# United States Patent

[11] **3,616,888**


[72] Inventors **Reijiro Kawano; Masatsugu Arakawa; Yoshinari Fujishima; Yoshio Tanaka, all of Tokyo, Japan**



[21] Appl. No. **759,260**
[22] Filed **Sept. 3, 1968**
[45] Patented **Nov. 2, 1971**
[73] Assignee **Kurosawa Tele-communications Limited Tokyo, Japan**
[32] Priorities **Sept. 1, 1967**
[33] **Japan**
[31] **42/56,296;**
**Sept. 1, 1967, Japan, No. 42/56,297; Sept. 1, 1967, Japan, No. 42/56,298, Sept. 1, 1967**


[54] **TYPEWRITING MECHANISM HAVING PLURAL TYPE WHEEL TYPE HEAD**
**2 Claims, 28 Drawing Figs.**


[52] **U.S. Cl.** ..... **197/18,** 197/55, 178/34
[51] **Int. Cl.** ..... **B41j 1/44**
[50] **Field of Search** ..... 197/18, 55, 48, 49; 178/34



[56] **References Cited**
UNITED STATES PATENTS

| | | | |
|---|---|---|---|
| 2,919,002 | 12/1959 | Palmer | 197/16 |
| 3,233,715 | 2/1966 | Flieg | 197/16 X |
| 3,302,765 | 2/1967 | Hickerson et al. | 197/16 |
| 3,353,648 | 11/1967 | Amada et al. | 197/55 |
| 3,391,774 | 7/1968 | Greer | 197/19 |
| 3,404,765 | 10/1968 | Gassino et al. | 197/55 |
| 3,414,103 | 12/1968 | Knudsen et al. | 197/16 X |
| 3,453,379 | 7/1969 | Holmes | 197/19 X |



*Primary Examiner*—Edgar S. Burr
*Attorney*—Sughrue, Rothwell, Mion, Zinn & Macpeak



**ABSTRACT:** A typewriter mechanism which uses a plurality of type wheels with the characters thereon. The type wheels are positioned in a type wheel head which is actuated by an axial selector means and a rotation selector means. The selector means and the type wheel head are mounted on a movable carriage frame such that the type wheel heads and the selector means are positioned with respect to the typewriter platen. Each selector is operated by a separate lever mechanism which is in turn operated by electromagnet means through a connecting means. The electromagnet means are operated in accordance with a binary coded input signal.

