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 [21] Appl. No. **714,672**
 [22] Filed **Mar. 20, 1968**
 [45] Patented **Mar. 9, 1971**
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[54] **SHIFT ARRANGEMENT FOR KEYBOARD DATA SENDER**
6 Claims, 4 Drawing Figs.
 [52] U.S. Cl. **178/17, 178/33**
 [51] Int. Cl. **H04L 17/06**
 [50] Field of Search. 178/17(A), 17(C), 33, 27; 340/365; 17(C); 235/145

ABSTRACT: An alpha-only shift lock key in a keyboard sender permits generation of uppercase characters for alphabetic letters only. Control of conventional shifting is retained in the normal shift key whose operation dominates the function of the alpha-only key. Character generation is provided by a sender circuit which produces U.S.A. Standard Code for Information Interchange (ASCII). The sender circuit converts lowercase characters to the uppercase by inverting predetermined signal elements in accordance with the ASCII code. If the alpha-only key is operated, the inversion is provided when the sender detects certain code element signals which are common to all alphabet characters.

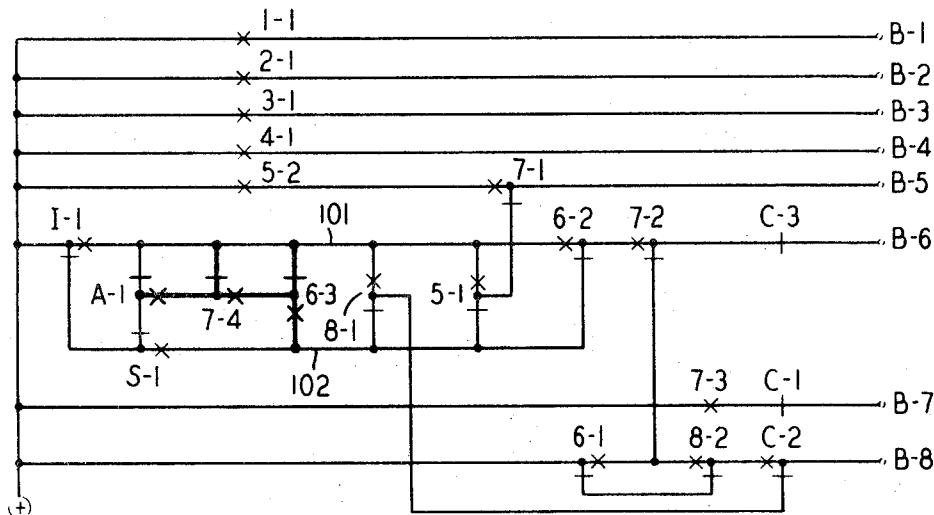


FIG. 1

PRIOR ART

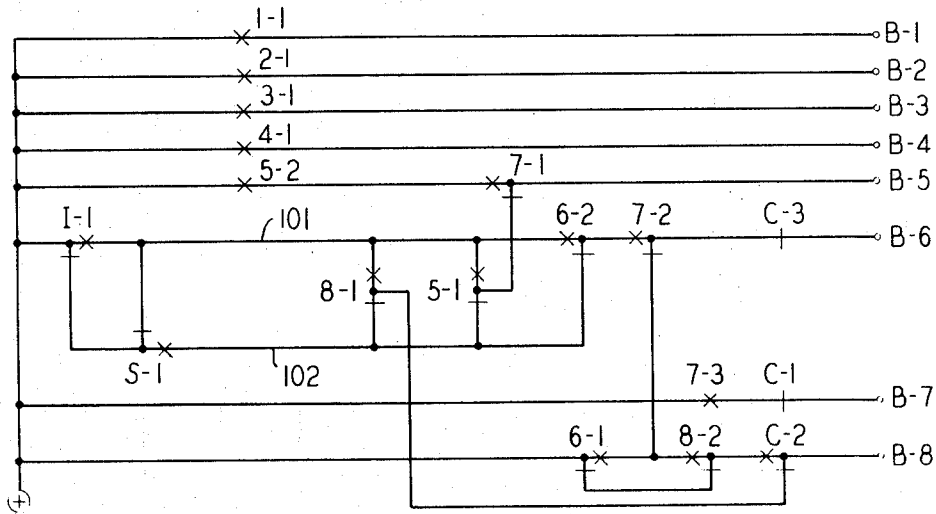
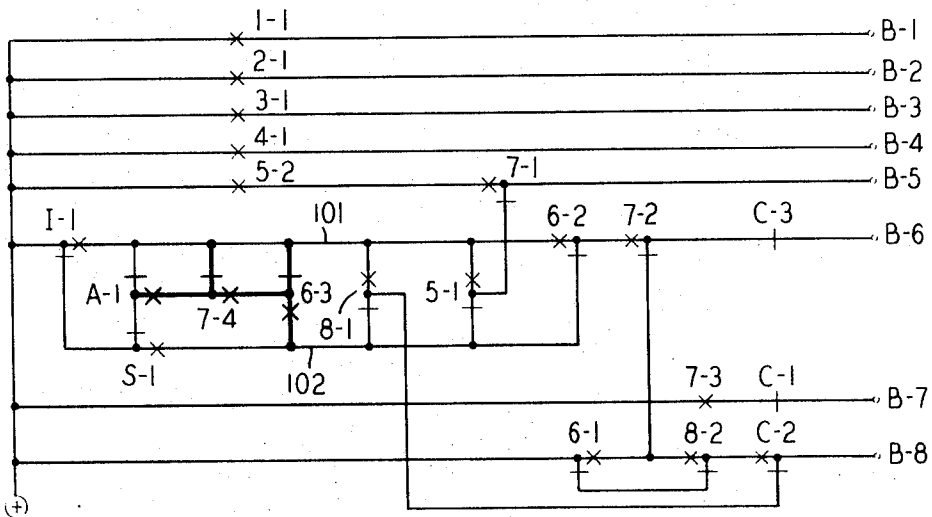


