Feb. 9, 1960 A. E. ZISKIND ET AL 2,924,321

REMOTE CONTROL TYPEWRITER

Filed June 4, 1958 4 Sheets-Sheet 1

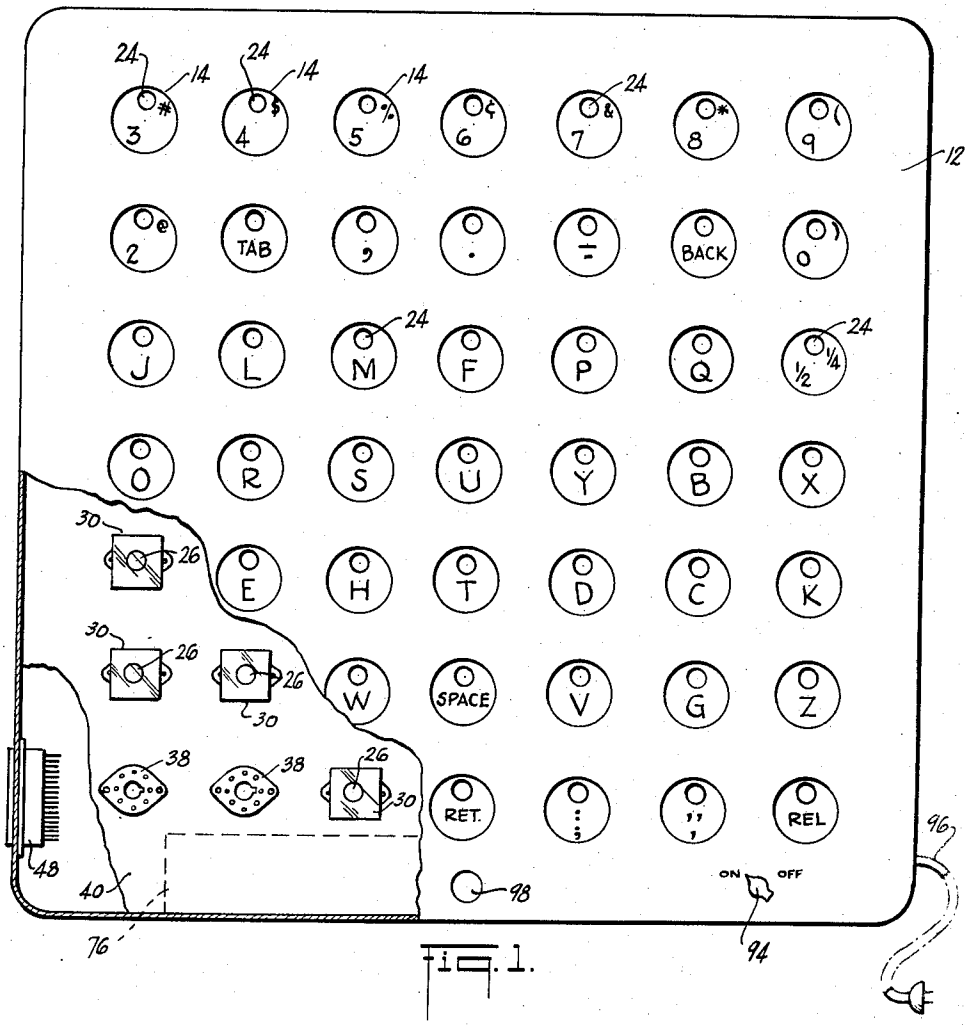



Fig. 1.

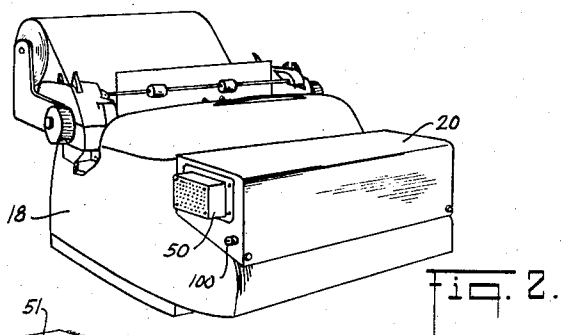


Fig. 2.

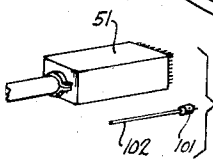


Fig. 14.

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4 Sheets-Sheet 2

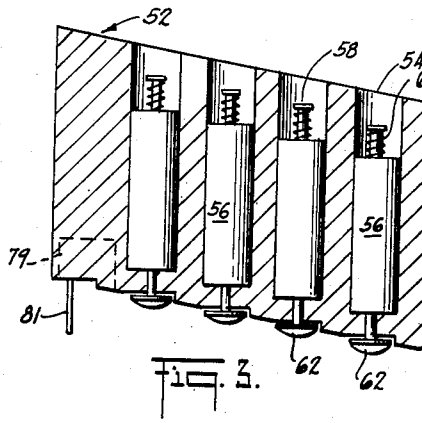



Fig. 3.