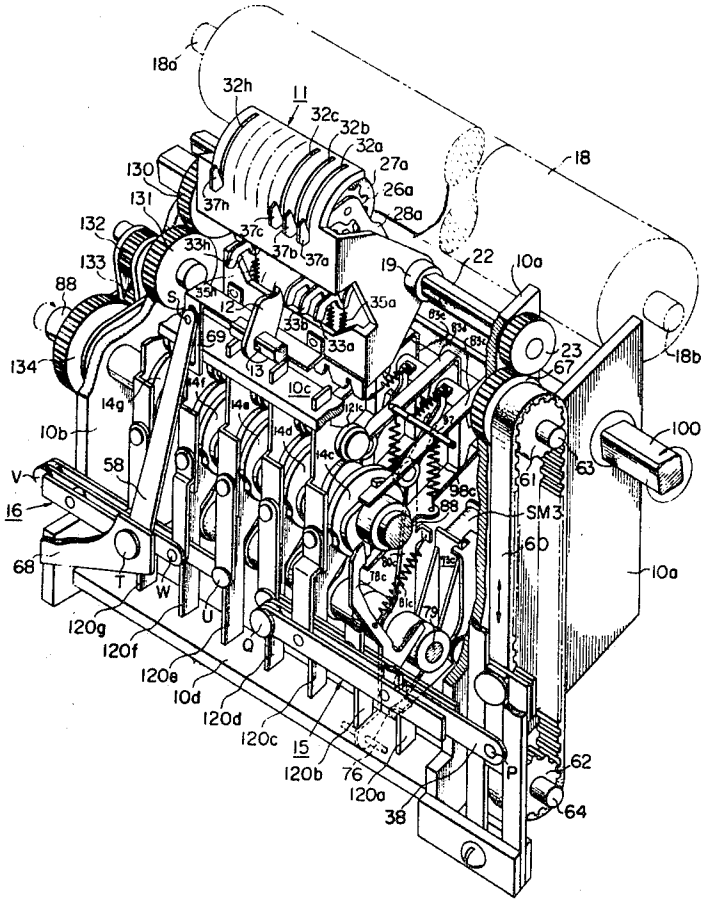



FIG. 1

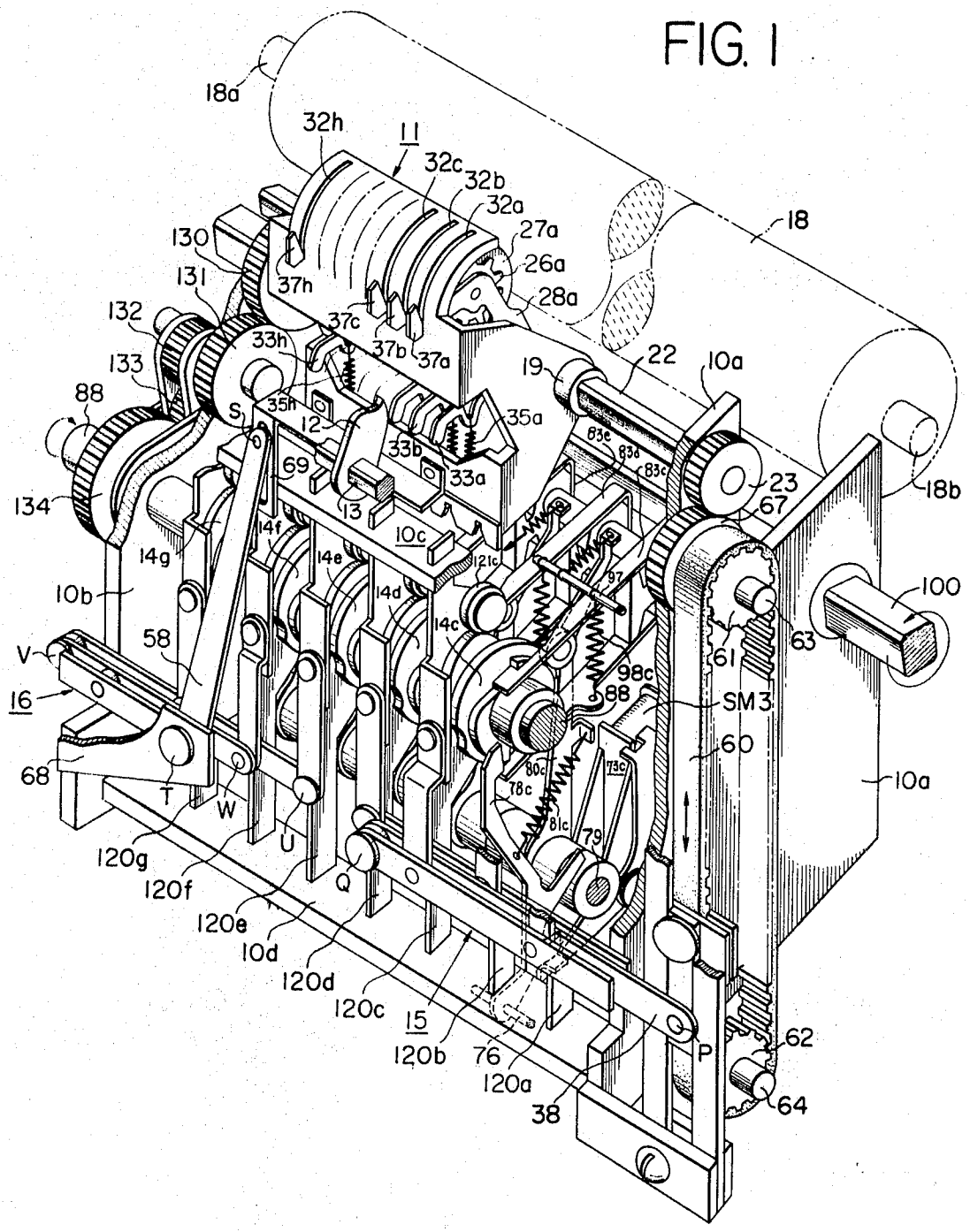

18a
32h
11
32c
32b
32a
27a
26a
28a
18
130
131
132
133
37h
37c
37b
37a
33h
35h
12
35a
33b
33a
19
22
10a
88
S
69
13
10c
134
14g
14f
14e
14d
14c
121c
97
23
67
18b
100
10b
58
V
16
O
68
T
W
U
Q
120g
120f
120e
10d
120d
120c
15
120b
76
120a
38
P
62
64
63
61
98c
88
SM3
60
80c
78c
81c
79
73c
10a

