April 21, 1959 R. D. SALMON ET AL 2,882,972

PRINTING TELEGRAPH APPARATUS

Filed Dec. 23, 1953 4 Sheets-Sheet 1

FIG. 1.

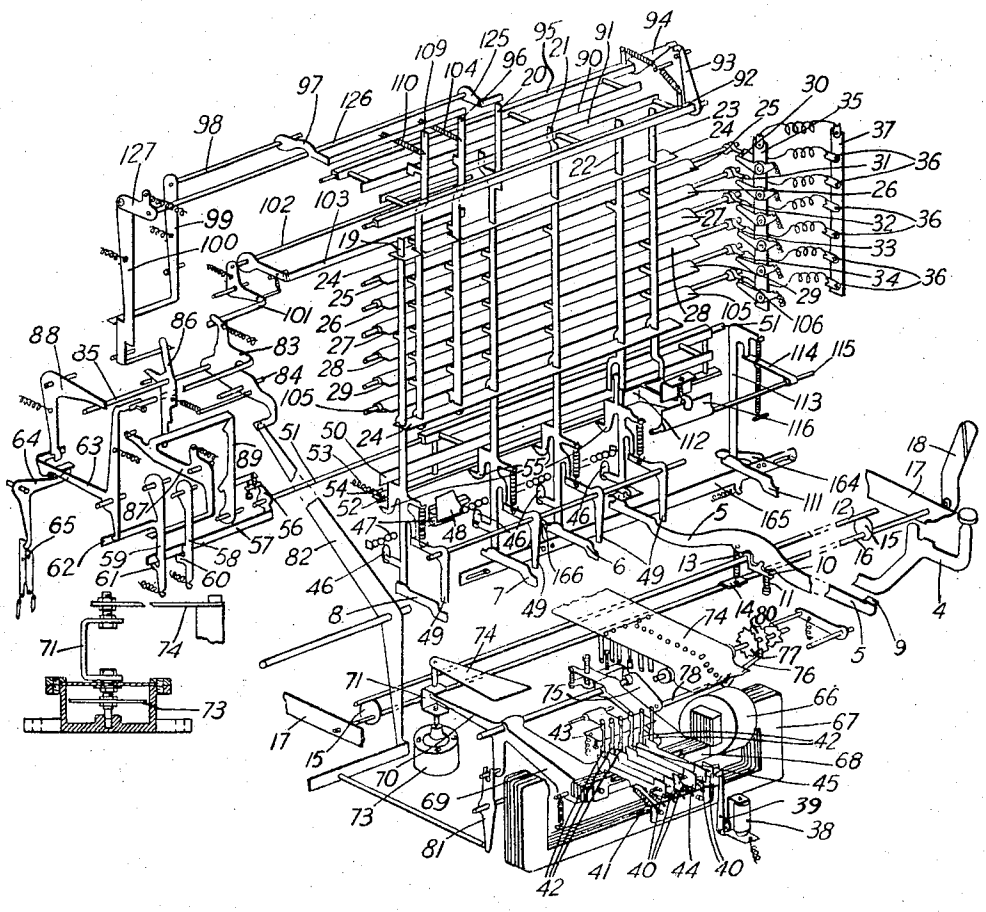

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FIG. 2.

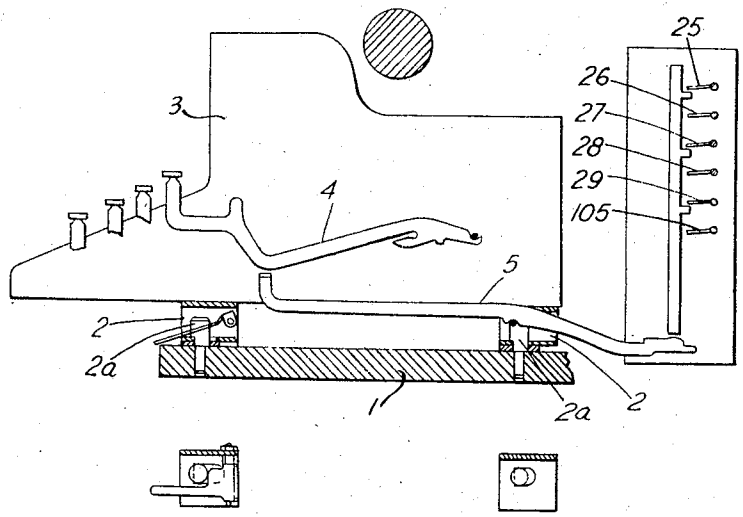

FIG. 3.

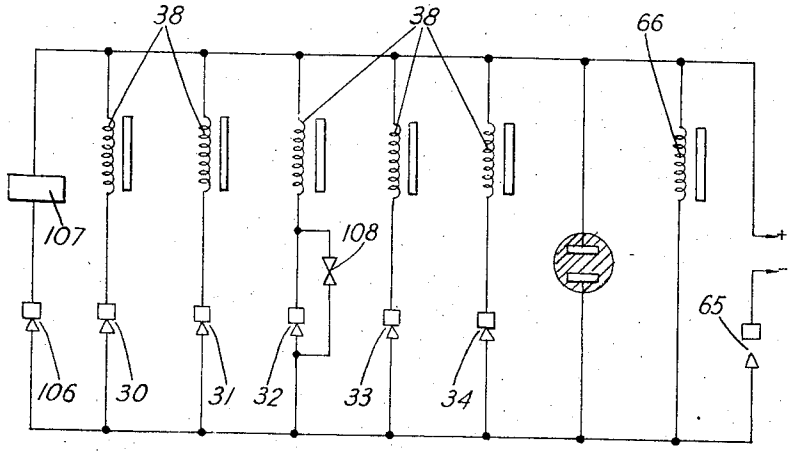

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FIG. 4.

