United States Patent

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[54] DATA INPUT MECHANISM FOR AN ELECTRICAL TYPEWRITER

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[52] **U.S. Cl.** **197/19**, 197/16

[51] **Int. Cl.** **B41j 5/30**

[58] **Field of Search** 197/16, 19

[56] **References Cited**

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3,453,379	7/1969	Holmes	197/19 X
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[57] **ABSTRACT**

A baseplate attachment for initiating operations of a typewriter in response to coded electrical signals from an external source includes bail actuators for manipulating the internal character selection mechanism of the typewriter and further includes solenoids which determine the particular bail actuators to be activated in response to each set of incoming signals. The driving force for operating the bail actuators to manipulate the character selection mechanism is obtained from the typewriter motor rather than the solenoids which may be small and do not require high current input signals.

7 Claims, 4 Drawing Figures

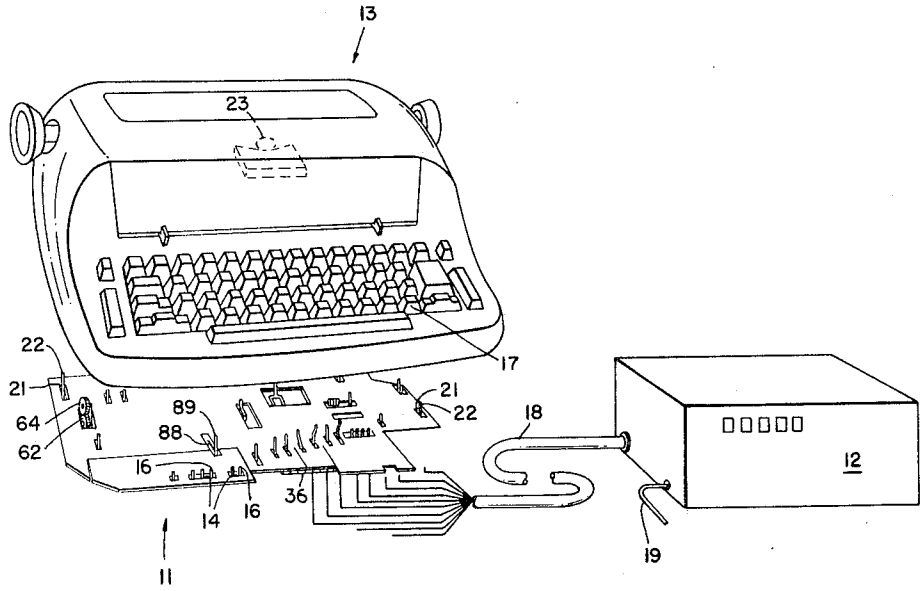
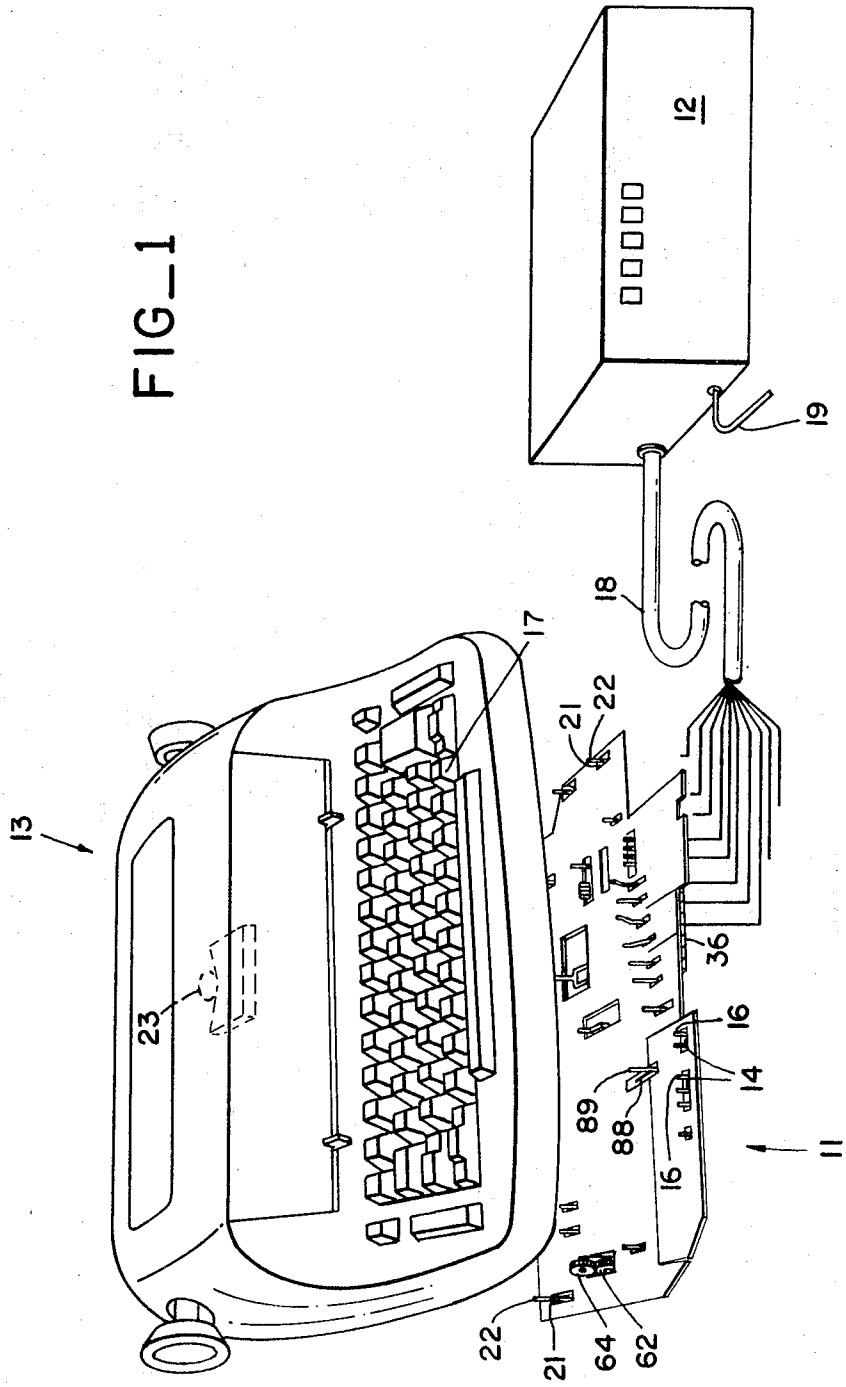