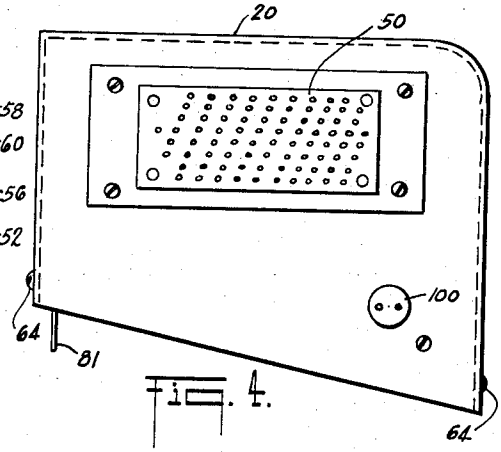



Fig. 4.

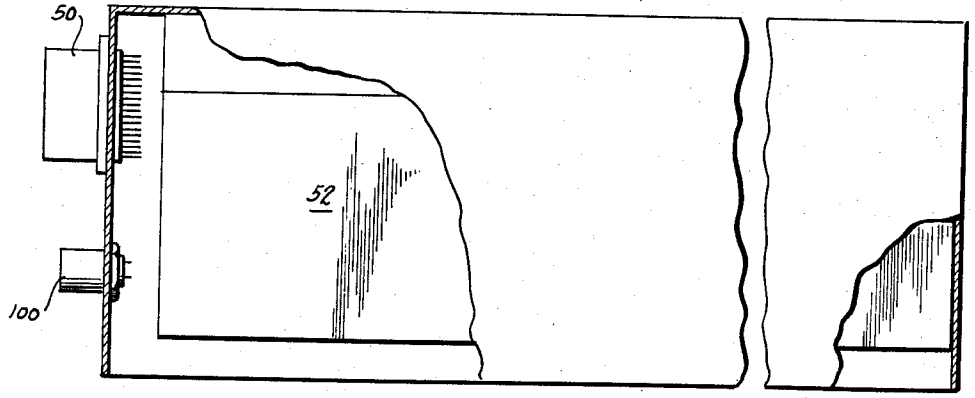



Fig. 5.

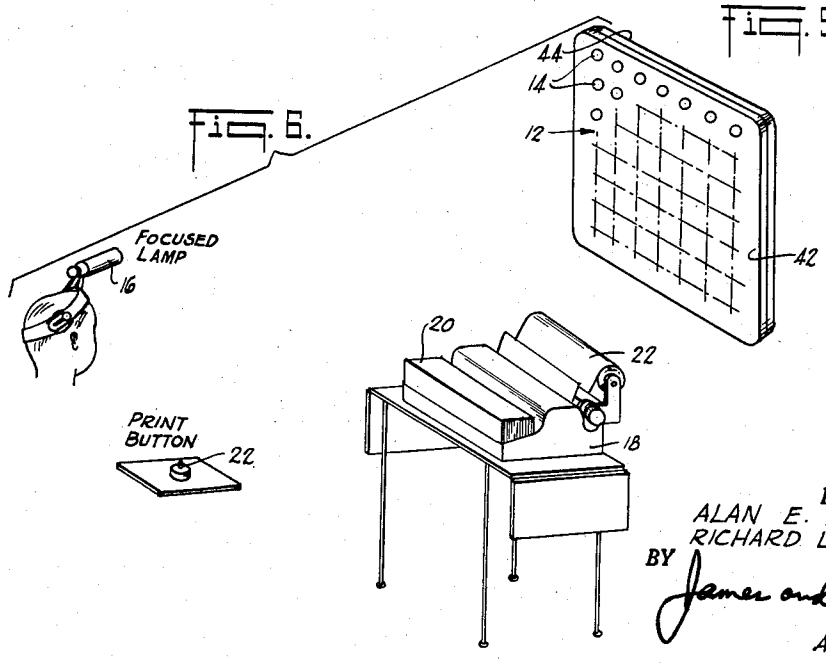



Fig. 6.