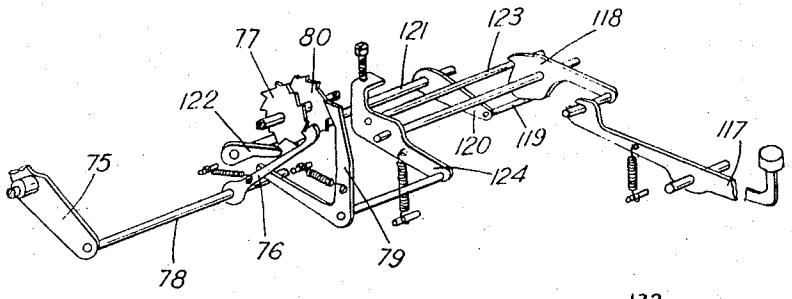
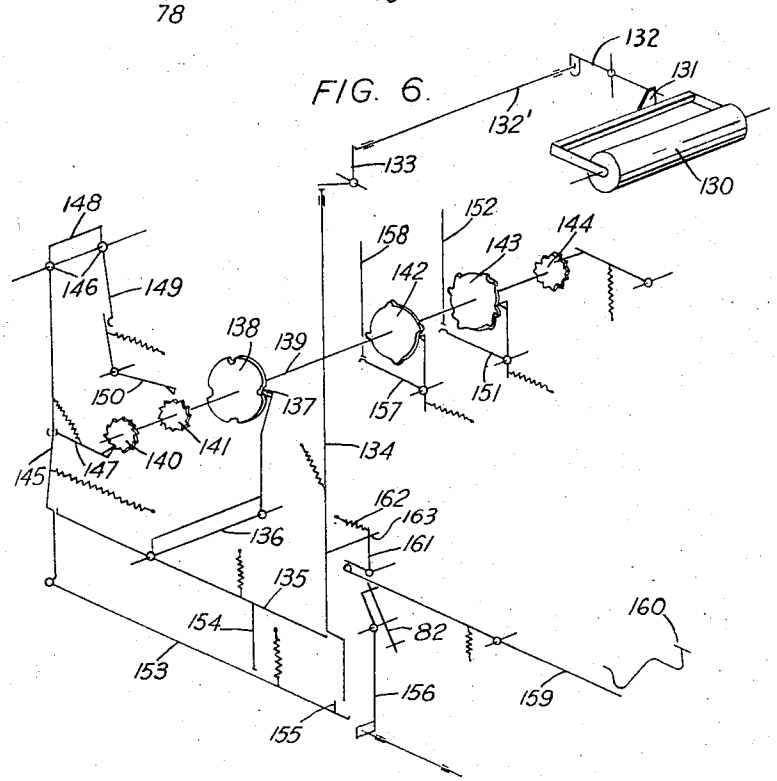


FIG. 6.



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PRINTING TELEGRAPH APPARATUS

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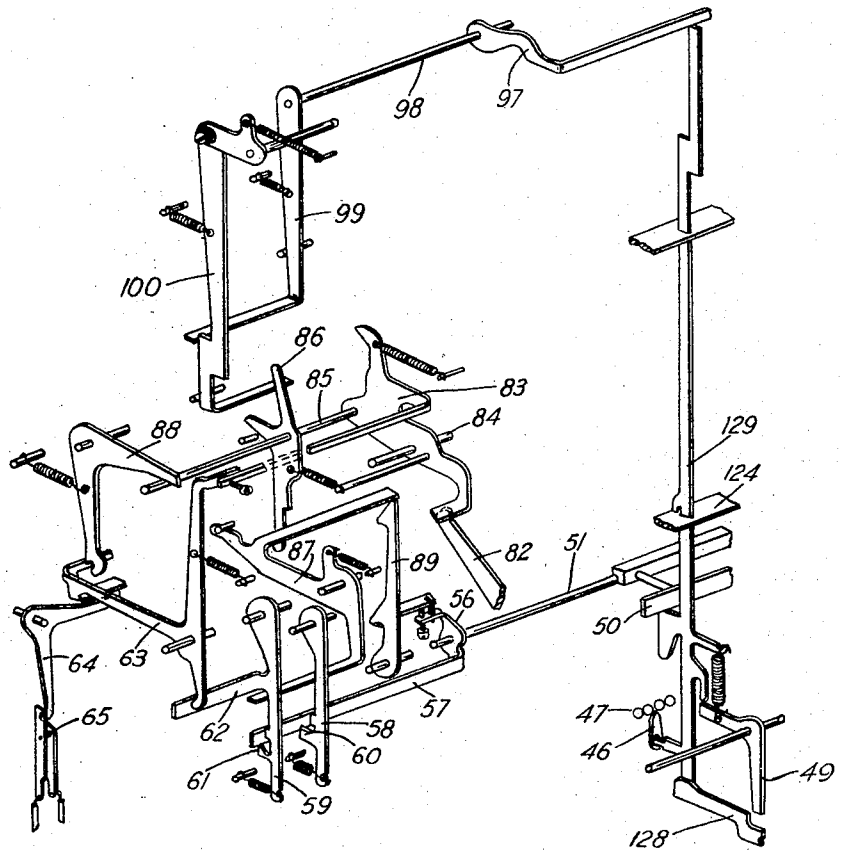
FIG. 5.



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PRINTING TELEGRAPH APPARATUS

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Application December 23, 1953, Serial No. 399,860

Claims priority, application Great Britain December 30, 1952

9 Claims. (Cl. 164—113)

This invention relates to perforating apparatus for perforating a tape according to a code, more particularly, but not exclusively for perforating a tape according to a printing telegraph code.

Such apparatus is required for printing telegraph purposes and also for perforating a tape required to control computer apparatus. The same code as is used for printing telegraph purposes is frequently used also to control computer apparatus, although other codes may be used for the latter purpose. In all cases however the tape is perforated with a series of holes arranged in a code combination. In the case of printing telegraphy, the code perforations are used to control the subsequent transmission of a message represented thereby.