FIG_1



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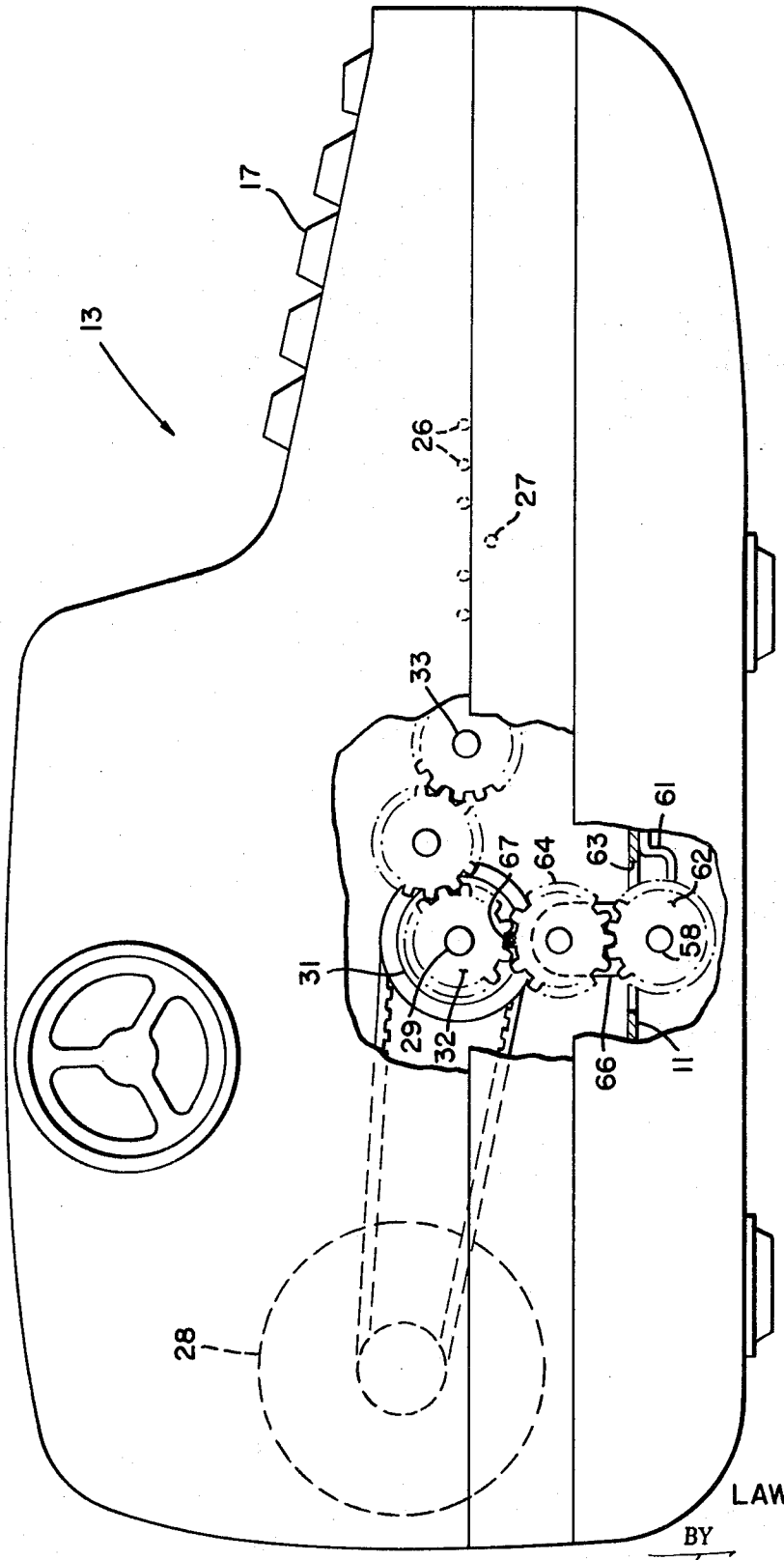