FIG. 2

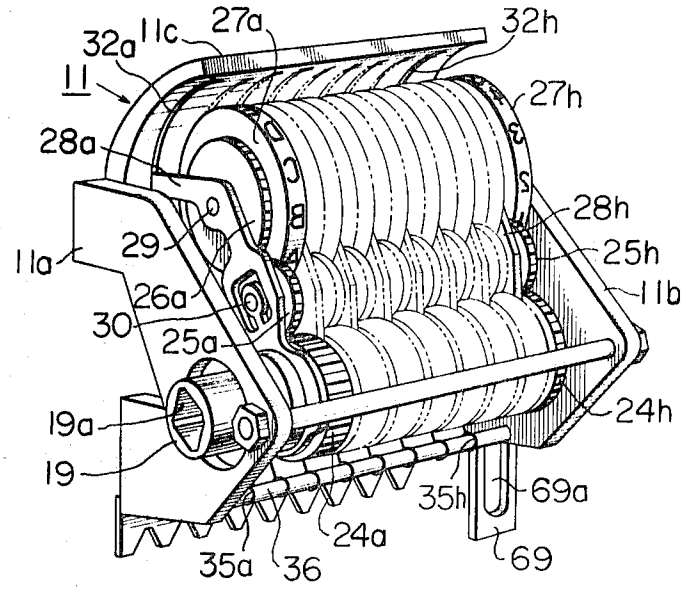



FIG. 8

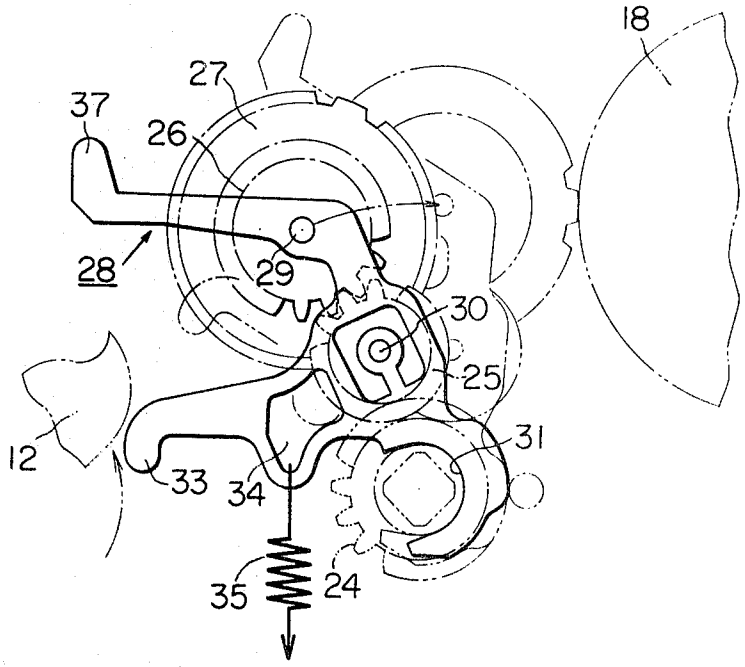



FIG. 9

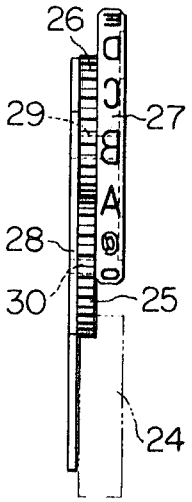


FIG. 3

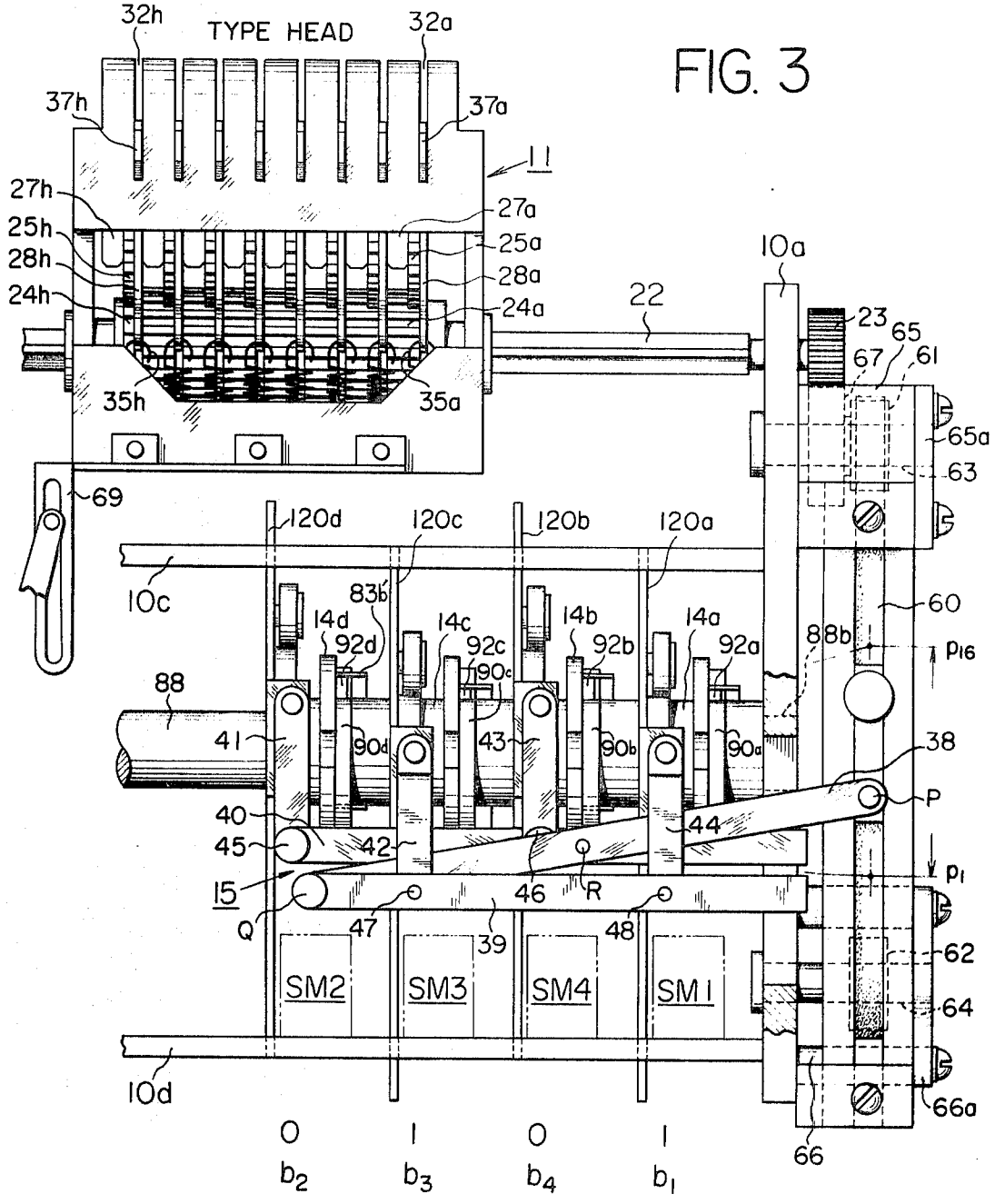

32h
TYPE HEAD
32a
37h
37a
11
27h
27a
25h
25a
28h
28a
24h
24a
22
10a
23
65
67
61
65a
63
35h
35a
69
120d
120c
120b
120a
10c
83b
14d
92d
14c
92c
90c
14b
92b
14a
92a
88b
60
P16
88
41
90d
43
90b
90a
38
P
40
45
42
44
15
46
R
P1
Q
47
39
48
62
64
SM2
SM3
SM4
SM1
10d
66a
66
0
1
0
1
b2
b3
b4
b1