FIG. 2



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FIG. 3

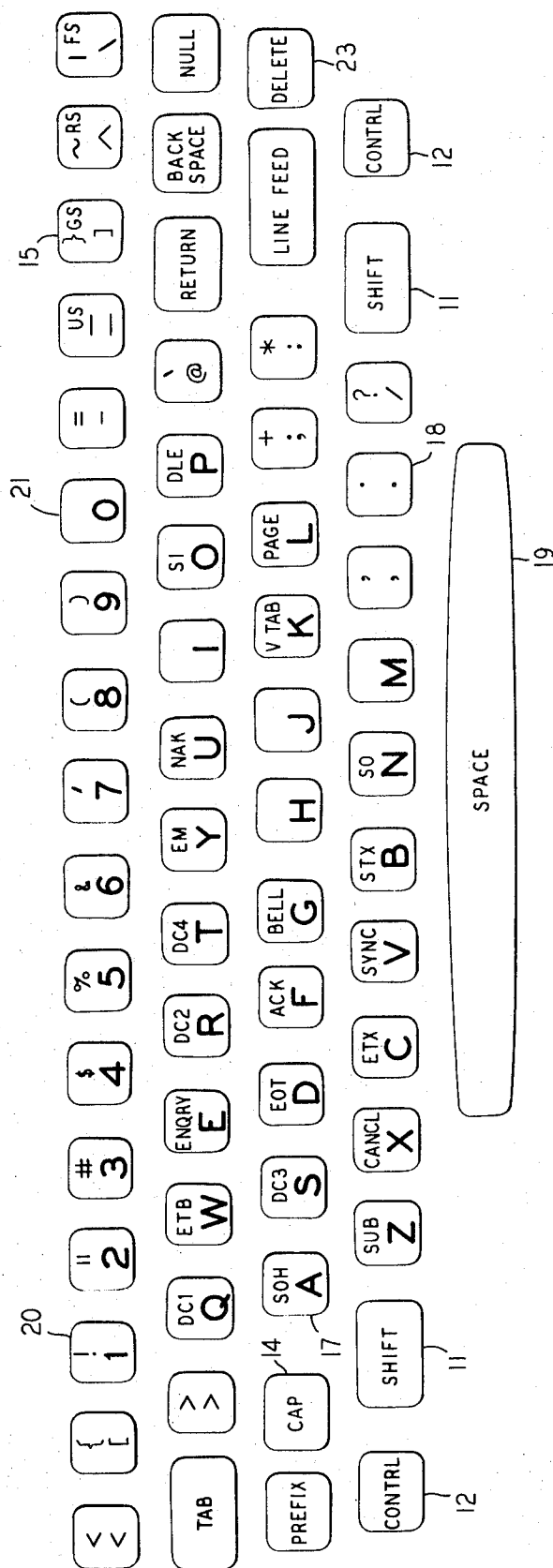


FIG. 4

				COLUMN																ROW															

PRIMARY AFFECTED BY SHIFT

PRIMARY NOT AFFECTED BY SHIFT

SHIFT (INVERT 5 & 8 OR INVERT 6 & 8)