FIG_2

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FIG_3

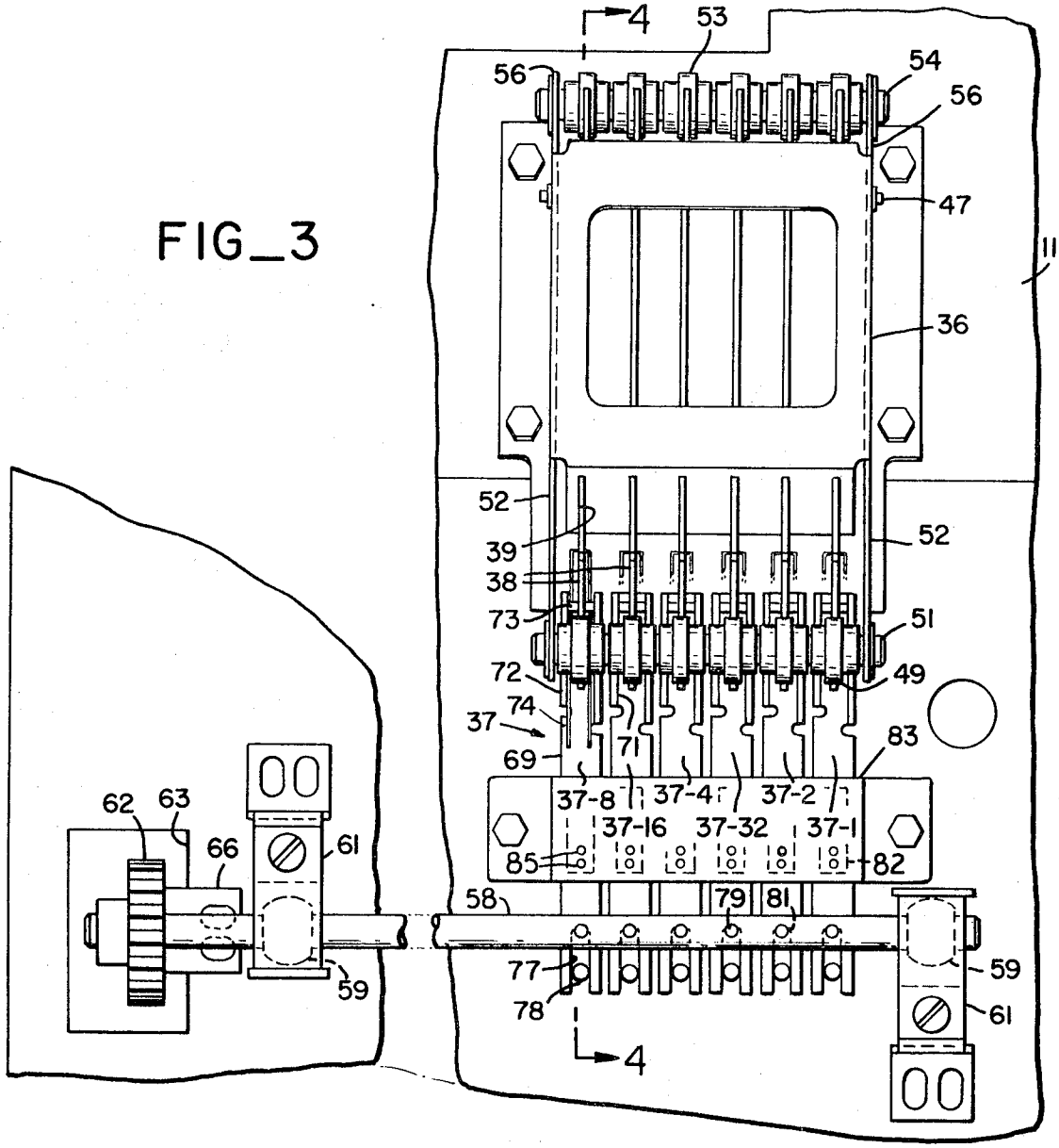
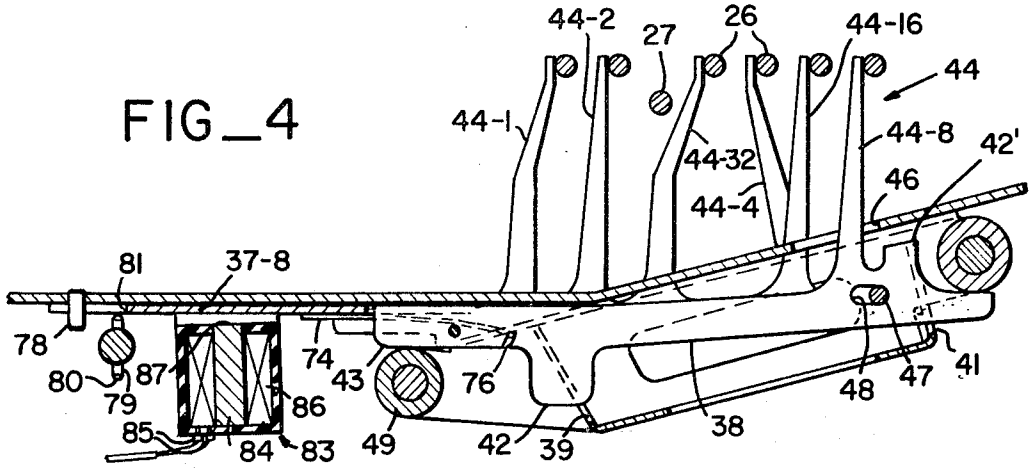