FIG. 4

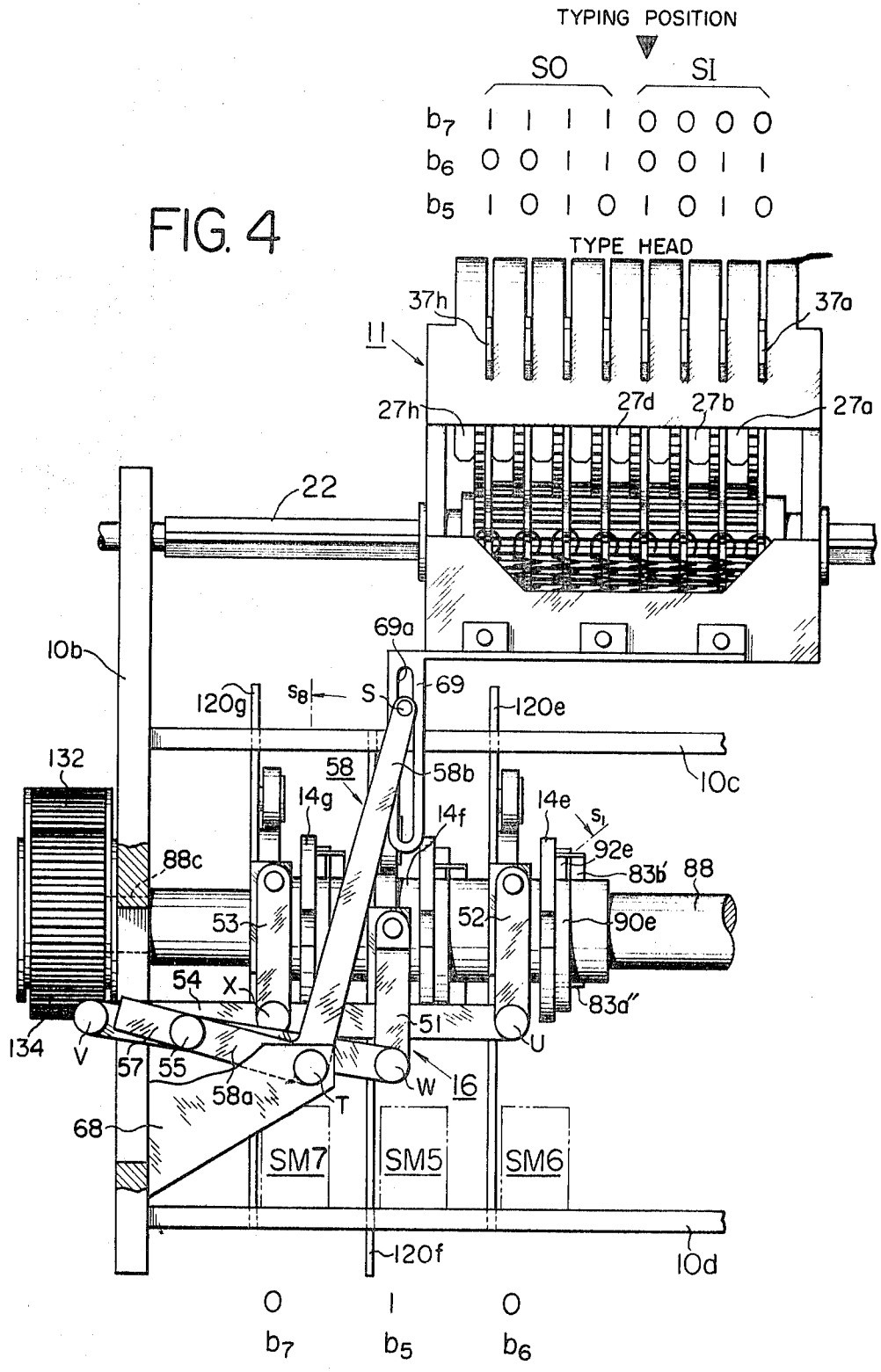

TYPING POSITION
SO
SI
b7 1 1 1 1 0 0 0 0
b6 0 0 1 1 0 0 1 1
b5 1 0 1 0 1 0 1 0
TYPE HEAD
37h
37a
11
27h
27d
27b
27a
22
10b
69a
120g
S8
S
69
120e
10c
132
58
58b
14g
14f
14e
S1
92e
83b'
88
88c
53
52
90e
54
X
83a''
51
134
V
57
55
58a
T
W
16
U
68
SM7
SM5
SM6
120f
10d
0 1 0
b7 b5 b6