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4 Sheets-Sheet 3

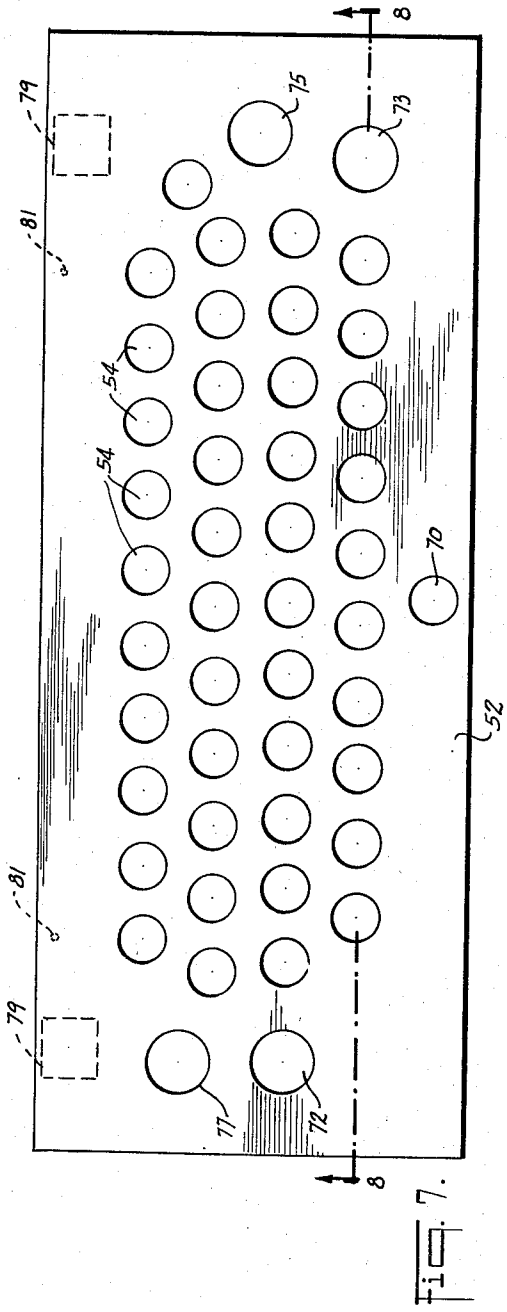



Fig. 7.

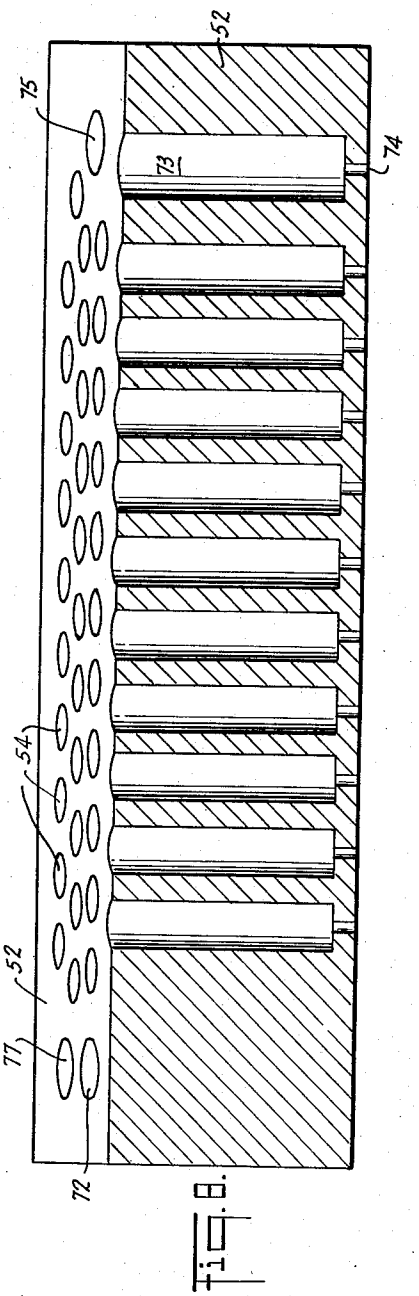



Fig. 8.

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Filed June 4, 1958 4 Sheets-Sheet 4