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FIG_4


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44-16
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44-1
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DATA INPUT MECHANISM FOR AN ELECTRICAL TYPEWRITER

BACKGROUND OF THE INVENTION

This invention relates to terminal equipment for data processing systems and more particularly to typewriter mechanism for printing data in response to coded electrical signals which identify characters to be printed.

Data processing systems in which information is transmitted in the form of coded electrical signals generally require one or more terminal devices for printing out the information in written form when desired. One of the more common forms of terminal device is essentially an electrical typewriter with added provisions for actuating the internal print and function mechanisms of the typewriter in response to sets of incoming electrical signals. United States Pat. No. 3,453,379 discloses a particularly advantageous system of this kind and U. S. Pat. No. 3,452,851 discloses a basically similar system in which all of the provisions needed to adapt a common form of office typewriter for use as a data terminal are disposed on a simple baseplate attachment which may be quickly mounted on the typewriter without requiring any internal modifications therein.

In the system described in the above identified patents and in various other data terminal constructions, solenoid coils, having a movable armature, are employed to perform the manipulations of internal typewriter mechanism which are necessary to initiate operations identified by incoming signals. In order to provide sufficient force and speed of response, the solenoids have necessarily been large. Physical size and electrical power input, among other factors, both affect the mechanical force and speed of response of a solenoid and the term large is used broadly herein with reference to either of these factors or a compromise therebetween.

The physical size of power requirements of the solenoids have heretofore introduced certain undesirable complications and cost factors into the manufacture and operation of data terminals of this kind. For example, adjacent mechanism frequently limit the permissible size of the solenoids and the electrical circuits which control the solenoids must then include costly components, generally solid state, capable of supplying and handling high currents. Aside from direct costs, this in turn may aggravate heat generation and causes other problems as well.

Prior data terminals have been subject to still other undesirable complications which are not a direct result of the physical or electrical parameters of the solenoids but which arise from mechanical aspects of the prior constructions. In particular, it has heretofore been the practice to operate the internal control elements of the typewriter by means of solenoids which are disposed at various widely spaced locations with each being coupled to its particular control element through entirely independent linkage. In such an arrangement, very precise individual adjustment of the position of each solenoid or the associated linkage is necessary to assure that the several solenoids operate their associated typewriter control mechanisms in the proper time relationship to each other when the solenoids are energized by a single set of signals. Further, control circuit complications may be necessary to assure that the solenoids do not operate to initiate a typewriter print operation until at least a certain stage in the performance of a previous print operation has been reached. In a common form of typewriter which is frequently used for data terminal purposes the premature initiation of a print operation can cause breakage of certain components of the typewriter.

SUMMARY OF THE INVENTION

This invention is a data input mechanism which initiates operations of a typewriter in response to coded electrical signals and which may employ relatively small or low power solenoids to alleviate certain of the problems discussed above.

Basically, this is made possible by relieving the solenoids of the burden of performing the work required to manipulate

control elements within the typewriter. Other powered drive means are provided for this purpose and the input solenoids serve only to activate the appropriate power drive means in response to incoming signals. In effect, the solenoids are no longer required to perform a work operation in addition to a control function with respect to the internal mechanism of the typewriter. Accordingly, the solenoids may be substantially smaller, in terms of physical size or electrical power input or both, than has heretofore been the case.

In a preferred form of the invention, the powered means, which is activated by the input solenoid to manipulate control elements of the typewriter, is itself driven through a coupling to the typewriter motor. Thus, the work of manipulating the typewriter control mechanisms may be shifted from the input solenoids to the typewriter motor itself and the power requirements of the input circuit may be reduced accordingly.

Also, in a preferred form of the invention, the powered drive means which operate different ones of the internal control mechanisms of the typewriter, when instructed to do so by an associated input solenoid, have a single mechanical drive input from the typewriter motor whereby all such means operate in synchronism and cannot be reoperated until completion of a prior operation thereby relieving the adjustment and breakage problems discussed above.

Accordingly, it is an object of this invention to facilitate the printout of information from data processing systems.

It is an object of the invention to reduce input coil size or power requirements in a data input mechanism for operating a typewriter in response to coded electrical signals.

It is another object of the invention to provide an attachment having mechanism for operating control elements of an electrical typewriter in response to incoming signals in which power for the actuation of the typewriter control elements is derived from the typewriter itself.