BLOCKED ON SHIFT

CONTROL (INVERT 6 & 7 OR INVERT 7 & 8)

BLOCKED ON CONTROL

8TH BIT MARKING

SHIFT ARRANGEMENT FOR KEYBOARD DATA SENDER

FIELD OF THE INVENTION

This invention relates to teletypewriter keyboard-operated sender circuits and, more particularly, to shifting arrangements for keyboard-operated sender circuits which generate lowercase and uppercase data characters.

DESCRIPTION OF THE PRIOR ART

Current keyboards for teletypewriters include mechanisms whose behaviors are similar to that of present day typewriters. For example, modern teletypewriter keyboards include shift mechanisms to alternatively generate the lowercase or the uppercase data character designated on the keyboard key. In addition, a shift lock arrangement is conventionally included to enable the preparation of names, captions and other material in all uppercase letters without continuous depression of the shift mechanism key.

When the shift lock key is operated to shift the keys to their uppercase symbols, the operator is deprived of convenient access to the numerals and certain common punctuation marks which are generally represented by lowercase data symbols. In this event, the operator must release the lock holding the shift mechanism to produce the lowercase symbol and then relock the mechanism to resume the preparation of the uppercase material.

To alleviate this problem, special keyboards have been constructed. One special keyboard is arranged to have its normal or primary mode in the uppercase and be "shifted" to the lowercase mode. Another special keyboard has numerals in the "shifted" mode, the same mode as the uppercase letters. These arrangements reduce the inaccessibility to the numerals when all-capitals work is prepared but decreases the flexibility of the keyboard when conventional lowercase alphabet text is being typed. In another special application, one group of keys is unaffected by the "shift" of the keyboard. This permits accessibility to symbols in either mode but reduces the number of symbols available on the keyboard.

SUMMARY OF THE INVENTION

It is an object of this invention to prepare text in one of the shift modes while permitting ready accessibility to the characters in the other mode without reducing the number of available symbols.

This invention contemplates a signal sender having a primary and shift mode for generating primary and shift data characters, respectively. In addition, the sender may alternatively be arranged when in the primary mode to generate the "shift" code for one group of the primary characters such as the alphabetic characters. Thus, in the alternative mode, the sender provides uppercase alphabetic text with ready accessibility to other lowercase symbols.

The keyboard sender of the illustrative embodiment advantageously employs the U.S.A. Standard Code for Information Interchange (ASCII) and may cooperate with apparatus for inserting "start" and "stop" elements in each code character to produce a data code hereinafter referred to as the ASCII teletypewriter code. The ASCII code is logically constructed. Groups of code characters having related functions are assigned related signal element permutations. For example, the sixth element and the seventh element of each lowercase alphabetic character have the same signal condition as the corresponding elements of the other lowercase alphabetic characters. In addition, uppercase characters are produced by inverting the signal condition of predetermined elements of the corresponding lowercase character.

It is a feature of this invention that the sender is alternatively arranged to invert the condition of predetermined elements of lowercase characters when certain elements of the primary character have a selected signal condition. Specifically, the sender can be arranged to generate a shift character with the keyboard in the primary mode when the key for a lowercase alphabet letter is depressed by recognizing that certain ele-

ments of the letter character code have selected signal conditions.

It is another feature of this invention that the sender is arranged to provide the alternative "shift" in the primary mode by a special key on the keyboard. The effect of the operation of the special key is precluded, however, when the keyboard is placed in the uppercase or shift mode.

The foregoing and other objects and features of this invention will be fully understood from the following description of the illustrative embodiment taken in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

In the accompanying drawing:

FIG. 1 discloses details of a prior art signal sender of ASCII code;

FIG. 2 discloses the details of circuits and equipments arranged to form a signal sender of ASCII code in accordance with this invention;

FIG. 3 shows a key top arrangement of a keyboard which is suitable to cooperate with the signal sender disclosed in fig. 2; and

FIG. 4 depicts a table showing the permutation of signal elements forming characters in accordance with the ASCII code.