FIG. 5

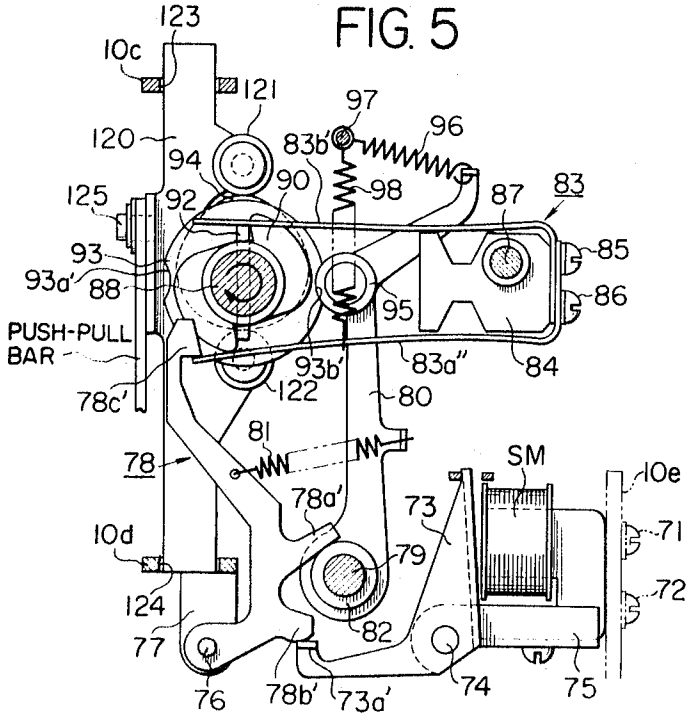



FIG. 6

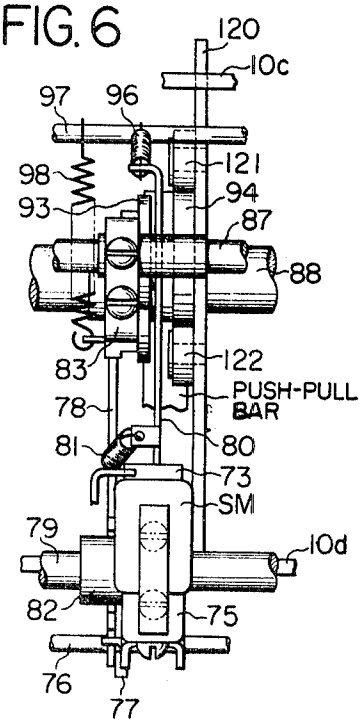



FIG. 14

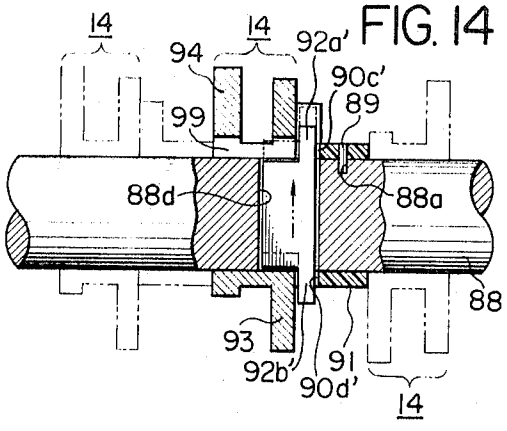



FIG. 15

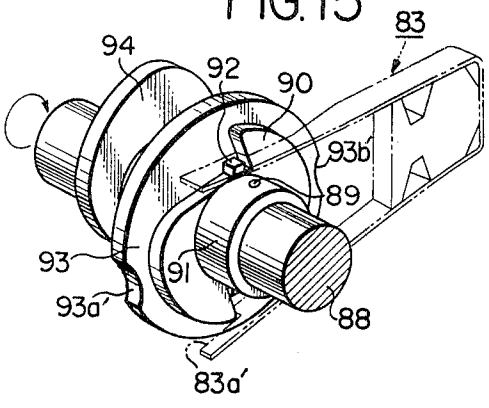



FIG. 17

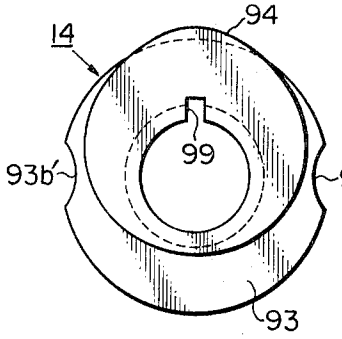



FIG. 18

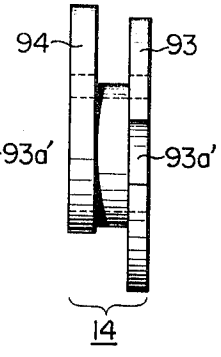



FIG. 19

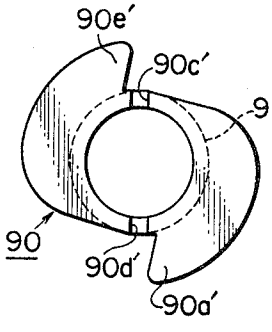



FIG. 20

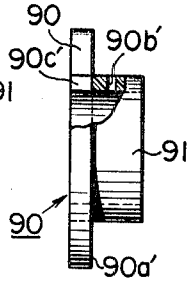


FIG. 7

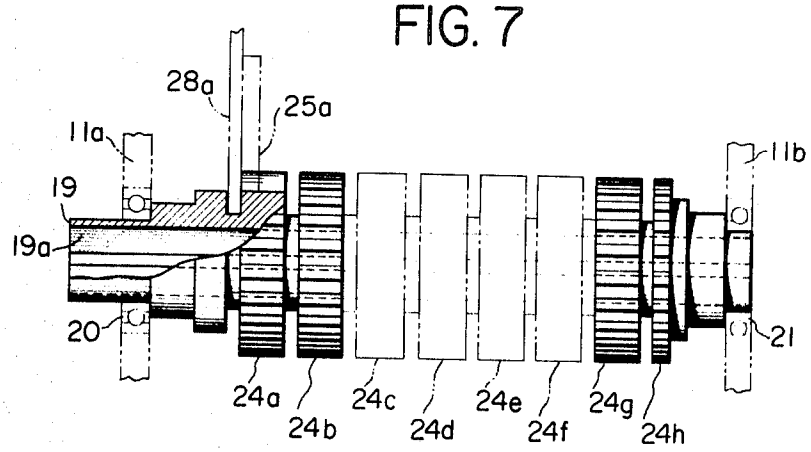



FIG. 27

113

| | S1 | | | | S0 | | | |
|---|---|---|---|---|---|---|---|---|
| $b_7$ | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| $b_6$ | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| $b_5$ | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |

| $b_{7-5}$ / $b_4$ $b_3$ $b_2$ $b_1$ | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| 0 | SPACE | 0 | @ | P | SPACE | — | タ | ミ |
| 1 | ! | 1 | A | Q | 。 | ア | チ | ム |
| 2 | " | 2 | B | R | 「 | イ | ツ | メ |
| 3 | # | 3 | C | S | 」 | ウ | テ | モ |
| 4 | $ | 4 | D | T | 、 | エ | ト | ヤ |
| 5 | % | 5 | E | U | ・ | オ | ナ | ユ |
| 6 | & | 6 | F | V | ヲ | カ | ニ | ヨ |
| 7 | ' | 7 | G | W | ァ | キ | ヌ | ラ |
| 8 | ( | 8 | H | X | ィ | ク | ネ | リ |
| 9 | ) | 9 | I | Y | ゥ | ケ | ノ | ル |
| 10 | * | : | J | Z | ェ | コ | ハ | レ |
| 11 | + | ; | K | [ | ォ | サ | ヒ | ロ |
| 12 | , | < | L | ¥ | ャ | シ | フ | ワ |
| 13 | − | = | M | ] | ュ | ス | ヘ | ン |
| 14 | . | > | N | ^ | ョ | セ | ホ | ゛ |
| 15 | / | ? | O | − | ッ | ソ | マ | ゜ |

105'

104'

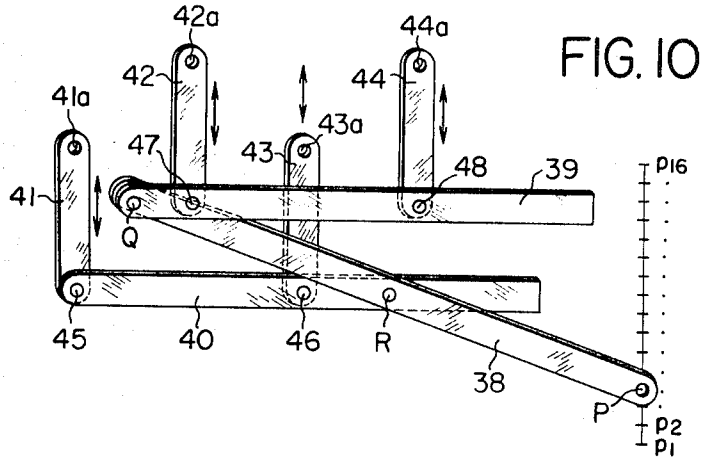



FIG. 10

FIG. 11

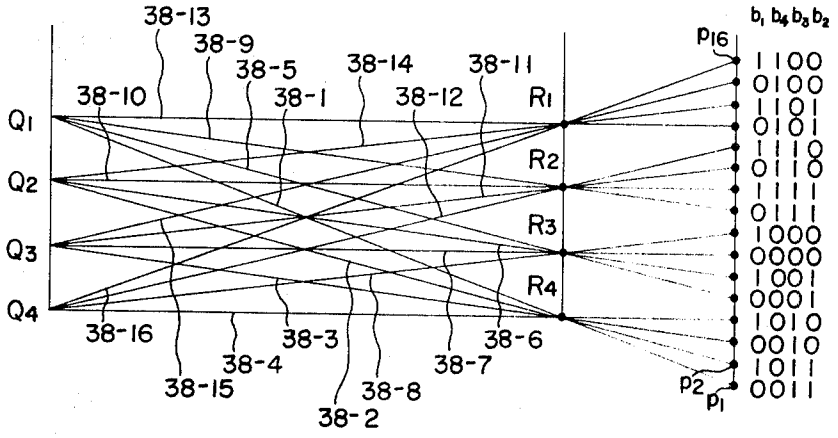



FIG. 21

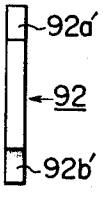



FIG. 22

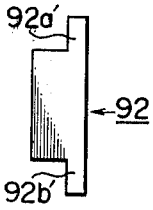
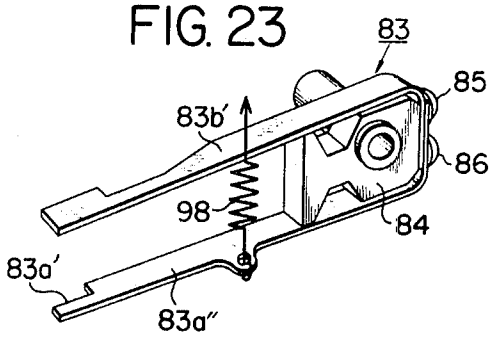