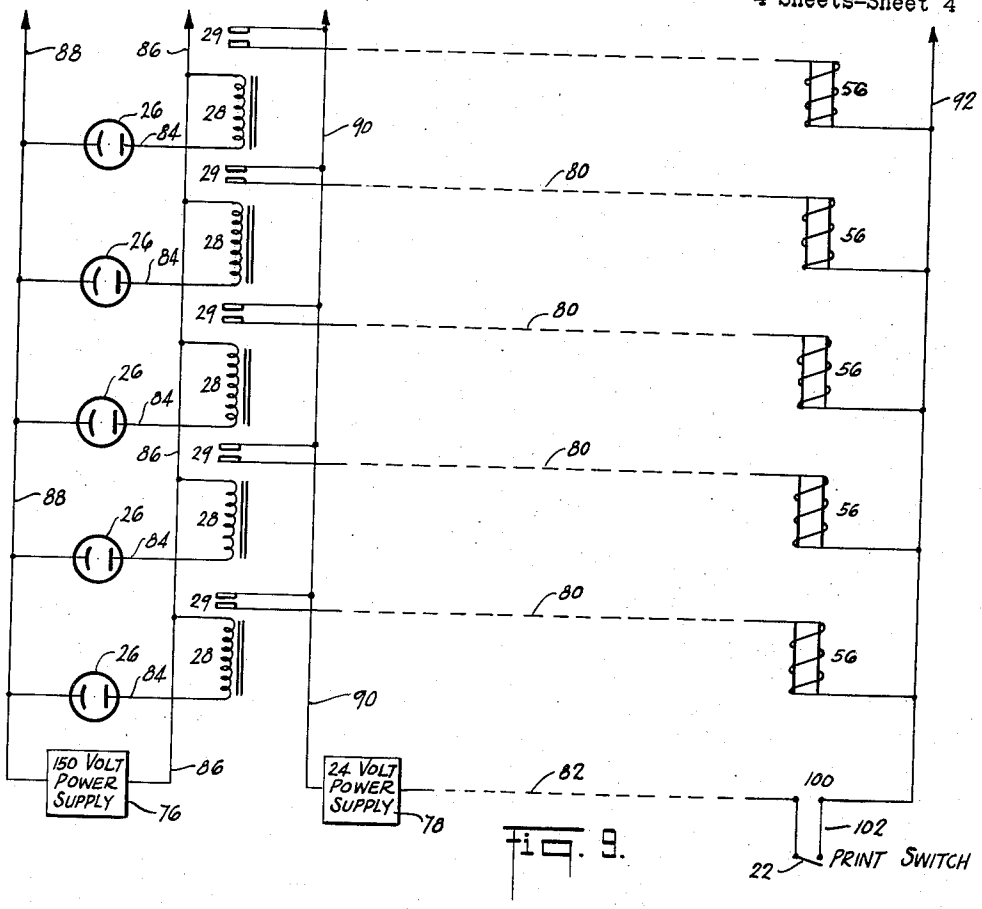



Fig. 9.

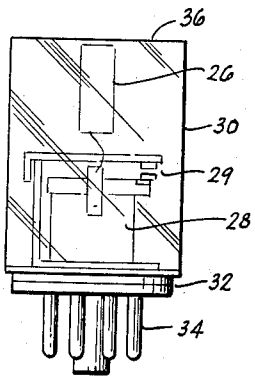



Fig. 10.

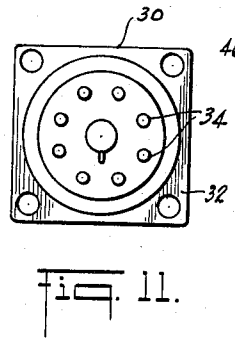



Fig. 11.

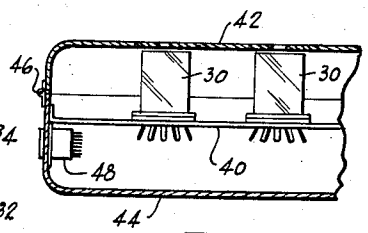



Fig. 12.

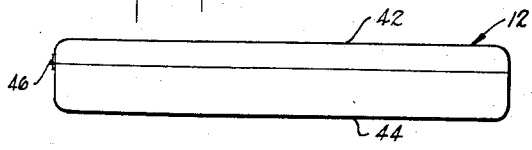



Fig. 13.

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United States Patent Office 2,924,321
Patented Feb. 9, 1960



2,924,321

# REMOTE CONTROL TYPEWRITER

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Application June 4, 1958, Serial No. 739,791

16 Claims. (Cl. 197—19)

This invention relates to typewriters, and especially an operating means therefor, and particularly such means for use by invalids.

The primary object of the present invention is to provide a typewriter control system for use by invalids. A further object is to provide such a system which may be used even in extreme cases of invalidism, with most of the body of the invalid incapacitated. The present system is operable if two parts of the body remain controllably movable, as for example, the head and one knee, or the head and one elbow, or one arm and one knee.

A further object is to provide such a system which is applicable to a standard electric typewriter. Still another object is to provide means which is detachably applicable to the typewriter so that the same machine may be used with or without the present control system.

To acomplish the foregoing general objects, and other more specific objects which will hereinafter appear, my invention resides in the typewriter control system and the elements thereof, and their relation to one another and to the typewriter, as are hereinafter more particularly described in the following specification. The specification is accompanied by drawings in which:

Fig. 1 is a partially cut away front elevation of a target board forming a part of the invention;

Fig. 2 is a perspective view of a typewriter fitted with a solenoid block forming a part of the invention;

Fig. 3 is a transverse section through the solenoid block;

Fig. 4 is an end view of a housing for the block shown in Fig. 3;

Fig. 5 is a partially sectioned front elevation showing the block in the housing;

Fig. 6 is a perspective view explanatory of the invention;

Fig. 7 is a plan view of the solenoid block;

Fig. 8 is a section through the block taken in the plane 8—8 of Fig. 7;

Fig. 9 is a wiring diagram showing the circuitry used;

Fig. 10 is an elevation of a photocell and relay combination, many of which are used;

Fig. 11 is a bottom view of the same;

Fig. 12 is a fragmentary section through the target board;

Fig. 13 is an edge view of the target board, drawn to small scale; and

Fig. 14 shows male connectors used at Fig. 2.