DETAILED DESCRIPTION

Refer first to FIG. 3. There is shown therein the key top arrangement of a keyboard in accordance with this invention. The key tops shown in FIG. 3 include a pair of shift keys 11 which are linked together whereby the depression of either one of keys 11 places the keyboard in the shifted condition and operates an associated pair of transfer contacts S-1, shown in FIGS. 1 and 2. In FIGS. 1 and 2, normally open contacts are represented by two short lines diagonally intersecting the conductor line while normally open contacts are represented by a single line perpendicular to the conductor line. The depression of one of keys 11 opens the normally closed contacts and closes the normally open contacts of transfer contacts S-1.

A pair of control keys 12 are linked together in a similar arrangement, the depression of either one of the keys operating the contacts associated therewith. As shown in FIGS. 1 and 2, the depression of one of keys 12 opens normally closed contacts C-1 and C-3 and opens the normally closed contacts and closes the normally open contacts of transfer contacts C-2.

The keyboard arrangement shown in FIG. 3 also shows capitals key 14. In accordance with the embodiment shown in FIG. 3, capitals key 14 is located in the same position that a shift lock key may ordinarily be positioned. Thus, in the embodiment shown in FIG. 3, the shift lock key and the shift lock mechanism is deleted and the capitals key and the capitals key mechanism is substituted therefor, which key and mechanism function is described hereinafter. It is understood, however, that the capitals key may be substituted for other keys, such as one of control keys 12 or one of shift keys 11, permitting the retaining of the shift lock key with the shift lock mechanism. Alternatively, the capitals key may be provided in addition to the various conventional keys on the keyboard. In any event, the capitals key with the associated function is provided in accordance with this invention in a manner described hereinafter. It is noted that the capitals key mechanism preferably includes a lock mechanism which maintains the key depressed upon the operation thereof and which permits the release of the key upon a subsequent operation. Mechanism which provides these functions is well known in the art.

Included in the keyboard are a plurality of character keys and space character bar 19, hereinafter referred to as space character key 19. Each character key controls nine code bars, now shown. As is well known in the teletypewriter art, the depression of any character key operates each code bar to one of two positions. This operates or releases one or more contacts associated with each code bar.

The first seven of the code bars establishes the seven information bits defining the ASCII teletypewriter code of the primary character of the key, i.e., the character on the key which denotes the primary or unshifted mode. The eighth code bar establishes the parity bit of the primary character. The code selected for this embodiment provides even parity. The ninth code bar is used in conjunction with the shift mechanism, as described below. This ninth code bar is associated with transfer contacts I-1, shown in FIGS. 1 and 2, and is operated to inhibit a "shift" of the primary character, as described hereinafter.

Considering now the specific key top arrangement shown in FIG. 3, it is noted that this is an exemplary arrangement and that other arrangements may be apparent to one skilled in the art. Referring first to a key top designated key 15, an examination of this key top discloses that the primary character thereon is the punctuation mark ".". Accordingly, the depression of key top 15 provides the generation, as described hereinafter, of the ASCII teletypewriter code character denoting the mark ".". In the event that shift key 11 is depressed, the depression of key 15 provides the generation of the ASCII teletypewriter code character denoting the punctuation mark ".". Finally, if control key 12 is operated, the depression of key 15 provides the generation of an ASCII teletypewriter code character which defines the control function "group separator" (GS). This is one of the supervisory or control characters available in the code.

Referring next to key top 17, it is seen that the depression of this key in the primary or unshift condition provides the generation of the lowercase or unshifted character "a." In the shifted condition the depression of key 17 provides the generation of the capital character "A" and with the keyboard arranged to send a control character, the depression of key 17 generates the ASCII teletypewriter character "SOH" (Start-of-Heading).

Considering now key top 18, the depression thereof with the keyboard in either the unshifted or shifted condition provides the generation of the ASCII teletypewriter code character designating the punctuation mark ":",. The depression of this key operates the ninth code bar described above to operate, in turn, the shift inhibit contacts I-1. This, as described below, arranges that the code generated is the same whether the keyboard is in the shifted or unshifted condition. As is described hereinafter, key top 18 also includes conventional blocking mechanism which precludes the depression thereof when control key 12 is depressed. This blocking mechanism, as is well known in the art, functions to block the operation of key 18 to preclude the generation of any character when the keyboard is arranged to transmit control characters.

Another key top of interest that may be considered is key 20. The primary character of this key is the numeral "1," while the shifted character is the punctuation mark "!" This key also is associated with the blocking mechanism which precludes its operation when control key 12 is depressed.