The invention, together with further objects and advantages thereof, will best be understood by reference to the following description of a preferred embodiment and by reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

FIG. 1 is a perspective view of a common form of office typewriter together with a baseplate attachment therefor embodying the data input mechanism of the present invention and enabling the typewriter to be operated by electrical signals from an external source, the baseplate attachment being shown slightly separated from the typewriter for clarity of illustration;

FIG. 2 is a side elevation view of the typewriter of FIG. 1 showing the baseplate attachment positioned thereon, with portions of the typewriter sidewall being broken out;

FIG. 3 is a view of a portion of the underside of the baseplate of FIG. 1 showing data input mechanism thereon in accordance with the present invention; and

FIG. 4 is a section view taken along line IV—IV of FIG. 3 further illustrating the data input mechanism thereof.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring initially to FIG. 1 of the drawings, there is shown a baseplate attachment 11 and an associated housing 12 for control circuits of the general type described in U.S. Pat. Nos. 3,452,851 and 3,453,379. As set forth in U.S. Pat. No. 3,452,851 baseplate 11 may be attached to a common form of office typewriter 13 and functions to generate and transmit coded electrical signals, indicative of print and function operations at the typewriter, and may also operate the typewriter in response to signals received from an external source which may variously be another typewriter or a computer or other data processing system.

To generate signals for transmission to remote systems, the baseplate 11 carries switches 14 which are operated by arms 16 that extend up into appropriate locations in the typewriter

mechanism to sense movement of the mechanisms which are actuated in the course of print and function operations resulting from manipulation of the typewriter keys **17**. A cable **18** connects the baseplate **11** with control circuit housing **12** which has circuits for sensing the condition of the switches **14** and for generating suitable signals for transmission to a remote system over an output line **19**. The switches **14** and the transmission circuits associated therewith may be essentially similar to the corresponding elements as described in the above identical prior patents and accordingly will not be further described herein.

The baseplate **11** is also adapted to operate typewriter **13** in response to incoming signals from an external source and for this purpose has solenoid coils **21** operating arms **22** which extend up into the typewriter mechanism to manipulate the appropriate control elements therein when a set of incoming signals indicates that the typewriter is to perform a function operation. Suitable arrangements of the function solenoids **21** and associated control circuits are also described in the above identified United States patents.

The particular typewriter **13** shown in this example of the invention is a common form of office typewriter manufactured by the IBM Corporation under the trademark, "Selectric," and is distinct from older forms of office typewriter in that a complete set of alpha-numeric characters and punctuation marks or other symbols to be printed are carried on a spherical printing element **23**. Printing element **23** rotates and tilts in response to depression of the typewriter print keys **17**, to impress the appropriate characters on the paper, and shifts transversely a distance of one character space in the course of each print operation. The details of the internal construction and mode of operation of such a typewriter are set forth in the above identified prior United States patents and accordingly will not be described herein except for elements which interact directly with elements of the present invention.

In particular, with reference to FIG. **2**, a typewriter **13** of this form has a series of six transverse rods or code bails **26** each of which may be shifted a small distance toward the front of the typewriter. Depression of specific ones of the print keys **17** of the typewriter acts to shift a combination of the code bails **26** which is unique for that particular key. Thus, the position of the code bails **26** considered collectively identifies a print operation, if any, to be carried out at any given time. The typewriter **13** also has a transverse cycle bail **27** which is shifted forward by depression of any one of the print keys **17**. The typewriter has a continuously operating drive motor **28** and a rotatable cycle shaft **29** which may be selectively coupled to drive motor **28** by engagement of a cycle clutch **31**. Forward shifting of the cycle bail **27** by depression of any of the print keys **17** as described above acts to engage the cycle clutch **31** temporarily to turn the cycle shaft **29** through 180° of angular motion. Cycle shaft **29** carries a cycle shaft gear **32** which drives a filter shaft **33** and various other mechanisms within the typewriter that must operate to perform the operation identified by the particular key **17** which was depressed. The collective positions of the code bails **26** as a print cycle commences determine the movement of the spherical print head **23** in a manner described in the above identified U. S. patents.

Of particular interest relative to the present invention is the fact that a print operation of the typewriter may be initiated by shifting the cycle bail **27** forward a small distance while also shifting appropriate ones, if any, of the code bails **26** forward to identify the particular symbol to be printed.

The baseplate of prior U. S. Pat. No. 3.452,851 includes six print solenoids each of which is capable, when energized, of shifting an associated one of the code bails **26** forward by means of an arm which extends upward from the baseplate to the code bail. In other systems, solenoids are secured inside the typewriter to shift the code bails. Such arrangements are subject to the problems which have been hereinbefore discussed. Space limitations prohibit the use of physically large solenoids. Accordingly, the electrical power input to the solenoids must be sizable in order to shift the code bails **26** reliably and with sufficient speed and this necessitates high current circuit elements and power supplies in the associated control circuits thereby adding substantially to manufacturing and operating costs. In a typical example of the system of U. S. Patent No. 3,452,851, print solenoids with 50 ohm resistances are required whereas considerable savings could be realized by converting to solenoids with a higher resistance of 70 ohms or more. Tests have demonstrated that, with applied voltage and other factors held constant, 70 ohm solenoids do not reliably provide the necessary mechanical power for manipulating the code bails.

Accordingly, I have received this problem by deriving mechanical power from the motor **28** of the typewriter for the purpose of shifting the code bails **26**. In this construction, the input solenoids for print signals have a control function only and need not generate sufficient mechanical force to move the code bails **26**. In this system, best illustrated in FIGS. **3** and **4** in conjunction, high resistance solenoids may be employed without difficulty and substantial savings in the cost and operation of the apparatus are realized.