It is usually desirable when perforating a paper tape by means of a keyboard to prepare simultaneously a printed record of the perforated codes so that the latter can be checked and errors detected. In the printing telegraph art this is normally accomplished by operating the perforator and a telegraph transmitter "in parallel" from the same keyboard, the transmitter being connected to a local printing telegraph receiver which thereby prepares the printed record. This means, however, that three items of equipment are simultaneously monopolised: the perforator, the transmitter and the receiver. It would clearly be an advantage if the operator could perforate without using the transmitter or receiver and still see what signals were being perforated.

It has previously been proposed for this purpose to cause a power operated typewriter to control a tape perforating mechanism. A power operated typewriter is an expensive piece of apparatus and is not yet in very extensive use. It is the object of the present invention therefore to provide a more economical form of apparatus for attaining this end.

According to the present invention therefore, perforating apparatus is provided in which key bars, when actuated, positively move type bars to print a character and also control a mechanism for perforating a tape in accordance with a code.

Preferably there is provided a tape perforating mechanism for perforating a tape in accordance with a code and means for associating said mechanism with a typewriter having type bars positively linked with the key bars thereof in such manner that actuation of a key bar controls perforation of said tape as well as printing from the type bar linked therewith.

In the embodiment to be described we provide a frame carrying perforator key bars, means for controlling the perforation of a tape by operation of said key bars, means in said frame to position therein a typewriter and means for causing the actuation of the keys of the typewriter to actuate the said perforator key bars.

In this embodiment there is also provided a means by which the perforator key bars may be positioned to be actuated by the typewriter key bars or clear of the latter, so that the typewriter may be used, if required, without perforating a tape.

Various problems arise from the provision of control of a perforator by typewriter keys. One of these is that separate keys are provided in the standard forms of typewriter for characters which share the same perforated code combination but are distinguished in the perforated record by being preceded by different case shift combinations. Accordingly, in the embodiment to be described, provision is made for automatic case shift insertion on change of case. In the standard typewriter also some keys are common to two characters having different code combinations in a perforator, the distinction between characters to be printed being determined by actuation or non-actuation of a typewriter shift key. Accordingly, provision is made to alter the code combination perforated if the shift key of the typewriter is actuated.

Again in a typewriter the carriage is returned to the beginning of a line and the platen is rotated by manual action independent of the keys. Accordingly, in the embodiment to be described, provision is made for perforating code combinations representing carriage return and line feed automatically on the carriage being returned to the beginning of the line.

An embodiment of the invention will now be described with reference to the accompanying drawings in which:

Fig. 1 is an exploded perspective view of a perforator mechanism according to the invention with certain parts broken away or omitted.

Fig. 2 shows how a standard commercial typewriter is associated with the perforator key bars.

Fig. 3 is a circuit diagram of the electrical connections of the perforator.

Fig. 4 is an exploded perspective view of the mechanism for spacing the perforated tape.

Fig. 5 is an exploded perspective view of the mechanism for running out tape from the perforator; and

Fig. 6 is a line diagram of the mechanism for perforating carriage return and line feed codes in the tape.

Referring to the drawing and first to Fig. 2, a base plate 1 is provided having means thereon for locating the feet 2, of a standard commercial typewriter 3.

It is preferred to replace the usual rubber feet of a typewriter by horizontally disposed U-shaped metal feet, the lower limb of each U being provided with an aperture which fits over an upstanding stud on the base plate 1. A sliding member (not shown) is then provided to lock the feet 2 in position.

When the typewriter 3 is in position on the base 1 each key bar 4 is positioned above a corresponding perforator key bar such as 5.

Referring to Fig. 1, one key bar 4 of the typewriter is shown and perforator key bars 5, 6, 7 and 8, of which 5 only is shown in full. Each of the perforator key bars is formed with a flat end portion, such as 9, positioned below the lowest portion of the corresponding typewriter key bar.

Each perforator key bar, such as 5, is pivoted on a pivot member 10 which is held between an individual stop 11 and a common rail 12. Each key bar, such as 5, is held against its pivot member 10 by a spring 13 stretched between the key bar and a bar 14 fixed to the base plate 1 (not shown in Fig. 1).

The rail 12 is supported on cam discs 15 fixed to a rod 16 journalled in side members 17 of the framework. Exterior to the framework a handle 18 is fixed to rod 16. By means of handle 18 the rod 16 may be rotated to the position shown, in which position cam discs 15 support pivot members 10 so that perforator key bars are in the position shown for key bar 5. In this position, when typewriter key bar 4 is actuated, it strikes the portion 9 of key bar 5 and so causes a code to be perforated in the tape in a manner described hereinafter.

If on the other hand handle 18 is rotated through 90°

the rail 12 is brought on to the lower portions of cam discs 15 and so key bars, such as 5, are lowered, so that the key bars of the typewriter may be operated without striking the perforator key bars.

The perforator key bars are associated with code bars, such as 19, 20, 21, 22 and 23, slidably mounted for vertical movement in horizontal frame members 24. The code bars are formed with projections on which rest pivoted vanes 25, 26, 27, 28, 29. The projections are provided on the code bars in combinations representing a code and each code bar therefore supports a corresponding combination of code vanes. The code vanes rest by gravity on the projections of the code bars and in their lowermost positions close contacts 30, 31, 32, 33 and 34 respectively. The lower contact of each pair is mounted on and connected to a common bus bar 35 whilst the upper contacts are connected to individual contact pieces 36 mounted on an insulating support 37.