In addition, key 21 provides the generation of the primary ASCII teletypewriter code character designating the numeral "0." The key top is associated with a first blocking mechanism precluding its operation when control key 12 is depressed and a second blocking mechanism precluding its operation when shift key 11 is depressed. Thus, key 21 can be operated only with the keyboard in the primary condition.

The code table, shown in FIG. 4, shows the permutations of the seven information bits for the various letters of the alphabet, numerals, punctuation marks, control characters, etc., in accordance with a preferred form of the ASCII code. In addition, to the right of the table there is disclosed a legend which identifies whether the character is a primary, shift or control character, whether the eighth or parity bit of the character is marking, and, for each of the primary codes, whether the corresponding key is not affected by a shift condition of the keyboard, i.e., whether the key enables the shift inhibit contacts, and, finally, whether the key is blocked on shift or is blocked on control.

The characters in the table are arranged in eight columns (0 to 7) and 16 rows (0 to 15). Examining the table it is seen that, in row 0, the first four bits (bits b1, b2, b3 and b4) of all the characters in the row, are all 0. In row 1, the first four bits of all the characters therein are 0001 with the least significant bit b1 on the right. In row 2 the first four bits of all characters in the row are 0010. Thus, the bits construct a binary number which corresponds to the row number.

Examining the columns, it is seen that in column 0, the fifth, sixth and seventh bits of each character in the column are all 0. In column 1, the fifth, sixth and seventh bits of all characters in the column are 001 with the least significant bit on the right. It is of interest that all of the lowercase alphabet characters are in columns 6 and 7. In these columns, the sixth and seventh bits b6 and b7 are always 1. Thus the codes for all lowercase alphabet letters have the common feature that the sixth and seventh bits are both 1. It is of further interest that, in addition to the lowercase letters, the character "Delete" (DEL) is the only other primary code character in columns 6 and 7 of the table.

Recall now that key 15 generates the primary ASCII teletypewriter code character defining the punctuation mark ".", the shift character "}" and the control character "GS." The primary character "." is shown in column 5, row 13, of the table in FIG. 4. Examining the table and considering the legend, it is seen that this is a primary character and, in addition, the eighth bit is marking. Accordingly, scanning across row 13 to bits b1 through b4 and scanning up column 5 to bits b5 through b7, it can be determined that the ASCII teletypewriter character comprises the bits 11011101, with the least significant bit to the right.

In the event that the keyboard is in the shift, or uppercase, mode or condition, the depression of key 15 provides the generation of the character defining the punctuation mark "}" as previously described. This character is shown in column 7, row 13, of the table. Examining the table and considering the legend, we can see that this is a shift character and, in addition, the eighth bit is not marking. Accordingly, scanning across row 13 and up column 7, we can determine that the ASCII teletypewriter shift character "}" comprises the bits 01111101 with the least significant bit to the right. It is noted, that in accordance with the legend, the shift character differs from the primary character in that bits b5 and b8 or bits b6 and b8 are inverted. In the case of this character it is seen that the bits b6 and b8 of the primary character are inverted to obtain the shift character.

If the keyboard is in the control mode, with control key 12 depressed or operated, the depression of key 15 generates the control character "GS." This control character is shown in column 1, row 13, of the table. Examining the table and considering the legend, again we can see that this is the control character and, in addition, the eighth bit is not marking. Scanning across row 13 and up column 1, it is seen that the control character comprises the bits 00011101. It is noted that in accordance with the legend, the control character differs from the primary character insofar as bits b6 and b7 or bits b7 and b8 are inverted. In the case of this control character, the sixth and seventh bits are inverted from 1 to 0.

Consider now key 17. It is recalled that the depression of this key provides the generation of the lowercase primary character "a" when the keyboard is in the primary or unshifted mode, provides the generation of the uppercase character capital "A" when the keyboard is in the shift mode, and provides the generation of the control character "SOH" when the keyboard is in the control mode. The primary character lowercase "a" is shown in column 6, row 1, of the table in FIG. 4. It is seen that this is a primary character and the eighth bit is marking. Scanning across row 1 and up column 6, it can be determined that the ASCII teletypewriter character comprises the bits 11100001. The upper case or shift character capital "A" is shown in column 4, row 1, and comprises the bits 01000001. It is noted that this shift character differs from the primary character through the in-

version of bits *b6* and *b8*. Finally, the control character is shown in column 0, row 1, and comprises the bits 10000001, differing from the primary character by the inversion of bits *b6* and *b7*.