A housing **36** is secured to the underside of a forward portion of baseplate **11** at a position which is beneath the region of the code bails **26** when the baseplate is implaced on the typewriter. Housing **36** supports six slidable bail actuators **37** including actuators **37-1**, **37-2**, **37-4**, **37-8**, **37-16** and **37-32**. (To facilitate an understanding of the relationship of this structure to that of the above identified prior U. S. patents, the foregoing reference numerals for bail actuators **37** identify the binary weight of the input signal transmitted by each actuator in accordance with the coding system described in the prior patents). Each bail actuator **37** has a flat upright forward member **38** which extends through slots **39** and **41** at the back and front respectively of the housing **36** and is movable in a forward and backward direction relative to the housing. As best seen in FIG. **4** in particular, each forward member **38** has a downwardly directed tab **42** within slot **39** and an upwardly extending tab **42'** in slot **41** to maintain the member upright and has a back extension **43**, immediately below the baseplate **11**, which extends rearwardly from the housing. Each forward member **38** has a finger **44** which extends through a slot **46** in the baseplate to a separate one of the code bails **26**, the finger extending adjacent the back of the associated code bail. Thus, if forward member **38** is moved forward the associated one of the code bails **26** of the typewriter is operated. The fingers **44** of members **38** need not extend directly upward but may be angled if necessary, as in the case of finger **44-32**, to avoid abutment with elements of the typewriter when the baseplate is disposed thereon. A guide pin **47** extends transversely through housing **36** and transpierces an elongated slot **48** on each member **38** to define the limits of forward and backward travel of the bail actuators **37**. To reduce wear and frictional resistance to movement of the bail actuators, the undersides of the back extensions **43** of members **38** ride on rotatable rollers **49**. As best seen in FIG. **3**, the rollers **49** for each of the six members **38** may be mounted on a common axle **51** secured to housing **36** by a pair of rearwardly extending arms **52** thereon. Owing to spring forces to be hereinafter described, the forward ends of the members **38** tend to rise. Accordingly, antifriction rollers **53** for the front end of the members **38** bear against the upper edge thereof. Forward rollers **53** may be mounted on a single axle **54** carried between arms **56** which extend forward from housing **36**.

Accordingly, appropriate ones of the code bails **26** may be operated to establish the identity of a character to be printed by shifting the corresponding ones of the members **38** forward concurrent with shifting of the cycle bail **27** to initiate a cycle of operation. The physical force necessary for shifting the appropriate members **38** is provided through a rotatable drive shaft **58** which extends transversely along the underside of the baseplate **11** behind housing **36**. Drive shaft **58** is supported by bearings **59**, preferably of the self aligning type, which are in turn fastened to the underside of the baseplate by suitable brackets **61**.

Baseplate drive shaft 58 is driven by the typewriter motor and for this purpose a gear 62 is mounted on one end of the shaft and an opening 63 is provided in the baseplate immediately above the gear whereby the upper portion of the gear projects slightly above the baseplate as best shown in FIG. 2. The drive shaft gear 62 is positioned to be beneath the cycle shaft gear 32 of the typewriter when the baseplate is positioned thereon. For reasons which will hereinafter be apparent it is necessary in this example of the invention that drive shaft 58 rotate 180° for each cycle of operation in a manner similar to the rotation of the cycle shaft 29 of the typewriter itself. Accordingly, baseplate drive shaft gear 62 should be of the same diameter as the cycle shaft gear 32. To transmit drive from cycle shaft gear 32 to gear 62, an intermediate gear 64 is situated therebetween and is supported by a bracket 66 attached to the baseplate and extending upwardly through one side of opening 63. It is necessary that the drive shaft 58 have a specific angular position at the time that the baseplate 11 is installed on the typewriter. To provide a convenient means for assuring that this orientation is present, one tooth 67 of one of the baseplate gears, such as drive shaft gear 62, may be colored differently from the others or other indicia may be provided.

Accordingly, the 180° rotation of the typewriter cycle shaft 29, which occurs when cycle bail 27 is operated, results in a similar 180° rotation of the baseplate drive shaft 58. Referring now again to FIGS. 3 and 4, each of the bail actuators 37 has a rear member 69 extending from the back end of forward member 39 to a position between the underside of baseplate 11 and drive shaft 58. The forward end of each rear member 69 carries a pair of parallel downwardly extending edges 71 and 72 spaced on either side of the back extension 43 of forward member 38 and a pin 73 extends between both edges and through extension 43 to form a pivot joint between front and rear members 38 and 69, respectively. Thus any forward or backward motion of the rear member 69 is transmitted to the forward member 38 and the rear member may pivot in the vertical direction relative to the forward member. Each rear member 69 is normally held in an upward position against the underside of baseplate 11 by a U-shaped spring 74 having the base end engaged in a notch 76 in forward member extension 43 and having parallel arms which extend back on either side thereof and which are slightly flexed over pin 73 to bear against the underside of member 69. This spring action also tends to lift the front end of forward member 39 causing the forward end of the member 39 to ride against the forward rollers 53 as previously described.

