the lateral projection 60 on the plunger to move away from projection 62 on lever 66, thereby immediately opening contacts 70, 72 to disconnect the character key operating solenoids from the source of power 26. At the end of the downward stroke of the plunger 13, the projection 60 engages the projection 64 on lever 66 and the lever arm 68 moves contact 74 into engagement with contact 76, thereby connecting electromagnet 136 to the source of power 26 through lead 140, contacts 74, 76, and leads 102 and 104. Energization of electromagnet 136 causes lever arm 128 to be moved toward the electromagnet and out of engagement with the upper surface of the end of pivoted arm 120, thereby releasing the arm and permitting spring 126 to move it upwardly about its pivotal support to a position in which contacts 44 and 124 are engaged. When these contacts are engaged the winding of the operating solenoid for the unshift key is connected to the source of power 26 and may be energized upon depression of any lower case key of the auxiliary keyboard 2. As stated hereinbefore, when the parts are in the last position described any upper case character key of the auxiliary keyboard 2 will, on operation thereof, cause the energization of the operating solenoid for the corresponding character key of the tape perforating machine without in any way affecting the shift key or its operating solenoid. Subsequent operation of any lower case key of the auxiliary keyboard will cause the unshift key and the corresponding character key of the tape perforating machine to be operated in the manner described hereinbefore.

While we have described and illustrated one embodiment of our invention it will be apparent to those skilled in the art that other embodiments as well as modifications of that disclosed may be made and practiced without departing in any way from the spirit or scope of the invention for the limits of which reference must be had to the appended claims.

What is claimed is:

1. An auxiliary keyboard for operating the keys of the keyboard of a tape-perforating machine having a plurality of character keys each producing the same characteristic tape perforation for upper case and lower case, a shift key for producing a characteristic upper case tape perforation and an unshift key for producing a characteristic lower case tape perforation, the auxiliary keyboard comprising a plurality of keys each marked with an upper case or lower case character, a plurality of solenoids each having a plunger and each being arranged and positioned to be operatively associated with one of the character, shift and unshift keys of the tape-perforating machine to depress the associated key upon energization of the solenoid, a pair of contact members associated with each of the upper and lower case keys of the auxiliary keyboard and being positioned to be successively engaged by the associated key on depression thereof, an electric circuit including the first contact member of each pair associated with an upper case key of the auxiliary keyboard and also including the winding of the shift key solenoid, an electric circuit including the second contact member of each pair associated with an upper case key of the auxiliary keyboard and also including the winding

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of the solenoid associated with the corresponding character key of the tape-perforating machine keyboard, an electric circuit including the first contact of each pair associated with a lower case key of the auxiliary keyboard and also including the winding of the unshift key solenoid, an electric circuit including the second contact of each pair associated with a lower case key of the auxiliary keyboard and also including the winding of the solenoid associated with the corresponding character key of the tape-perforating machine keyboard, a source of power for said electric circuits, means including said first contact members and the circuits therefor and being operable upon depression of an upper case or lower case key of the auxiliary keyboard after operation of a lower case or upper case key of said auxiliary keyboard, respectively, to energize the shift or unshift key solenoid to cause the plunger thereof to move into engagement with and operate the shift or unshift key, means operated by the plunger of the operated shift or unshift key solenoid on movement thereof into engagement with the shift or unshift key first to disconnect the character key operating solenoids from the source of power and then at the limit of its movement into engagement with the shift or unshift key to disconnect the operating solenoid of the operated shift or unshift key from the source of power to cause said plunger to return to normal position and release the operated shift or unshift key, and means operated by said plunger on return to its normal position after de-energization of the operated shift or unshift key solenoid to connect the character key operating solenoids to the source of power to permit energization of the operating solenoid of the character key corresponding to the depressed key of the auxiliary keyboard.