Key 20 is also of interest. As previously described, this key generates the primary character defining the numeral "1" and the shift character defining the punctuation mark "!." It is also recalled that this key is blocked on control. The primary character "1" is shown in column 3, row 1, and in accordance with the legend it is seen that this is a primary character with the eighth bit marking and the key is blocked when the keyboard is in the control mode. This character comprises the bits 10110001. The shift character "!" is in the column 2, row 1, and comprises the bits 00100001. The key is, of course, blocked on control and no control character can, therefore, be generated.

Key 23 provides the generation of the character "Delete" (DEL). This is shown in column 7, row 15, of the table. Considering the legend, it is seen that this is a primary character with the eighth bit marking. It is further seen that the key is blocked when the keyboard is in the control mode and that, further, the key operates the shift inhibit contacts whereby the primary character is also generated when the keyboard is in the shift mode. The character comprises the bits 11111111.

A prior art circuit which may be used for generating the several characters is shown in FIG. 1. This circuit is arranged to provide element bits to output terminals B-1 through B-8. Specifically, a serial voltage potential is provided to terminal B-1, for example, when the first bit *b1* is a 1 and, alternatively, the potential applied to terminal B-1 is deleted if bit *b1* is a 0. Similarly, potentials are applied to the other terminals B-2 through B-8 or deleted from terminals B-2 through B-8 if the corresponding bits are 1's or 0's. These bits are thus generated in parallel on the output terminals and may, as is well known in the art, be applied, for example, to a parallel to serial converter for subsequent transmission or, alternatively, be applied in parallel to translating or logic devices, etc.

Consider first the depression of key 15. If the keyboard is in the primary or unshifted mode, contacts I-1, S-1 and C-1 through C-3 are in their normal condition. In addition, recalling the premutation of the character, the first, third, fourth, fifth, seventh and eighth code bars are operated to a position to move their corresponding contacts away from their normal condition. Thus, a positive potential is applied through contacts 1-1, 3-1 and 4-1 to terminals B-1, B-3 and B-4, respectively. With the fifth and seventh code bars operated, contacts 5-2 and the normally open contacts of transfer contacts 7-1 are closed, providing a positive potential to output terminal B-5.

Recalling that the keyboard is in the primary mode, a positive potential is applied through the normally closed contacts of transfer contacts I-1 and S-1 to lead 101 in FIG. 1. Lead 101 normally has a potential applied thereto when the keyboard is in the primary mode. Since the eighth code bar is operated, the potential on lead 101 is extended through the normally open contacts of transfer contacts 8-1 and through the normally closed contacts of transfer contacts C-2 to output terminal B-8. Finally, a potential is applied through contacts 7-3 and C-1 to output terminal B-7. Thus, the bits of the character defining the punctuation mark "!" are generated in parallel on output terminals B-1 through B-8.

In the event that the keyboard is in the shift mode when key 20 is depressed, transfer contacts S-1 are operated. The positive potential passed through the normally closed contacts of transfer contacts I-1 is thus passed through the normally open contacts of transfer contacts S-1 to lead 102. It is thus seen that a positive potential is normally applied to lead 102 when the keyboard is in the shift mode. With the potential removed from lead 101 and now applied to lead 102, the potential on output terminal B-8 is now deleted. A potential is now applied, however, to output terminal B-6 from lead 102 by way of the normally closed contacts of transfer contacts 6-2, the normally open contacts of transfer contacts 7-2 and the nor-

mally closed contacts C-3. Accordingly, for the shift character "!" the sixth and eighth bits are inverted.

If the keyboard is in the control mode, the potential applied to output terminal B-7 is removed by the operation of contacts C-1. Similarly, the potential applied to output terminal B-8 is removed by the opening of the normally closed contacts of transfer contacts C-2. Thus, for the control character "GS," bits *b7* and *b8* of the primary character are inverted.

Consider now key 17. When the keyboard is in the primary mode, the depression of the key energizes output terminal B-1 and precludes the application of the positive potential to output terminals B-2, B-3 and B-4. The fifth code bar does not operate its associated contacts, precluding the application of a potential to output terminal B-5. The sixth and seventh code bars, however, operate their associated contacts, whereby output terminal B-6 and B-7 are energized. The path back from output terminal B-6 can be traced through normally closed contacts C-3 and the normally open contacts of transfer contacts 7-2 and 6-2 to lead 101, while the path from terminal B-7 can be traced through normally closed contacts C-1 and normally open contacts 7-3. Finally, since the eighth bit is marking, the potential on lead 101 is passed through the normally open contacts of transfer contacts 8-1 and the normally closed contacts of transfer contacts C-2 to output terminal B-8. Thus, the appropriate bits of the primary character "a" are generated on output terminals B-1 through B-8.