The circuits controlled by the contacts 30 to 34 are shown in Fig. 3. Each set of contacts is connected in series with a coil 38 of an individual electromagnet, one only of these magnets being shown in Fig. 1. These magnets select the punches of the perforator that are required to be operated. When a magnet is operated, the armature 39, Fig. 1, pushes to the left in Fig. 1 a corresponding sliding member 40. When the magnet is not operated, as shown in Fig. 1, the corresponding slide member 40 is held to the right in the figure by its individual spring 41. Punches 42, slidably mounted in a member 43, are held against the upper surfaces of sliding members 40. A sixth member 44, fixed permanently in position, supports a punch 45 for perforating feed holes. In the position shown, all the punches 42 and 45 rest on raised portions of members 40 and 44. When an electromagnet 38 is energized, it pushes it corresponding sliding member 40 to the left, so that the corresponding punch 42 rests on the lower portion of the sliding member 40.

When a perforator key bar is actuated, it raises a corresponding code bar and this in turn lifts a combination of the code vanes 25–29 to open those contacts 30–34 corresponding to mark elements in the combination.

On each of the code bars 19, 20, 21 and 22 there is a wedge member 46 (Fig. 5) pivotally mounted for a limited amount of rotation. Wedges 46 cooperate with a row of balls 47 held in a channel 48, so that when the balls 47 are displaced by the rise of a code bar, upward movement of any other code bar is prevented. Spring coupled to each code bar is a latch 49 which prevents any reactuation of the corresponding key bar 5, 6, 7 or 8 whilst the code bar is in a raised position.

Upward movement of a code bar lifts a trip bar 50 fixed to a rod 51 journalled in the framework of the machine. Also fixed to rod 51 is a locking bar 52 normally held by a spring 53 against a back stop 54. When trip bar 50 is lifted by a code bar, rod 51 is rotated counter clockwise in the drawing against spring 53 and locking bar 52 is moved below a projection 55 on the lifted code bar and above the projections 55 on code bars that have not been lifted, thus locking the code bars in position.

Fixed to rod 51 is a member 56 (also shown in Fig. 5) having a horizontal extension 57. Levers 58 and 59 are pulled by individual springs so that projections 60 and 61 thereon rest against extension 57. When rod 51 is rotated counter-clockwise, extension 57 moves upward in the drawing and allows levers 58 and 59 to move to the left in the drawing. Projection 60 of lever 58 moves under extension 57 and holds it against clockwise movement, thus keeping the code bars locked.

Projection 61 on lever 59 is cut away, as shown in Fig. 5, so that once the end thereof has passed extension 57, lever 59 moves rapidly. A horizontal extension 62 has been holding a three-armed lever 63 against movement, but when 62 moves to the left, 63 follows under the influence of its spring and allows a bell crank lever 64 to move anti-clockwise and so close contacts 65.

Contacts 65, as shown in Fig. 3, close the circuit of the energising coil 66 of a perforator magnet and also the circuits of those electromagnets 38 of which the contacts 30–34 have been left closed.

The perforator magnet, Fig. 1, comprises a rectangular laminated core 67 and an energising coil 66. On energisation of the coil 66 a straight bar armature 68 is drawn upwards into line with the pole pieces of the core 67. The armature 68 is mounted on a pivoted frame 69, a rearward extension 70 of which moves between stops fixed to a U-shaped member 71. Member 71 is fixed to a piston 72 sliding in an oil-filled dash pot 73. The upper end of member 71 is also fixed to a stiff blade spring 74. The blade spring 74 serves to keep the piston 72 in a central position, so that it damps the last small fraction of movement of the frame 69 in either direction.

The upward movement of the armature 68 raises the sliding members 40 and the member 44 and so forces punch 45 and any of the punches 42 that rest on raised portions of sliding members 40 through the paper tape 74 to punch a feed hole and a set of code holes in the tape.

Upward movement of the armature frame 69 also moves upward an arm 75 fixed to which is a feed pawl 76, Figs. 1 and 4. The pawl 76 is thus moved to engage another tooth on a feed ratchet 77. At the same time a rod 78 fixed to arm 75 disengages a reverse feed pawl 79 from a reverse feed ratchet wheel 80.

Upward movement of armature frame 69 also rotates a lever 81 clockwise in Fig. 1. Lever 81 rotates a lever 82 and the upper end of lever 82 rotates a lever 83 counter clockwise about its pivot 84. This rotation of lever 83 causes a rod 85 fixed thereto to be moved downward.

Rod 85 carries pivoted thereon a latch 86, and when the armature 68 has finished its movement, latch 86 has moved far enough to engage a horizontal extension on a lever 87 and rotate this lever counter clockwise. Another horizontal extension of lever 87 rotates levers 58 and 59 counter clockwise and frees arm 57 to allow it to be restored to normal position. As lever 83 rotates, a horizontal arm thereof pushes lever 63 counter clockwise and so rotates bell crank lever 64 to allow contacts 65 to open.

As rod 85 moves downwards, a bell crank lever 88 follows it and presses against an arm on lever 63. When lever 63 moves counterclockwise, lever 88 moves over an extension thereof and so keeps contacts 65 open until the armature has completed its return stroke, at the conclusion of which, rod 85 rotates lever 88 clear of lever 63, so that the latter can again snap in behind lever 88 into the position shown in Fig. 1.

In order to prevent a second operation of the perforator if the operator should hold down a key too long, a latch 89 is provided, spring loaded against member 56 (Figs. 1 and 5). When member 56 rotates counterclockwise with rod 51, latch 89 also rotates counterclockwise. When lever 87 is rotated to disengage levers 58 and 59 from extension 57 of member 56, the upper horizontal extension of lever 87 moves downwards and is engaged by latch 89 which holds it in actuated position until release of the key by the operator allows locking bar 52 to move against its back-stop 54, thus withdrawing latch 89 from lever 87 and allowing the mechanism to restore to the positions shown in Fig. 1.