The back end of each rear member 69 extends between drive shaft 58 and the underside of baseplate 11 has a longitudinal slot 77. To position the back ends of members 69, while providing for forward and backward travel thereof, a guide pin 78 projects downward from baseplate 11 through each slot 77.

Considering now the means by which 180° of rotation of drive shaft 58 is translated into forward motion of appropriate ones of the bail actuators 37 in accordance with received electrical signals, the drive shaft 58 is provided with a series of short radially directed kicker pins 79 having hemi-spherical ends 80. A pair of such pins 79 extend from drive shaft 58, in opposite directions, beneath the back end of each member 69. As best seen in FIG. 4, the angular position of the drive shaft 58 when the baseplate is implaced on the typewriter in the manner hereinbefore described is fixed so that one pin 79 of each pair extends directly upward towards the base 81 of the slot 77 in the adjacent member 69. Pins 79 are proportioned to end immediately below the associated member 69 when the member 69 is against the underside of baseplate 11. Thus if member 69 is pivoted downward a small distance one of the pins 79 will engage against base 81 of slot 77 and subsequent rotation of the drive shaft 58 will then drive the depressed member 69 forward momentarily. Accordingly, any combination of the code bails 26 may be operated by depressing the rear members 69 of the associated bail actuators while simultaneously operating cycle bail 58 to produce 180° of rotation of drive shaft 58.

To depress appropriate ones of the bail actuator members 69 in accordance with each set of received print signals, a bank of six solenoid coils 81 is contained in a coil housing 83 secured to the baseplate 11 subjacent the row of members 69. Coil housing 83 is transverse to the members 69 and situated forward from the drive shaft 58. As best seen in FIG. 4, each such solenoid 82 has a core element 84, formed of iron or other ferromagnetic material, disposed within a winding 86, and has a pole 87 spaced a small distance downward from the associated bail actuator member 69 when the member is against the underside of baseplate 11. Members 69 are formed at least in part of iron or other ferromagnetic material and thus are drawn downward upon energization of the associated solenoid coil 83 by application of an electrical current to terminals 85 of the solenoid. Terminals 85 of the several solenoids may be coupled to signal receiving circuitry of the form described in the above U.S. patents.

In operation, with reference initially to FIG. 1, control circuit 12 receives signals coded to indicate print and function operations of the typewriter 13 that are to be performed. Each set of signals is transmitted, in parallel form, to the appropriate solenoids of baseplate 11 through cable 18. Each such set of signals for a print operation includes a signal for energizing a cycle clutch solenoid 88 which, by means of arm 89, actuate the cycle bail 27 shown in FIG. 2. Cycle clutch 31 is thereby engaged temporarily to turn cycle shaft 29 and cycle shaft gear 32 to drive the mechanism necessary to perform the operation represented by the set of signals. By means of gears 64 and 62 a corresponding angular motion of the baseplate drive shaft 58 is produced.

Concurrently, with energization of the cycle clutch solenoid 88, the control circuits momentarily energize each one of the print solenoids 82 which is associated with a code bail 26 that must be operated to cause the typewriter to print the character identified by the set of signals.

Referring now to FIGS. 3 and 4, any of the print solenoids 82 which are energized in this matter act to draw the associated bail actuator member 69 downward. Upon the rotation of baseplate drive shaft 58 which accompanies the operation cycle any of the members 69 which are drawn downward in this manner are also driven forward by the kicker pins 79 of the shaft. The forward motion of any of the members 69 is transmitted to the corresponding code bail 26 of the typewriter through fingers 44. Thus, the typewriter is conditioned to print the particular character represented by the incoming set of signals. In a typewriter of the form herein described, each of the code bails 26 are spring biased towards the unoperated position and thus serve to return the bail actuators 37 to the original position following each cycle of operation. Thus with this particular form of typewriter, the baseplate need not have springs for this purpose.

While the invention has been herein described with reference to the input of print operation signals only, it will be apparent that essentially similar structure may be used to manipulate the function operation initiating mechanisms of the typewriter. Similarly, the invention has been herein described with all components of the data input mechanism mounted on a detachable baseplate 11 as this has many advantages in that commercially available office typewriters can be adapted to function as data terminals by simply fastening the baseplate on the typewriter and without requiring any internal modification therein or even any positive direct attachment of movable elements of the baseplate to internal mechanisms of the typewriter. However it will be apparent that components of the present data input mechanism can be fastened directly to internal structure of the typewriter, rather than on a removable baseplate, should this be desired. Further, the data input mechanism may readily be adapted to typewriters of a form other than the specific example herein described. Accordingly, it is not intended to limit the invention except as defined in the following claims.