Referring to the drawing, and more particularly to Fig. 6, the typewriter control system comprises a target board **12** having an array of target areas **14** which are marked in symbols to correspond to typewriter keys. Each such area has a light aperture with a photocell behind the aperture. There is also a source **16** of a concentrated light beam adapted to be aimed by a movable part of the invalid's body at the target board. This light source may resemble a doctor's headlight, such as the known Welch Allyn headlight, or it may be a



medical mirror which reflects light from some other source. For convenience, a mirror is here also referred to as a light source. The source is secured to a selected part of the invalid's body, for example, the forehead, or an arm, or hand.

A standard electric typewriter **18** is located at any convenient point, preferably in the same room. This is fitted with an array of solenoids arranged at the keyboard of the typewriter, with a solenoid for each key. In preferred form the solenoids are upright push solenoids arranged to push downward, and they are located in what may be termed a "solenoid block" indicated at **20**, which block is disposed over the keyboard of the typewriter **18**. An additional modification of the typewriter may be made, which is to provide it with a paper roll **22** for continuous paper supply, in lieu of sheets, because in most cases the invalid is bedridden or otherwise unable to manage the insertion and removal of separate sheets of paper. Such roll supplies of paper are already commercially available as accessories for standard electric typewriters such as the I.B.M. typewriter.

The source **16** is aimed at a desired letter and energizes a photocell corersponding to that letter, which then seeks to operate the solenoid of the appropriate typewriter key. However, a single or master "print switch" button **22** provides a normally open switch in a common return or power circuit which prevents operation of all of the solenoids until the button **22** is touched. This button is adapted to be disposed near a selected movable part of the invalid's body, for example, a knee or elbow, and when touched the selected solenoid is energized and operates the typewriter key.

Referring now to Fig. 1 of the drawing, the target board **12** is preferably relatively large, say a square which is two to three feet on edge. It has relatively large target areas **14** which in the present case are two inches in diameter. These are marked in large symbols, easily read from some distance away, and they are marked to correspond to typewriter keys. Each target area has a smaller light aperture **24**, the said apertures having a diameter of say ½ inch. A photocell is disposed behind each aperture, as indicated at **26** at the lower left where the front of the target board has been cut away.

Referring now to Fig. 10, each photocell **26** preferably is combined with a relay **28**. The resulting combination is housed in an envelope **30** secured to a base **32** having prongs **34** such as those used at the base of a radio tube. The prongs are perferably standard, so as to be received in a standard radio tube socket. The envelope **30** may be made of glass or a transparent plastic, or it may be opaque except at the end **36**, which should be transparent.

Reverting now to Fig. 1, each photocell and relay combination is detachably received in a mating tube socket, two of which are indicated at **38**. These are mounted on a chassis plate **40** secured between the front and back walls of the target casing **12**.

This is better shown in Fig. 12, in which the casing of the target board has a front wall **42** and a rear wall **44**, with the chassis plate **40** secured therebetween. For convenience, the front and back of the target may be hinged as indicated at **46**, so that the front of the target is openable, and when opened the photocell units **30** are exposed for inspection, removal or replacement. The wiring is not shown in Fig. 12 but is located behind the plate **40**, and includes wires leading from the soldering lugs of the tube sockets to the female part **48** of a multiple pin connector which may have an appropriately large number of contacts, as explained later.

The target casing may also be used to house the power

supply for the system. This preferably provides D.-C. voltage at 150 volts for the photocells and relay coils, and D.-C. voltage at 24 volts for the solenoid system controlled by the relay contacts.

Referring now to Fig. 2, the typewriter **18** has a solenoid block **20** fitted over its keyboard, as previously described. The female portion **50** of a multiple pin connector is mounted at one end of unit **20**, and it will be understood that a multiple wire cable with a male connector at each end, indicated at **51**, in Fig. 14 is used to connect the target to the solenoid block. The detachable connectors are merely for convenience, and are not at all essential to the invention. Also, a connector may be used at either the target, or the solenoid block, instead of two connectors, one at each, as here shown.

Referring now to Fig. 3, the inner casting **52** of the solenoid block may have an array of holes **54** each receiving a solenoid coil **56**. These coils act on solenoid plungers **58** which are normally raised by small compression springs **60**. The solenoids are of the push type, and are mounted in inverted condition so that they push downward. At its lower end, each solenoid plunger is preferably fitted with a head **62** for striking a key of the typewriter. The solenoids may be received with a tight fit in the holes **54** and require no additional means to secure them in position, but additional means, for example a short length of hollow tubing of about the same outside diameter, above the coil, may be provided if desired, in which case the coils need not be tight in the holes. The inner block **52** is made of a non-ferrous material, for example aluminum, magnesium or other light weight metal alloy, or a plastics material.