Automatic case shift insertion

For automatic insertion of case shift signals, a letter shift bail 90 and a figure shift bail 91 are provided. The mechanism is shown in the position which it assumes when a perforation in the letter shift case has been made. The automatic insertion of the figure shift code perforation will therefore be described.

In the position shown, the figure shift bail 91 is positioned a little above the upper ends of code bars, such as 22 and 23, representing characters in the upper case.

When such a code bar is moved upwards, it lifts the figure shift bail **91** and thus rotates a bar **92** to which the bail **91** is fixed. Fixed to bar **92** is a latch **93**, which, as it rotates clockwise, rides clear of a latch **94**. Latch **94** is then pulled downwards by its spring and latches latch **93** and figure shift bail **91** in raised position. Latch **94** is fixed to a bar **95** to which letter shift bail **90** is also fixed, so that when latch **94** falls, letter shift bail **90** falls into position to be operated when a code bar representing a code in the letter shift is operated.

Figure shift bail **91**, when moved upward, raises a figure shift code bar **96**. This code bar rotates an arm **97** fixed to a rod **98** journalled in the framework of the machine. Rotation of rod **98** causes rotation of a lever **99** which engages another lever **100** and through it rotates latch **86**. When the perforator magnet first operates, the latch **86** is therefore unable to act upon the extension of lever **87** as lever **83** rotates. As the armature of the magnet completes its return stroke therefore, lever **63** is free to rotate clockwise to allow contacts **65** to close a second time.

As lever **83** is rotated during the first operation of the armature, it moves a member **101** clockwise. This causes a rod **102** to move perpendicular to the plane of the paper, carrying with it a horizontal member **103**. This member **103** pushes the figure shift code bar **96** to the right against its spring **104** until a projection thereon is free of the face of the figure shift bail **91**, whereupon figure shift code bar **96** falls and the projection thereon engages the face of the figure shift bail, the figure shift code bar being thus kept to the right.

When code bar **96** drops, arm **97** and levers **99** and **100** are restored to the position shown in the drawing, so that upon the second operation of the magnet, armature latch **86** is operative in the manner previously described to cause contacts **65** to be opened and prevented from closing again until another key bar is operated.

It will be seen therefore that when figure shift code bar **96** is lifted the perforator magnet is operated twice in succession. On the first operation the figure shift code combination is perforated. This results from the lifting of code vanes **25**, **26**, **28** and **29** by the figure shift code bar **96** to open contacts **30**, **31**, **33** and **34**. The figure shift code combination is mark, mark, space, mark, mark and it may be that the code bar corresponding to the key bar actuated has raised code vane **27**, and opened contacts **32**. To prevent the opening of these contacts having any effect during the first operation of the perforator magnet, a sixth code vane **105** is provided, which is raised by the figure shift code bar **96** to open a sixth set of contacts **106**. Contacts **106** are, as shown in Fig. 3 in series with a relay **107** having contacts **108** which shunt contacts **32**. Normally each time contacts **65** close, relay **107** will be operated and will open its contacts **108**. But when contacts **106** are opened by the figure shift code bar, contacts **108** remain closed and render nugatory any opening of contacts **32**. After figure shift code bar **96** has been restored, the combination of contacts **30–34** operated by the character code bar is effective to control the perforations made during the second operation of the perforator magnet.

In a similar manner the insertion of a letter shift code is effected by means of a letter shift code bar **109**, Fig. 1. With the letter shift bail **90** in the position shown in the figure, the letter shift code bar **109** rests against the bail **90**, but when the figure shift bail **91** is operated and letter shift bail **90** drops, letter shift code bar **109** is moved by its spring **110** so that a projection thereon rests above the letter shift bail **90**. Operation of a code bar, such as **21**, representing a character in the lower case, then raises the letter shift bail **90** and this latter lifts the letter shift code bar **109**. When the letter shift bail **90** is raised, latch **94** is rotated until it is free of latch **93** and the latter then rotates under latch **94** into

the position shown in the figure and holds this latch **94** and letter shift bail **90** in the raised position.

The letter shift code bar **109** acts in the same manner as the figure shift code bar **96** in allowing two successive operations of the perforator magnet. As the letter shift code bar **109** operates all the vanes **25–29**, all the contacts **30–34** are opened and an all mark combination is perforated. On the armature stroke, member **103** moves code bar **109** to the right, so that it is pushed clear of the letter shift bail **90** and falls down into the position shown in the drawing. On the second stroke of the magnet the combination representing the selected code bar, such as **21**, is perforated.

Typewriter shift key

Some of the keys on the typewriter represent two different characters, both being in the upper case in the teleprinter code. The distinction between them in the typewriter is made by means of a shift key. Accordingly in the perforator, two code bars, such as **22** and **23**, are provided for each such typewriter key and a key bar **111** is positioned to be actuated by the typewriter shift key. With the typewriter shift key in unoperated position, operation of perforator key bar **5** acts to raise code bar **22** through a member **112** and not directly. When key bar **111** is operated, a bar **113** is lifted and a member **114** is spring urged to follow it. Member **114** is fixed to a rod **115** journalled in the framework of the machine, and rod **115** therefore rotates clockwise. A member **116** is fixed to rod **115** and so pulls member **112** out of position to engage code bar **22** and into position to engage code bar **23**. Accordingly, when key bar **5** is now actuated, code bar **23** is raised and not code bar **22**.

Back spacing and correction of perforator errors

For the purpose of allowing the perforated tape **74** to be spaced backwards, a separate key **117**, Fig. 4 is provided, independent of the keys of the typewriter. When the perforator back-space key **117** is operated a cam member **118** is rotated anti-clockwise and acts on a rod **119** to cam it in clockwise direction. Rod **119** is fixed to an arm **120** which is also fixed to a shaft **121** journalled in the frame of the machine. Fixed to shaft **121** is a member **122**, so that when shaft **121** rotates in a clockwise direction, member **122** rotates in the same direction and removes feed pawl **76** from engagement with the feed ratchet **77**.