What is claimed is:

1. In an electrical typewriter having a drive motor and rotary drive means for operating character imprinting means and having a plurality of code bails different combinations of which are shifted to condition the typewriter for printing specific characters, an attachment for said typewriter having mechanism for shifting said code bails in response to sets of coded electrical signals which identify characters to be printed, comprising:

plate means for supporting element of said attachment, said plate means being attached to said typewriter,

a rotary drive shaft carried by said plate means,

means supported by said plate means for coupling said shaft to said rotary drive means whereby said shaft is turned as said motor operates said character imprinting means,

a plurality of bail actuators carried by said plate means and each having an arm extending to a separate one of said code bails whereby movement of any of said actuators shifts the associated one of said bails, said actuators each having a portion extending toward said drive shaft and which may be urged into engagement therewith whereby turning of said shaft moves the actuator to shift the associated one of said bails, said actuator portions each having ferromagnetic material, and

a plurality of electrical coils secured to said plate means each receiving a separate component of said sets of signals and each being disposed adjacent a separate one of said bail actuators in proximity to said ferromagnetic material thereof whereby operation of specific ones of said coils moves specific ones of the actuator bail portions into driven engagement with said shaft.

2. The combination defined in claim 1 wherein said bail actuators extend in parallel relationship to each other and are slidable longitudinally on said plate means by engagement with said drive shaft thereof to shift the associated ones of said bails.

3. The combination defined in claim 1 wherein each of said bail actuators is comprised of a first member carrying said arm which extends to one of said code bails and a second member pivotably coupled to said first member and including said portion extending toward said drive shaft and including said ferromagnetic material, and resilient means acting between said first and second members of each bail actuator and exerting a force therebetween which tends to pivot said second member away from said electrical coil associated therewith.

4. The combination defined in claim 3 further comprising guide means for restricting movement of said first member of each bail actuator to longitudinal movement only.

5. In an attachment for an electrical typewriter which has character imprinting means driven by rotary mechanism and which has a rotary drive motor and a cycle clutch which temporarily engages in response to shifting of a cycle clutch control bail to couple said drive motor to said imprinting means drive mechanism, and further having a plurality of movable code bails each of which may be independently shifted whereby said code bails may be made to assume a collective position which is unique for each character to condition said imprinting means to print specific characters, means for initiating operation of said typewriter in accordance with sets of received electrical signals that identify print operations to be performed comprising:

a plate attachable to said typewriter,

a drive shaft mounted on said plate for rotary motion thereon,

rotary drive transmitting means mounted on said plate and positioned thereon to extend up into said typewriter and engage with said rotary drive mechanism thereof when said plate is attached to said typewriter whereby said drive shaft is turned when said cycle clutch of said typewriter engages, a plurality of code bail actuators mounted on said plate each having an arm which extends into said typewriter to a separate one of said code bails thereof when said plate is mounted on said typewriter and each having a portion which extends towards said drive shaft of said plate and is shiftable into and out of engagement with said drive shaft whereby in the engaged position angular motion of said shaft translates said bail actuator to operate the associated one of said code bails of said typewriter, said portions of said bail actuators each having ferromagnetic material,

a plurality of electrical coils each receiving a separate component of said sets of electrical signals and each being positioned in proximity to a separate one of said ferromagnetic portions of said bail actuators whereby energization of any coil by a signal component magnetically influences said ferromagnetic portion of the adjacent bail actuator to control engagement and disengagement of said bail actuator with said drive shaft, and

a cycle clutch solenoid attached to said plate and operating an arm which extends into said typewriter to said cycle bail thereof when said plate is emplaced on said typewriter, said cycle clutch solenoid and arm being responsive to said sets of signal to shift said cycle bail and initiate said temporary engagement of said cycle clutch.

6. In an attachment for an electrical typewriter which has character imprinting means driven by rotary mechanism in response to depression of typewriter keys and which has a rotary drive motor and a cycle clutch which temporarily engages in response to depression of individual ones of said keys to couple said drive motor to said imprinting means drive mechanism, and further having a plurality of movable elements each of which may be independently shifted and which are shifted in response to depression of individual ones of said keys into a collective position which is unique for each key to condition said imprinting means to print specific characters, means for initiating operation of said typewriter in accordance with sets of received electrical signals that identify operations to be performed comprising, in combination:

a plate attachable to said typewriter,

a drive shaft mounted on said plate for rotary motion thereon, rotary drive transmitting means mounted on said plate and positioned thereon to extend into said typewriter and engage with said rotary drive mechanism thereof when said plate is attached to said typewriter, said rotary drive transmitting means being coupled to said drive shaft of said plate for turning said drive shaft when said clutch cycle of said typewriter is engaged,

a plurality of actuators mounted on said plate each having an arm positioned to extend into said typewriter to a separate one of said movable elements thereof when said plate is attached to said typewriter and each having a portion which is shiftable into engagement with said drive shaft to translate said rotary motion of said drive shaft into shifting of the associated one of said movable elements of said typewriter, and

a plurality of electrical coils each receiving a separate component of said sets of electrical signals and each being secured to said plate in proximity to a separate one of said actuators to magnetically shift said separate one of said actuators into engagement with said drive shaft in response to components of said sets of electrical signals.

7. The combination defined in claim 6 wherein said drive shaft has radially extending means for contacting said actuators to slide said actuators relative to said plate upon rotation of said drive shaft, and wherein said actuators each further comprise a first member carrying said arm which extends into said typewriter and a second member pivoted to said first member and being pivotable by the associated one of said coils between a position at which said second member is out of contact with said radially extending means of said drive shaft and a position at which said second member is contacted by said radially extending means of said drive shaft.

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