2. An auxiliary keyboard for operating the keys of the keyboard of a tape-perforating machine having a plurality of character keys each producing the same characteristic tape perforation for upper case and lower case, a shift key for producing a characteristic upper case tape perforation and an unshift key for producing a characteristic lower case tape perforation, the auxiliary keyboard comprising a plurality of keys each marked with an upper case or lower case character, a plurality of solenoids each having a plunger and each being arranged and positioned to be operatively associated with one of the character, shift and unshift keys of the tape-perforating machine to depress the associated key upon energization of the solenoid, a pair of contact members associated with each of the upper and lower case keys of the auxiliary keyboard and being positioned to be successively engaged by the associated key on depression thereof, an electric circuit including the first contact member of each pair associated with an upper case key of the auxiliary keyboard and also including the winding of the shift key solenoid, an electric circuit including the second contact member of each pair associated with an upper case key of the auxiliary keyboard and also including the winding of the solenoid associated with the corresponding character key of the tape-perforating machine keyboard, an electric circuit including the first contact of each pair associated with a lower case key of the auxiliary keyboard and also including the winding of the unshift key solenoid, an electric circuit including the second contact of each pair associated with a lower case key of the auxiliary keyboard and also including the winding of the solenoid associated with the corresponding character key of the tape-perforating machine keyboard, a source of power for said electric circuits, means including each of said first contact members associated with the lower case keys of the auxiliary keyboard and the circuits including said keys, and being operable upon depression of any lower case key of the auxiliary keyboard after operation of any upper case key of the auxiliary keyboard to energize the unshift key solenoid to cause the plunger thereof to move into engagement with and operate the unshift key, means associated with the plunger of the unshift key solenoid and operated thereby and being operable by such movement of the unshift key solenoid plunger first to disconnect the character key operating solenoids from the source of power and at the limit of operating movement of the plunger to disconnect the unshift key operating solenoid from the source of power to cause the same to return to normal position and release the unshift key and operable on return of said plunger to normal position by de-energization of its solenoid to re-connect the character key operating solenoids to the source of power to permit energization of the operating solenoid of the character key corresponding to the depressed key of the auxiliary keyboard.

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to the source of power, means including switches associated with each of the plungers of the shift and unshift key solenoids and operable thereby upon energization of the associated solenoid to disconnect the character key solenoids from the source of power and being operable to reconnect the character key solenoids to the source of power upon de-energization of the associated solenoid and return of the plunger thereof to its normal position, means including other switches associated with each of the plungers of the shift and unshift key solenoids and operable thereby at the limit of movement of the associated plunger upon operation of its solenoid to energize one of the aforesaid means to maintain the operated shift or unshift key solenoid disconnected from the source of power and the other connected to the source of power.

3. An auxiliary keyboard for operating the keys of the keyboard of a tape perforating machine having a plurality of character keys each producing the same characteristic tape perforation for upper case and lower case, a shift key for producing a characteristic upper case tape perforation and an unshift key for producing a characteristic lower case tape perforation, the auxiliary keyboard comprising a plurality of keys each marked with an upper case or lower case character, a plurality of solenoids each having a plunger and each being arranged and positioned to be operatively associated with one of the character, shift and unshift keys of the tape-perforating machine to depress the associated key upon energization of the solenoid, a pair of contact members associated with each of the upper and lower case keys of the auxiliary keyboard and being positioned to be successively engaged by the associated key on depression thereof, an electric circuit including the first contact member of each pair associated with an upper case key of the auxiliary keyboard and also including the winding of the shift key solenoid, an electric circuit including the second contact member of each pair associated with an upper case key of the auxiliary keyboard and also including the winding of the solenoid associated with the corresponding character key of the tape-perforating machine keyboard, an electric circuit including the first contact of each pair associated with a lower case key of the auxiliary keyboard and also including the winding of the unshift key solenoid, an electric circuit including the second contact of each pair associated with a lower case key of the auxiliary keyboard and also including the winding of the solenoid associated with the corresponding character key of the tape-perforating machine keyboard, a source of power for said electric circuits, means including each of said first contact members associated with the lower case keys of the auxiliary keyboard and the circuits including said keys, and being operable upon depression of any lower case key of the auxiliary keyboard after operation of any upper case key of the auxiliary keyboard to energize the unshift key solenoid to cause the plunger thereof to move into engagement with and operate the unshift key, means associated with the plunger of the unshift key solenoid and operated thereby and being operable by such movement of the unshift key solenoid plunger first to disconnect the character key operating solenoids from the source of power and at the limit of operating movement of the plunger to disconnect the unshift key operating solenoid from the source of power to cause the same to return to normal position and release the unshift key and operable on return of said plunger to normal position by de-energization of its solenoid to re-connect the character key operating solenoids to the source of power to permit energization of the operating solenoid of the character key corresponding to the depressed key of the auxiliary keyboard.