One end of cam member **118** rests on a rod **123** fixed to an arm **124** carrying the backward feed pawl **79**, so that counter-clockwise rotation of cam member **118** and arm **124** rotates pawl **79** whilst it is in engagement with back-space ratchet **80** and so steps the paper tape **74** one step backwards.

An erroneous perforation in the tape may then be cancelled by over perforating it with the all-mark combination. For this purpose an "erase" key bar **7**, Fig. 1, is provided independent of a key bar in the typewriter. Actuation of key bar **7** lifts up an "erase" code bar **20**. This code bar lifts all five vanes **25–29**. As the "erase" code is the same as the "letter shift" code for printing telegraph purposes, the erase code bar **20** in rising also lifts the letter shift bail **90** if this is in its lower position. In such case the letter shift code bar **109** is also lifted by the rise of the letter shift bail **90**. The normal action of the lifting of the letter shift code bar **109** in causing two strokes of the armature of the perforator magnet is, however, prevented in this case. The rise of the erase code bar **20** rotates an arm **125** counter-clockwise. Arm **125** is fixed to a shaft **126** journalled in the framework of the machine, and thus rotation of shaft **126** turns an arm **127** fixed to the shaft counter-clockwise. Vertical lever **100** is loosely jointed to arm **127** and is moved vertically downwards until a cut-away portion is opposite lever **99**. When therefore lever **99** is moved counter-clockwise by rise of the letter shift code bar **109**, it moves into the

cut-away portion of lever 100 and does not strike this lever against latch 86. Latch 86 is therefore effective to move levers 58 and 59 away from the horizontal extension 57 of member 56 and so allows extension 57 to move downwards and hold levers 58 and 59 in the position shown in the drawing.

Spacing without printing

The perforator key bar 8 is actuated by the typewriter space key and raises a code bar 19 which raises code vane 27 only to open contacts 32. The code bar 19 thus causes perforation in the tape of the code space, space, mark, space, space. The code bar 19 does not, however, act on either the letter shift bail 90 or the figure shift bail 91. The key bar 8 is positioned somewhat closer to the space key bar of the typewriter than are other perforator key bars, to the corresponding typewriter key bars so that a greater proportion of the movement of the typewriter space key bar is used in operating the perforator than in the case of other typewriter key bars.

Run out perforator key

A key external to the typewriter is provided for running a quantity of blank tape out of the perforator. This key actuates a key bar 128, Fig. 5. Key bar 128 raises a bar 129 similar to the code bars but differing therefrom in several respects. Bar 129 does not act on any of the code vanes. It cooperates with the trip bar 50 but is not provided with any projection 55 to co-act with the locking bar 52 (Fig. 1).

Bar 129 operates on trip bar 50 to rotate member 56 and so allow levers 58 and 59 to move to the left as previously described to allow contacts 65 to close and operate the perforator magnet 66, Fig. 1. As all the magnets 38 are operated, all sliding members 40 are moved to the left and the punches 42 rest on the lower portions of members 40. Consequently the only punch operative is punch 45 to punch a feed hole in the tape 74.

On the armature stroke, lever 83 is rotated, as previously described, and moves rod 85 and latch member 86 downward.

Bar 129 acts in the same manner as the letter shift code bar 109 or the figure shift code bar 96 to operate lever 99 and through lever 100 to rotate latch 86, so that when rod 85 moves downwards, carrying with it latch 86, the latter is clear of the horizontal extension of lever 87, so that levers 58 and 59 are not moved. When the armature of the perforator magnet completes its return stroke, therefore, lever 63 is free to rotate clockwise and allow contacts 65 to close a second time, as previously described for the double operation of the perforator magnet when a case shift signal is inserted.

Contrary to what happens when a case shift signal is inserted, however, there is now no case shift code bar to drop and allow levers 99 and 100 to return to normal position. So long as the operator's finger remains on the run-out key, bar 129 remains lifted and latch 86 is inoperative to act on lever 87. Consequently this lever remains in unoperated position and cannot be engaged by latch 89. The perforator magnet continues to operate and to feed out tape.

Insertion of carriage return and line feed code perforations

Fig. 6 shows in outline the mechanism for inserting on the tape code perforations representing carriage return and line feed signals when the typewriter carriage 130 is returned to the beginning of a line. When this happens, a projection 131 on the carriage strikes a bell crank lever 132 and rotates it counter clockwise. Bell crank lever 132 acts on another bell crank lever 133 by means of slidable rod 132' to rotate it counter-clockwise. This movement depresses a sliding rod 134, so that a projection thereon rotates a lever 135. Lever 135 is fixed to a rod 136, journalled in the framework of the machine, and rotation of rod 136 removes a holding pawl 137 from a cam disc 138. Cam disc 138 is fixed on a shaft 139 on which are also fixed a feed ratchet wheel 140, a holding ratchet wheel 141, cam discs 142 and 143 and a jockey wheel 144.

When lever 135 rotates clockwise, the left hand end thereof rises and allows a lever 145 to move to the right under the influence of its spring. Lever 145 is pivoted at 146 and carries a pawl 147 cooperating with ratchet 140. Pawl 147 thereby rotates ratchet 140 by one tooth. Lever 145 carries a frame 148 to which is fixed an arm 149, and as lever 145 moves to the right, arm 149 allows a lever 150 carrying a pawl cooperating with ratchet 141 to fall in and engage the next tooth on that ratchet.

As ratchet 140 is rotated by one tooth, cam disc 138 and cams 142 and 143 are also rotated. Cam 143 operates a bell crank lever 151 which lifts a code bar 152. Code bar 152 cooperates with the vanes 25–29, Fig. 1 in the same way as other code bars. Code bar 152 operates vanes 25–29 in a combination representing the carriage return code, and the perforator is accordingly operated to perforate that code in the tape.