The block is housed within a sheet-metal housing, one end of which is shown in Fig. 4. The connector **50** is secured at one end of the housing, and the housing may be secured to the casting **52**, as by means of a number of screws **64**. The housing fits the block closely at the front and back, but there is clearance at the ends, or at least one end, providing space to receive a part of the connector **50** as shown in Fig. 5, and the wiring (not shown) from the connector to the solenoids.

The construction of the casting **52** is also shown in Figs. 7 and 8, including its array of holes **54**. These correspond to a typewriter keyboard, and preferably to a standard typewriter keyboard. For this purpose, the center to center spacing of the holes is preferably ¾ inch, and the solenoids therefor must be less than ⅝ inch in diameter, and preferably are only say ½ inch in diameter.

The solenoid located at **70** operates the spacer bar, and could be larger in diameter, but extra force is not needed. Some other solenoids having special functions preferably provide extra force, and the holes may be larger in diameter. Thus the solenoids at **72** and **73** are used for selecting as between capitals and small letters. This shift movement is used in the locking position because the invalid cannot simultaneously operate two keys. Accordingly, the solenoid at **72** is over the lock key and provides a "shift lock," while the solenoid at **73** is over an ordinary "shift" key and provides a subsequent "shift release." The solenoid at **75** is for carriage return, while that at **77** is the tabulator.

The dotted rectangles at **79** indicate recesses at the bottom of the casting to provide clearance around the "margin release" keys, which are not used in the present apparatus. The dotted circles at **81** represent downwardly projecting pins, which are the sole means for anchoring the block on the typewriter. One of these pins is shown at **81** in Figs. 3 and 4. The sole change needed in a standard electric typewriter such as the I.B.M. typewriter is the drilling of two small holes to slidably receive the pins **81**. The weight of the solenoid block is sufficient to hold it in position, once it has been located by the two pins **81**.

From inspection of Figs. 3 and 8, it will be seen that the casting may be provided at the bottom with small



diameter holes **74** which act as guides for the solenoid plungers.

Referring now to Fig. 9 of the drawing, several but not all of the photocells are shown at **26**. The magnet coils of the corresponding relays are shown at **28**, and the relay contacts at **29**. The corresponding solenoid coils are shown at **56**. The print switch is shown at **22**. The cells **26**, relays **28**, and preferably also the power supply unit here symbolized by rectangles **76** and **78**, are housed within the target casing. The solenoids **56** are located on the typewriter. The target and the typewriter may be quite far apart, and are interconnected by a multiple wire cable, the wires of which are indicated by the broken lines **80**, there being one such wire between each relay contact **29** and its corresponding solenoid **56**.

There is also an additional wire **82** acting as a common return and disposed in series with the preferably low voltage, say 24 volt, power supply **78**. The print switch **22** is disposed in the common return **82**. Each photocell is connected to its adjacent relay magnet by an individual conductor **84**, and all of the magnets are connected to a common lead **86**, while all of the photocells are connected to a common lead **88**. These run to the 150 volt power supply **76**. The arrows at the upper end of the conductors **86**, **88**, **90** and **92** indicate that these should be considered extended indefinitely upward for connecting additional photocells, relays and solenoids, to the extent needed for the complete typewriter keyboard. One side of all of the pairs of relay contacts **29** is connected to common lead **90**, and one terminal of all of the solenoids **56** is connected to common lead **92**.

On reflection, it will be seen that when light strikes a photocell its circuit is energized thereby operating its adjacent relay to close the relay contacts, whereupon the 24 volt supply seeks to energize the corresponding solenoid at the typewriter. However, the solenoid does not operate unless the print switch **22** is also closed. This latter feature is desired in order to guard against unintended operation of typewriter keys while the light source is being moved across the target board. With the present arrangement the invalid may hesitantly, clumsily or gropingly move the light beam until it finds and illuminates the desired target letter, and thereafter the print switch is touched to cause actual printing of the desired letter.

The print switch is preferably located at the end of a flexible two-wire lead, and this may be detachably connected to either the target or the typewriter. In the present case, it is connected to the latter, and referring to Fig. 2, the female portion of a two-wire connector is shown at **100**. It receives a male connector **101** at the free end of flexible lead **102**. The connector **100** corresponds to the point **100** in Fig. 9, and the flexible two-wire lead running to the print switch **22** is represented at **102**. The 110 volt A.C. power supply coming into the circuit is not shown in Fig. 9, but if shown would simply lead to the rectangles indicated at **76** and **78**. The power supply may be any of a number of conventional commercial types such as those used in radio receivers and other comparable electronic equipment.