4. An auxiliary keyboard for operating the keys of the keyboard of a tape-perforating machine having a plurality of character keys each producing the same characteristic tape perforation for upper case and lower case, a shift key for producing a characteristic upper case

tape perforation and an unshift key for producing a characteristic lower case tape perforation, the auxiliary keyboard comprising a plurality of keys each marked with an upper case or lower case character, a plurality of solenoids each having a plunger and each being arranged and positioned to be operatively associated with one of the character, shift and unshift keys of the tape-perforating machine to depress the associated key upon energization of the solenoid, a pair of contact members associated with each of the upper and lower case keys of the auxiliary keyboard and being positioned to be successively engaged by the associated key on depression thereof, an electric circuit including the first contact member of each pair of contact members associated with an upper case key of the auxiliary keyboard and also including the winding of the shift key solenoid, an electric circuit including the second contact member of each pair associated with an upper case key of the auxiliary keyboard and also including the winding of the solenoid associated with the corresponding character key of the tape perforating machine keyboard, an electric circuit including the first contact member of each pair associated with a lower case key of the auxiliary keyboard and also including the winding of the unshift key solenoid, an electric circuit including the second contact of each pair associated with a lower case key of the auxiliary keyboard and also including the winding of the solenoid associated with the corresponding character key of the tape-perforating machine keyboard, a source of power for said electric circuits, a first pair of spaced normally closed contacts in the circuit of all of the character key operating solenoids, means operable by the plunger of the unshift key operating solenoid to maintain said contacts closed when said solenoid is de-energized and to open said contacts upon energization of said solenoid, a second pair of spaced normally closed contacts in the circuit of said source of power and the unshift key operating solenoid, means operable upon energization of the unshift key solenoid and movement of the plunger thereof into engagement with the unshift key to open said second pair of contacts to thereby de-energize the unshift key solenoid, means to maintain said second pair of contacts open, and means operable by energization of the shift key solenoid to release the means for maintaining said second pair of contacts open to thereby close the circuit of the unshift key solenoid and the source of power to permit operation of the unshift key solenoid on subsequent operation of a lower case key of the auxiliary keyboard.

5. An auxiliary keyboard apparatus according to claim 4, in which the means operable by the plunger of the unshift key operating solenoid to maintain the first pair of contacts closed comprises a lever mounted for pivotal movement adjacent the plunger of the unshift key solenoid and having a pair of spaced arms and a third arm adjacent and positioned to engage an adjacent one of said contacts, and an arm on said plunger disposed between the pair of spaced arms on said lever, the parts

being so positioned and arranged that the plunger arm engages one of the pair of spaced arms on the lever and the third lever arm engages said adjacent contact and holds it in engagement with its associated contact at the limit of movement of the plunger when the unshift key solenoid is de-energized.

6. An auxiliary keyboard apparatus according to claim 4, in which the means operable upon energization of the unshift key solenoid and movement of the plunger thereof into engagement with the unshift key to open said second pair of normally closed contacts comprises a pivoted arm on which one of the contacts of said second pair is mounted, an electromagnet adjacent said pivoted arm and adapted when energized to move said pivoted arm to move the contact carried thereby out of engagement with the other contact of said second pair of contacts, a third pair of contacts in the circuit of said electromagnet and said source of power, and means operable upon energization of the unshift key solenoid and movement of the plunger thereof into engagement with the unshift key to close said third pair of contacts to thereby energize said electromagnet and move the pivoted arm to separate said normally closed contacts.

7. An auxiliary keyboard apparatus according to claim 4, in which the means to maintain the second pair of contacts open comprises a first pivoted arm on which one of said second pair of contacts is mounted, a second pivoted arm mounted adjacent the first pivoted arm with the end parts of the two arms engaging each other, means constantly urging the end part of the second pivoted arm into engagement with the end of the first pivoted arm, the parts being so positioned and arranged that upon movement of the first pivoted arm to move the contact mounted thereon away from the other contact of the second pair of contacts the end of the second pivoted arm moves over the end part of the first pivoted arm and holds it from returning to its normal position in which the contacts of the second pair are in engagement with each other.

8. An auxiliary keyboard apparatus according to claim 7 comprising, in addition, means for moving the second pivoted arm out of holding engagement with the first pivoted arm upon energization of the shift key solenoid to thereby release the means for maintaining the second pair of contacts open, said means comprising an electromagnet adjacent the second pivoted arm and being positioned and operable when energized to move the second pivoted arm away from and out of engagement with the first pivoted arm, and means operable upon energization of the shift key solenoid and movement of the plunger thereof into engagement with the shift key to energize said electromagnet.

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