FIG. 23



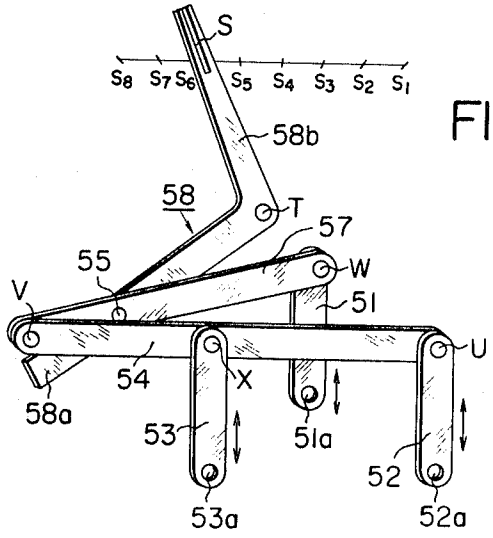



FIG. 12

FIG. 13

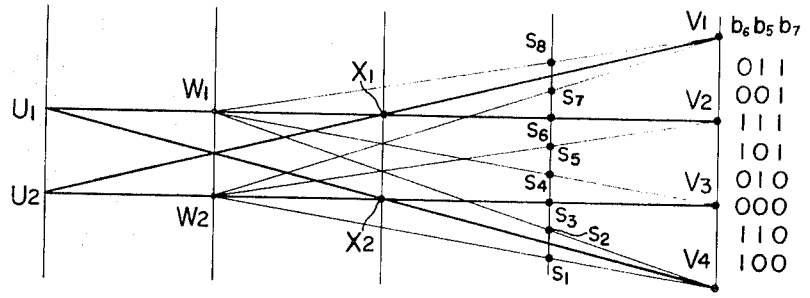



FIG. 16

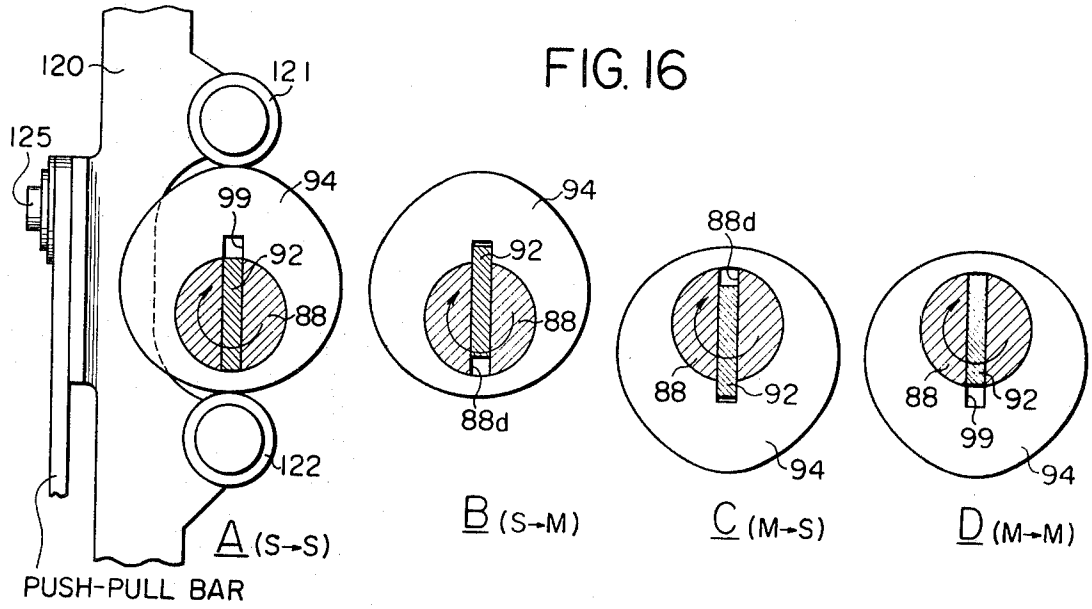
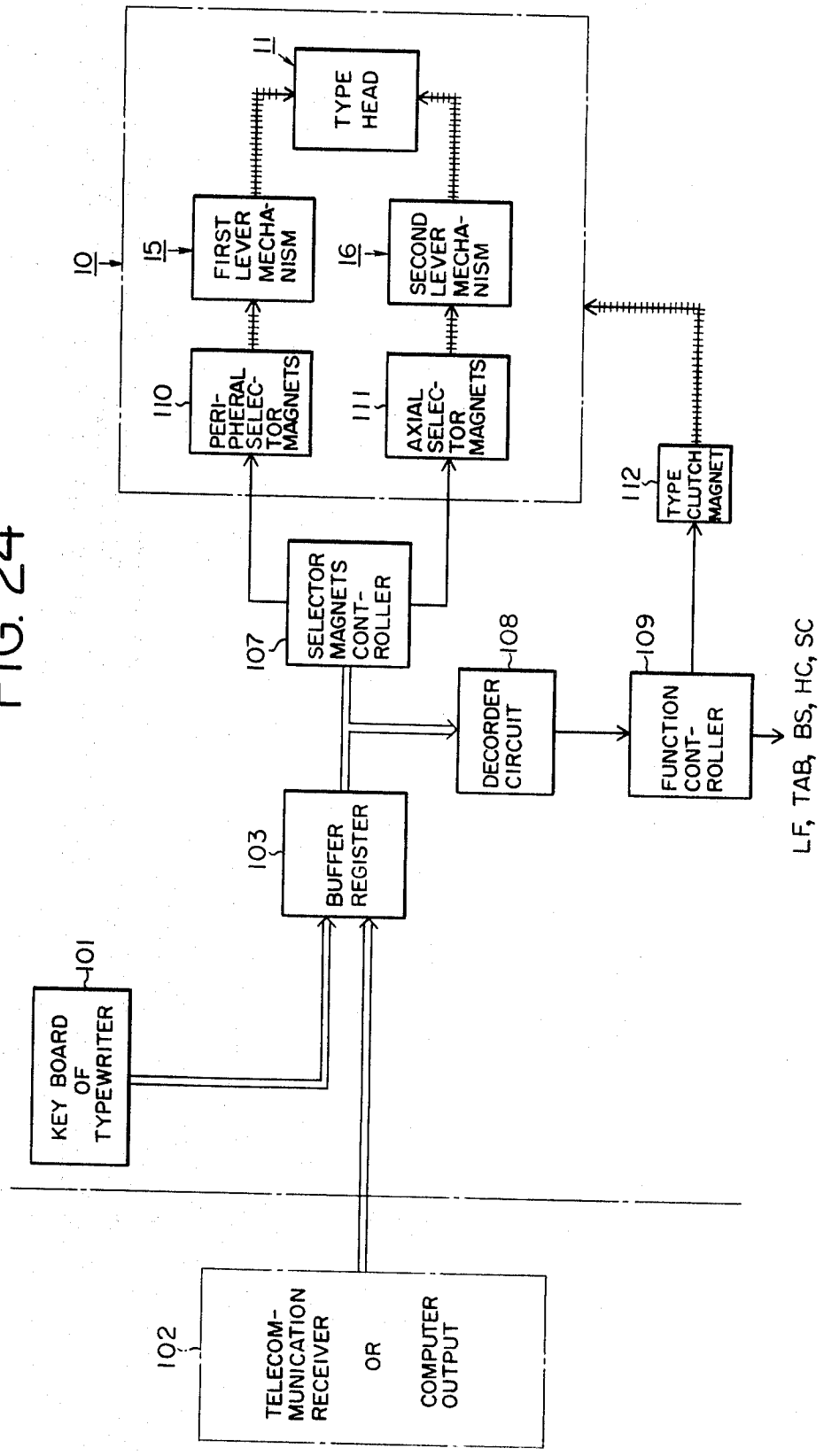