Reverting to Fig. 1, a master power switch may be provided, as shown at **94**. The lead for the ordinary 110 volt A.C. power supply is shown at **96**, and the on-off switch **94** is simply disposed in series with the power supply from line **96**.

A pilot lamp may be provided, as indicated at **98** in Fig. 1, and this may be across the incoming power line **96**, beyond or to the left of switch **94**. A fuse, not shown, is also provided in series with switch **94**.

It is known that photocells will respond to invisible light such as ultra-violet or infrared, and the light source therefore may be a source of such invisible light. However, it is important that the invalid know whether or not the light beam is "on target" and therefore the target areas **14** shown in Fig. 1 may be coated with a

substance such as phosphor paint which will glow or fluoresce when exposed to the invisible light.

By the way of example, and not in limitation of the invention, we may mentioned that in a particular structure the photocells **26** were Clairex Type CL3A and the relays **28** were Sigma type 11F9000G relays. The solenoids had a pressure of 3 to 6 ounces, and a stroke or thrust of ¼ to ⅜ inch. The sockets for the photocells and the bases of the latter were of the octal type. The multiwire cable provided fifty four wires, of which forty nine were used. These or other references to specific components, and any quantitative dimensions heretofore and here given, are intended merely as examples, and are not intended to be in limitation of the invention.

It is believed that the construction and operation of our typewriter control system for invalids, as well as the advantages thereof, will be apparent from the foregoing detailed description. It will also be apparent that while we have shown and described our invention in a preferred form, changes may be made without departing from the scope of the invention as sought to be defined in the following claims. In the claims, the reference to a "source" of light is intended to include a mirror such as a surgeon's mirror. The term "light" is intended to include invisible light such as ultra-violet or infrared. The term "typewriter" is intended to include adding machines, stenotype machines, and analogous keyboard operated machines.

We claim:

1. In a typewriter control system for invalids, a target board having an array of target areas marked in symbols to correspond to typewriter keys, each target having a light aperture, a photocell behind each aperture, a source of concentrated light beam adapted to be aimed by a movable part of the invalid's body at the target board, a typewriter, and circuitry controlled by said photocells for so operating the typewriter as to print the illuminated symbol.

2. In a typewriter control system for invalids, a target board having an array of target areas marked in symbols to correspond to typewriter keys, each target having a light aperture, a photocell behind each aperture, a source of concentrated light beam adapted to be aimed by a movable part of the invalid's body at the target board, a typewriter, circuitry controlled by said photocells for so operating the typewriter as to print the illuminated symbol, and a print switch in said circuitry adapted to be disposed near another movable part of the invalid's body, said print switch normally disabling the circuitry but being operable by the invalid to print the desired symbol when that symbol is illuminated.

3. In a typewriter control system for invalids, a relatively large target board having an array of relatively large target areas marked in large symbols to correspond to the typewriter keys of a standard typewriter, each target having a smaller light aperture, a photocell and relay combination behind each aperture, a source of concentrated light beam adapted to be aimed by a movable part of the invalid's body at the target board, a typewriter, circuitry controlled by said photocells for so operating the typewriter as to print the illuminated symbol, and a single normally open print switch in said circuitry adapted to be disposed near another movable part of the invalid's body, said print switch normally disabling the circuitry but being operable by the invalid to print the desired symbol when that symbol is illuminated.

4. A typewriter control system for invalids, said system comprising a target board having an array of target areas marked in symbols to correspond to typewriter keys, each target having a light aperture, a photocell behind each aperture, an array of solenoids arranged near the keyboard of the typewriter with a solenoid for operating each key, a multiple wire cable between said board and array with a wire between each photocell and its corresponding solenoid, additional power supply circuitry so arranged that an illuminated cell seeks to operate its corresponding solenoid, a single print switch in said circuitry to prevent operation of the solenoid until said print switch is operated, said print switch being adapted to be disposed near a selected movable part of the invalid's body, and a source of light adapted to be aimed by another movable part of the invalid's body at the target board.



5. A typewriter control system for invalids, said system comprising a relatively large target board having an array of relatively large target areas marked in large symbols to correspond to the typewriter keys of a standard typewriter, each target having a smaller light aperture, a photocell and relay combination behind each aperture, an array of solenoids arranged near the keyboard of a standard typewriter with a solenoid for operating each key, a multiple wire cable between said board and array with a wire between each photocell relay and its corresponding solenoid, additional power supply circuitry so arranged that an illuminated cell seeks to operate its corresponding solenoid, a single normally open print switch in said circuitry to prevent operation of the solenoid until said print switch is closed, said switch being adapted to be disposed near a selected movable part of the invalid's body, and a source of light adapted to be aimed by another movable part of the invalid's body at the target board.