In the event that the keyboard is in the shift condition when key 17 is depressed, the potential is removed from lead 101 and transferred to lead 102. This removes the application of the potential to output terminals B-6 and B-8. Accordingly, the fifth and eighth bits are inverted to generate the shift character "A."

If the keyboard is in the control mode, contacts C-3 and C-1 open to preclude the application of potentials to output terminals B-6 and B-7. At this time the potential applied to output terminal B-8 is maintained by way of the normally open contacts of transfer contacts C-2, the normally open contacts of transfer contacts 8-2 and the normally open contacts of transfer contacts 6-1. Accordingly, for the control character "SOH," the sixth and seventh bits of the primary character are inverted.

Consider now key 20. When the keyboard is in the primary mode, the depression of the key applies a potential to output terminal B-1. With the keyboard in the primary mode and the positive potential applied to lead 101, output terminals B-5 and B-8 have potentials applied thereto by way of transfer contacts 5-1 and 8-1, respectively. Finally, a potential is applied to output terminal B-6 by way of the normally open contacts of transfer contacts 6-1, the normally closed contacts of transfer contacts 7-2 and the normally closed contacts C-3. Accordingly, the bits of the code numeral "1" are applied to output terminals B-1 through B-8.

If the keyboard is in the uppercase mode, when key 20 is depressed the potential on lead 101 is removed and the potential is applied to lead 102. This removes the potential applied to output terminals B-5 and B-8. Thus, the fifth and eighth bits of the primary character are inverted for the shift character denoting the punctuation mark "!".

If key 23 is depressed and the keyboard is in the primary mode, potentials are applied to output terminals B-1 through B-5 and to output terminal B-7. In addition, key 23 depressed operates shift inhibit contacts I-1, as previously described, passing the positive potential to lead 101, via the normally open contacts of transfer contacts I-1. Contacts S-1 are thus bypassed and the unshifted mode of the circuit is maintained regardless of the operation of contacts S-1.

The potential on lead 101 is passed through transfer contacts 6-2 and 7-2 and normally closed contacts C-3 to output terminal B-6. The potential on lead 101 is also passed through transfer contacts 8-1 and C-2 to output terminal B-8. Thus, the bits of the code character "DEL" are applied to output terminals B-1 through B-8.

If the keyboard is in the shift mode, contacts S-1 are operated. Key 23 operates shift inhibit key contacts I-1, whereby, as previously described, the potential is maintained on lead 101. Thus, in the shift mode, the potentials on the output terminals are unaffected by the operation of contacts S-1 and key 23 depressed also generates the character "DEL."

In accordance with this invention, the keyboard is provided with capitals key 14 which permits the generation of shift characters for alphabet letters only. The circuit for providing this function is shown in FIG. 2. Examining FIG. 2 it is seen that this circuit is substantially identical to the circuit in FIG. 1, with the exception that lead 101 is connected to the normally open contacts of transfer contacts S-1 through three alternative paths and, in addition, lead 102 may be connected to the normally closed contacts of transfer contacts S-1 through one specific path. Transfer contacts A-1 are provided, which contacts are operated by the depression of capitals key 14. In addition, transfer contacts 6-3 and transfer contacts 7-4 are included, these contacts being controlled by the sixth and seventh code bars.

With the keyboard in the primary mode and the capitals key released, the positive potential is applied to lead 101. In FIG. 2, however, the potential is applied via the normally closed contacts of transfer contacts S-1 and then through the normally closed contacts of transfer contacts A-1. In the event that the keyboard is in the primary mode but with the capitals key depressed, the potential is still applied to lead 101 if the seventh bit of the primary character is 0, since the potential is passed through the normally closed contacts of transfer contacts S-1, the normally open contacts of transfer contacts A-1 and the normally closed contacts of transfer contacts 7-4. Similarly, in the event that the seventh bit of the primary character is 1 but the sixth bit is 0, the positive potential is still passed to lead 101 through the normally open contacts of transfer contacts 7-4 and the normally closed contacts of transfer contacts 6-3.