When lever 145 moves to the right, an arm 153 pivoted thereon is moved to the right and is kept depressed by a foot 154 on lever 135. An upright projection 155 on arm 153 thus strikes the lower end of rod 134 to free lever 135 from that rod and the right hand end of arm 153 is brought into the path of the lower end of a lever 156.

The lever 82, Fig. 1, rotates lever 156, Fig. 6 clockwise towards the end of the perforating stroke. The lower end of lever 156 acts on the end of arm 153 to push that arm and with it lever 145 to the left, thus disengaging it from the left hand end of lever 135. Lever 135 is now free, so far as rod 134 and lever 145 are concerned, to return to its former position, but is prevented from doing so by the engagement of pawl 137 with the high part of cam disc 138.

When lever 156 returns counter-clockwise with the falling back of the perforator magnet armature, lever 145 with pawl 147 again moves to the right and steps the ratchet 140 round by another tooth. Cam 143 again operates the carriage return code bar 152 to insert a second carriage return code perforation in the tape.

The same sequence of events recurs and, as lever 135 is still prevented from returning to normal position, lever 145 carrying pawl 147 rotates ratchet 140 a third time. Cam 143 is cut so that it is now ineffective to operate bell crank lever 151, but cam 142 operates a bell crank lever 157 to lift up the line feed code bar 158 to insert a line feed perforation in the tape.

Cam disc 138 is now in a position such that a hollow is presented to holding pawl 137, so that lever 135 can now rotate counter clockwise. When therefore arm 153 is moved to the left on the stroke of the perforator magnet armature, lever 135 rotates so that its left hand end prevents lever 145 from moving again to the right.

If the operator makes an error in the first character in the line and operates the back-space key in the typewriter to enable her to correct that error, the carriage will be brought to the beginning of the line again. Mechanism is provided to prevent a new insertion of carriage return and line feed perforations in those circumstances. To this end, a perforator key bar 159 is provided, to be actuated by the back-spacing key 160 of the typewriter. Key bar 159, when actuated rotates a bell crank lever 161 clockwise against a spring 162. Bell crank lever 161 acts on a projection 163 on rod 134 to move that rod to the right, so that depression of rod 134 upon the return of the carriage to the beginning of a line has no effect upon lever 135.

Prevention of actuation of certain keys

It is desirable to prevent any key being actuated to print a character not represented in the teleprinter code, so that the printed copy shall be a true printed represen-

tation of what is perforated in the tape. In certain cases two characters are represented by a single key of the typewriter, and the upper character, printed after the typewriter shift key has been actuated, is not represented in the teleprinter code although the lower character is.

The perforator key bar **111** actuated by the typewriter shift key acts on an arm **164** fixed to a sliding bar **165** and moves the bar **165** to the right in Fig. 1. Bar **165** carries a projection **166** which moves over the end of a perforator key bar, such as **6**, corresponding to the typewriter character key in question and prevents actuation of the key.

In order to avoid complicating Fig. 1 by showing a large number of perforator key bars and corresponding code bars, the projection has been shown as extending over a perforator key bar **6** representing a character in the lower case and shown to illustrate the arrangements for inserting the letter shift code, but it will be understood that a key bar which is to be prevented from actuation in such case will usually represent a character in the upper case.

If there are keys of the typewriter which represent single characters not provided for in the teleprinter code or which represent two characters neither of which is provided for in the teleprinter code, it may be arranged that actuation of the handle **18** to place the perforator under control of the typewriter keys causes flaps to be raised under any typewriter key bar that it is desired should not be operated.

While the principles of the invention have been described above in connection with specific embodiments, and particular modifications thereof, it is to be clearly understood that this description is made only by way of example and not as a limitation on the scope of the invention.

What we claim is:

1. Perforating apparatus adapted to be operated by a standard typewriter having a plurality of key bars, a plurality of type bars, each adapted when moved to print a character, and means for causing the actuation of a key bar to produce a positive movement of a corresponding type bar to print a character, a frame, a plurality of punches arranged in predetermined positions in said frame and adapted for tape-punching movement, either individually or in combination, a plurality of code bars, settable for determining code perforations to be made, means for mounting said code bars for limited movement in said frame, means operated by the movement of each code bar for causing the movement of a predetermined one of said punches or a combination thereof, perforator key bars positioned in said frame so as to cooperate with said key bars of said typewriter for causing the movement of a particular code bar when one of said typewriter key bars is actuated, locking means for locking a selected code bar in set position and unselected code bars in unset position, means for causing said locking means to move into operated position on actuation of a perforator key bar, the means for causing the movement of the punches including means operated by the movement of said locking means for causing the perforation of a code selected by said code bars.

2. Perforating apparatus, as claimed in claim 1, further comprising two latch means, means for independently releasing said latch means for movement under the influence of respective springs by movement of said locking means, one of said latch means controlling the means for causing movement of the punches and the other of said latch means constituting a part of said locking means for locking the code bars in position.

3. Perforating apparatus, as claimed in claim 2, further comprising means for restoring the other latch means only upon completion of a perforating operation.

4. Perforating apparatus adapted to be operated by a standard typewriter having a plurality of key bars, a plurality of type bars, each adapted when moved to print a character, and means for causing the actuation of a key bar to produce a positive movement of a corresponding type bar to print a character, a frame, a plurality of punches arranged in predetermined positions in said frame and adapted for tape-punching movement, either individually or in combination, a plurality of code bars, settable for determining code perforations to be made, means for mounting said code bars for limited movement in said frame, means operated by the movement of each code bar for causing the movement of a predetermined one of said punches or a combination thereof, perforator key bars positioned in said frame so as to cooperate with said key bars of said typewriter for causing the movement of a particular code bar when one of said typewriter key bars is actuated, means actuated by the return of the typewriter carriage to the beginning of a line for causing the perforation in said tape of codes representing "carriage return" and "line feed" and means for preventing the perforation of said "carriage return" and "line feed" codes if said carriage is returned to the beginning of a line by actuation of the back space key in said typewriter.