6. A typewriter control system for invalids, said system comprising a target board having an array of target areas marked in symbols to correspond to typewriter keys, each target having a light aperture, a photocell behind each aperture, a solenoid block carrying an array of upright push solenoids arranged to push downward, said block being dimensioned to be disposed over the typewriter keyboard with a solenoid over each key, a multiple wire cable between said board and block with a wire between each photocell and its corresponding solenoid, additional power supply circuitry so arranged that an illuminated cell seeks to operate its corresponding solenoid, a single print switch in said circuitry to prevent operation of the solenoid until said print switch is operated, said switch being adapted to be disposed near a selected movable part of the invalid's body, and a source of concentrated light beam adapted to be aimed by another movable part of the invalid's body at the target board.

7. A typewriter control system for invalids, said system comprising a relatively large target board having an array of relatively large target areas marked in large symbols to correspond to the typewriter keys of a standard typewriter, each target having a smaller light aperture, a photocell and relay combination behind each aperture, a solenoid block carrying an array of upright push solenoids arranged to push downward, said block being dimensioned to be removably disposed over the keyboard of a standard typewriter with a solenoid over each key, a multiple wire cable between said board and block with a wire between each photocell relay and its corresponding solenoid, additional power supply circuitry so arranged that an illuminated cell seeks to operate its corresponding solenoid, a single normally open print switch in said circuitry to prevent operation of the solenoid until said print switch is closed, said switch being adapted to be disposed near a selected movable part of the invalid's body, and a source of concentrated light beam adapted to be aimed by another movable part of the invalid's body at the target board.

8. A typewriter control system, as defined in claim 6 in which the solenoid block has a pair of downwardly projecting pins and in which the typewriter has mating holes to receive the pins, said block remaining in position of its own weight after being properly located by the aforesaid pins and holes.

9. A typewriter control system as defined in claim 4 in which there is a solenoid for the shift lock key of the typewriter, and another solenoid for the shift key of the typewriter, and in which the target board has a target indicating "shift lock" or equivalent for connection to the first said solenoid, and has another target marked "shift release" or equivalent for connection to the second of said solenoids.

10. A typewriter control system as defined in claim 5 in which there is a solenoid for the shift lock key of the typewriter, and another solenoid for the shift key of the typewriter, and in which the target board has a target indicating "shift lock" or equivalent for connection to the first said solenoid, and has another target marked "shift release" or equivalent for connection to the second of said solenoids.

11. A typewriter control system as defined in claim 6 in which the solenoid block has a solenoid disposed over the shift lock key of the typewriter, and has another solenoid disposed over a shift key of the typewriter, and in which the target board has a target indicating "shift lock" or equivalent for connection to the first said solenoid, and has another target marked "shift release" or equivalent for connection to the second of said solenoids.

12. A typewriter control system as defined in claim 7 in which the solenoid block has a solenoid disposed over the shift lock key of the typewriter, and has another solenoid disposed over a shift key of the typewriter, and in which the target board has a target indicating "shift lock" or equivalent for connection to the first said solenoid, and has another target marked "shift release" or equivalent for connection to the second of said solenoids.

13. A typewriter control system as defined in claim 1 in which the target board is on the front face of a hollow casing, and in which the front and rear halves of said casing are separable to open the casing, and in which there is a chassis plate mounted in the rear half of the casing and having an array of sockets disposed behind the light apertures of the front half of the casing for receiving the photocells, and in which each photocell has a base with pins to be detachably received in the aforesaid sockets.

14. A typewriter control system as defined in claim 3 in which the target board is on the front face of a hollow casing, and in which the front and rear halves of said casing are separable to open the casing, and in which there is a chassis plate mounted in the rear half of the casing and having an array of radio tube sockets disposed behind the light apertures of the front half of the casing for receiving the photocell and relay combinations, and in which each photocell and relay combination has a base with pins like those of a standard radio tube to be detachably received in the aforesaid sockets.

15. A typewriter control system as defined in claim 4 in which the target board is on the front face of a hollow casing, and in which the front and rear halves of said casing are separable to open the casing, and in which there is a chassis plate mounted in the rear half of the casing and having an array of sockets disposed behind the light apertures of the front half of the casing for receiving the photocells, and in which each photocell has a base with pins to be detachably received in the aforesaid sockets.

16. A typewriter control system as defined in claim 5 in which the target board is on the front face of a hollow casing, and in which the front and rear halves of said casing are separable to open the casing, and in which there is a chassis plate mounted in the rear half of the casing and having an array of radio tube sockets disposed behind the light apertures of the front half of the casing for receiving the photocell and relay combinations, and in which each photocell and relay combination has a base with pins like those of a standard radio tube to be detachably received in the aforesaid sockets.

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