The positive potential is transferred to lead 102 with the keyboard in the primary mode and capitals key 14 operated only in the event that the sixth bit and the seventh bit of the primary character are 1 bits. This path can be traced through normally closed contacts of transfer contacts S-1 and the normally open contacts of transfer contacts A-1, 7-4 and 6-3. Thus it is seen that the circuit of FIG. 2 functions similar to the circuit of FIG. 1 with the exception that with the keyboard in the primary mode, the potential is transferred from lead 101 to lead 102 when the capitals key is depressed and the sixth and seventh elements of the primary character comprise 1 bits.

Return now to the table in FIG. 4 and consider columns 6 and 7 wherein the sixth and seventh bits of the characters in columns 6 and 7 are both 1. As previously described, the only primary characters in columns 6 and 7 comprise the lowercase alphabet characters and the character "DEL." With respect to the character "DEL," however, it is recalled that the depression of key 23 to generate the character also operates inhibit contacts I-1. Accordingly, the depression of key 23 maintains the potential on lead 101 to provide the lowercase character "DEL" even though transfer contacts A-1 are operated.

In columns 6 and 7, it is seen that the remaining characters are all shift characters. To produce any shift character with the keyboard in the shift mode, transfer contacts S-1 are operated, and the potential is directly applied to lead 102 regardless of the condition of transfer contacts A-1.

Accordingly, transfer contacts A-1 in the circuit of FIG. 2 is effective only for lowercase alphabet characters. Since the sixth and seventh elements of all primary alphabet characters are 1 bits, the depression of any alphabet key with capitals key 14 depressed extends the positive potential to lead 102, as

previously described. Accordingly, with the potential on lead 102, the sixth and eighth bits are inverted, thereby generating the uppercase character. Thus it is seen that, with the keyboard in the primary condition and capitals key 14 depressed, the depression of any alphabet key provides the generation of the shift character while the depression of any other key provides the generation of the primary character.

When the keyboard is in the control mode the circuit of FIG. 2 is unaffected by the operation of capitals key 14. This can be seen since in the control mode contacts C-1 and C-3 always disconnect terminals B-6 and B-7 from the potential source. At the same time transfer contacts C-2 are operated whereby terminal B-8 is extended to transfer contacts 8-2. Since terminal B-8 is no longer extended to transfer contacts 8-1 it is thereby unaffected by the operation of transfer contacts A-1. Thus control characters are generated in the same manner as previously described with respect to the circuit of FIG. 1 even though capitals key 14 be depressed and transfer contacts A-1 be operated.

Although a specific embodiment of this invention has been shown and described, it will be understood that various modifications may be made without departing from the spirit of this invention and within the scope of the appended claims.

I claim:

1. In a signal sender of binary data code of primary and shift characters, each character having a plurality of signal elements, said primary characters being arranged into groups wherein certain corresponding ones of the elements of the characters in one of said groups have the same signal condition, means individual to each primary character for generating the signal conditions of the elements thereof, means for inverting the signal condition of predetermined ones of said signal elements to produce said shift characters, and operable shift means for enabling said inverting means, CHARACTERIZED IN THAT said sender includes other operable means for enabling said inverting means, the other operable means being rendered effective in response to said same signal condition being generated for said certain corresponding ones of the elements.

2. In a keyboard sender of binary data code of uppercase and lowercase alphabetic and nonalphabetic characters, each character having a plurality of signal elements, certain corresponding ones of the elements of all lowercase alphabetic characters having the same signal condition, a switch means for each element, each switch means operable for generating the signal condition for the associate element, a key individual to each lowercase character for operating a predetermined permutation of said switch means, means for inverting the signal condition of predetermined ones of said generated signal elements, manually operable shift means for enabling said inverting means, and further means for enabling said inverting means, the further means being rendered effective in response to the switch means associated with said certain corresponding ones of the elements being operated to generate said same signal condition.

3. In a keyboard sender, in accordance with claim 2, wherein said further means is effective only in the absence of the operation of said shift means.

4. In a keyboard sender, in accordance with claim 2, wherein said further means is enabled by a further key and further switch means individual thereto and operated by the further key.

5. In a keyboard sender, in accordance with claim 4, wherein the effectiveness of said further switch means is precluded by the operation of said shift means.

6. In a keyboard sender, in accordance with claim 4, wherein at least one of said character keys includes shift inhibit means for inhibiting the operations of said shift means and said further switch means.