5. Perforating apparatus adapted to be operated by a standard typewriter having a plurality of key bars, a plurality of type bars, each adapted when moved to print a character, and means for causing the actuation of a key bar to produce a positive movement of a corresponding type bar to print a character, a frame, a plurality of punches arranged in predetermined positions in said frame and adapted for tape-punching movement, either individually or in combination, a plurality of code bars, settable for determining code perforations to be made, means for mounting said code bars for limited movement in said frame, means operated by the movement of each code bar for causing the movement of a predetermined one of said punches or a combination thereof, perforator key bars positioned in said frame so as to cooperate with said key bars of said typewriter for causing the movement of a particular code bar when one of said typewriter key bars is actuated, an electromagnet for operating said punches, means operable upon the actuation of a key representing a character involving a change of case to close the circuit of the electromagnet a first time, means for causing a case shift code to be perforated in said tape by such circuit closure, means actuated upon opening of said circuit to close said circuit a second time, means for thereupon causing a code representing the character to be perforated in said tape, and means operable after the second opening of said circuit to prevent its reclosure until another key has been actuated or the same key has been released and actuated again.

6. Perforating apparatus adapted to be operated by a standard typewriter having a plurality of key bars, a plurality of type bars, each adapted when moved to print a character, and means for causing the actuation of a key bar to produce a positive movement of a coresponding type bar to print a character, a frame, a plurality of punches arranged in predetermined positions in said frame and adapted for tape-punching movement, either individually or in combination, a plurality of code bars, settable for determining code perforations to be made, means for mounting said code bars for limited movement in said frame, means operated by the movement of each code bar for causing the movement of a predetermined one of said punches or a combination thereof, perforator key bars positioned in said frame so as to cooperate with said key bars of said typewriter for causing the movement of a particular code bar when one of said typewriter key bars is actuated, and means for preventing the actuation of predetermined typewriter key bars representing in the upper shift characters for which no perforation code is provided, comprising a slidable bar, means for moving said bar upon actuation of the typewriter shift key, and stop projections on said bar so positioned as to block predetermined ones of said key bars against actuation.

7. Perforating apparatus adapted to be operated by a standard typewriter having a plurality of key bars including lower and upper case key bars, a plurality of type bars each adapted when moved to print a character, and means for causing the actuation of a key bar to produce a positive movement of a corresponding type bar to print a character, a frame, a plurality of punches arranged in predetermined positions in said frame and adapted for tape-punching movement, either individually or in combination, a plurality of code bars including lower and upper case code bars, a letters shift code bar, and a figures shift code bar, all of said code bars being settable for determining code perforations to be made, means for mounting said code bars for limited movement in said frame, means operated by the movement of each code bar for causing the movement of a predetermined one of said punches or a combination thereof, perforator key bars positioned in said frame so as to cooperate with said key bars of said typewriter for causing the movement of a particular code bar when one of said typewriter key bars is actuated, and mechanical linkage means between said lower and upper case code bars and said letters and figures shift code bars for causing the movement of said letters shift code bar when a lower case bar is actuated following upon the actuation of an upper case code bar, and for causing the movement of said figures shift code bar when an upper case code bar is actuated following upon the actuation of a lower case code bar.

8. Perforating apparatus adapted to be operated by a standard typewriter having a plurality of key bars including a key bar which represents both an upper case character and a lower case character, a shift key, a plurality of type bars, each adapted when moved to print a character, and means for causing the actuation of a key bar to produce a positive movement of a corresponding type bar to print a character, a frame, a plurality of punches arranged in predetermined positions in said frame and adapted for tape-punching movement, either individually or in combination, a plurality of code bars, including a pair of code bars representing respectively said upper and lower case characters, all of said code bars being settable for determining code perforations to be made, means for mounting said code bars for limited movement in said frame, means operated by the movement of each code bar for causing the movement of a predetermined one of said punches or a combination thereof, perforator key bars positioned in said frame so as to cooperate with said key bars of said typewriter for causing the movement of a particular code bar when one of said typewriter key bars is actuated, and mechanical linkage means between said shift key and said pair of code bars representing respectively said upper and lower case characters for selectively determining the actuation of said upper or lower case character code bar dependent upon the actuation or non-actuation of said shift key.

9. Perforating apparatus adapted to be operated by a standard typewriter having a plurality of key bars, a plurality of type bars, each adapted when moved to print a character, and means for causing the actuation of a key bar to produce a positive movement of a corresponding type bar to print a character, a frame, a plurality of punches arranged in predetermined positions in said frame and adapted for tape-punching movement, either individually or in combination, a plurality of code bars, settable for determining code perforations to be made, means for mounting said code bars for limited movement in said frame, means operated by the movement of each code bar for causing the movement of a predetermined one of said punches or a combination thereof, perforator key bars positioned in said frame so as to cooperate with said key bars of said typewriter for causing the movement of a particular code bar when one of said typewriter key bars is actuated, a back-space key, a forward-tape-spacing ratchet, a forward-spacing pawl engageable with said ratchet, a back-tape-spacing ratchet, a back-spacing pawl engageable with said back-spacing ratchet, means operable on a code perforation being made to operate said forward-spacing pawl and render said back-spacing pawl inoperative, and means operable on actuation of said back-space key to operate said back-space pawl and render said forward-spacing pawl inoperative, said back-tape-spacing ratchet and said back-spacing pawl being a part of the tape-back-spacing means.

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