FIG. 24


10
11
TYPE HEAD
15
FIRST LEVER MECHA-NISM
16
SECOND LEVER MECHA-NISM
110
PERI-PHERAL SELEC-TOR MAGNETS
111
AXIAL SELEC-TOR MAGNETS
112
TYPE CLUTCH MAGNET
107
SELECTOR MAGNETS CONT-ROLLER
108
DECORDER CIRCUIT
109
FUNCTION CONT-ROLLER
LF, TAB, BS, HC, SC
103
BUFFER REGISTER
101
KEY BOARD OF TYPEWRITER
102
TELECOM-MUNICATION RECEIVER
OR
COMPUTER OUTPUT

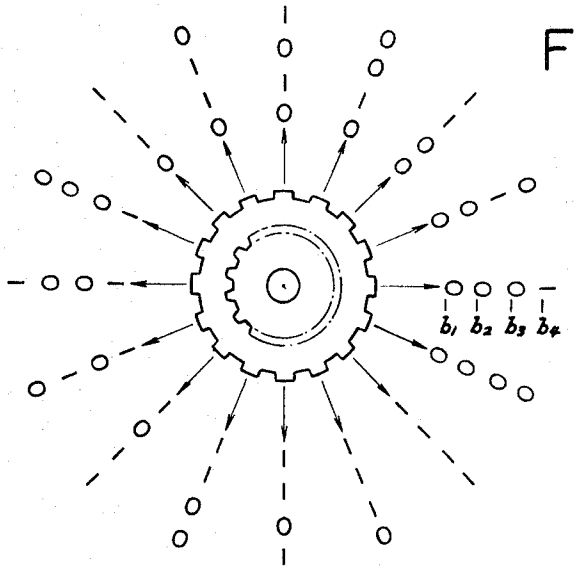



FIG. 28

FIG. 25

106

| | SI | | | | | | | | SO | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $b_7$ | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| $b_6$ | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| $b_5$ | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |

| $b_{7-5}$ / $b_4$ $b_3$ $b_2$ $b_1$ | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 0 0 0 | 0 | NUL | DLE | SPACE | 0 | @ | P | | | | SPACE | — | タ | ミ | | |
| 0 0 0 1 | 1 | SOH | $DC_1$ | ! | 1 | A | Q | | | | 。 | ア | チ | ム | | |
| 0 0 1 0 | 2 | STX | $DC_2$ | " | 2 | B | R | | | | 「 | イ | ツ | メ | | |
| 0 0 1 1 | 3 | ETX | $DC_3$ | # | 3 | C | S | | | | 」 | ウ | テ | モ | | |
| 0 1 0 0 | 4 | EOT | $DC_4$ | $ | 4 | D | T | | | | 、 | エ | ト | ヤ | | |
| 0 1 0 1 | 5 | ENQ | NAK | % | 5 | E | U | | | | ・ | オ | ナ | ユ | | |
| 0 1 0 0 | 6 | ACK | SYN | & | 6 | F | V | | | | ヲ | カ | ニ | ヨ | | |
| 0 1 0 1 | 7 | BEL | ETB | ' | 7 | G | W | | | | ア | キ | ヌ | ラ | | |
| 1 0 0 0 | 8 | BS | CAN | ( | 8 | H | X | | | | イ | ク | ネ | リ | | |
| 1 0 0 1 | 9 | HT | EM | ) | 9 | I | Y | | | | ウ | ケ | ノ | ル | | |
| 1 0 0 0 | 10 | LF | SUB | * | : | J | Z | | | | エ | コ | ハ | レ | | |
| 1 0 1 1 | 11 | VT | ESC | + | ; | K | ( | | | | オ | サ | ヒ | ロ | | |
| 1 1 0 0 | 12 | FF | FS | , | < | L | ¥ | | | | ヤ | シ | フ | ワ | | |
| 1 1 0 1 | 13 | CR | GS | — | = | M | ) | | | | ュ | ス | ヘ | ン | | |
| 1 1 1 0 | 14 | SO | RS | . | > | N | ^ | | SO | | ョ | セ | ホ | ゛ | | |
| 1 1 1 1 | 15 | SI | US | / | ? | O | — | DEL | SI | | ッ | ソ | マ | ° | | ALL MARK |

105

104

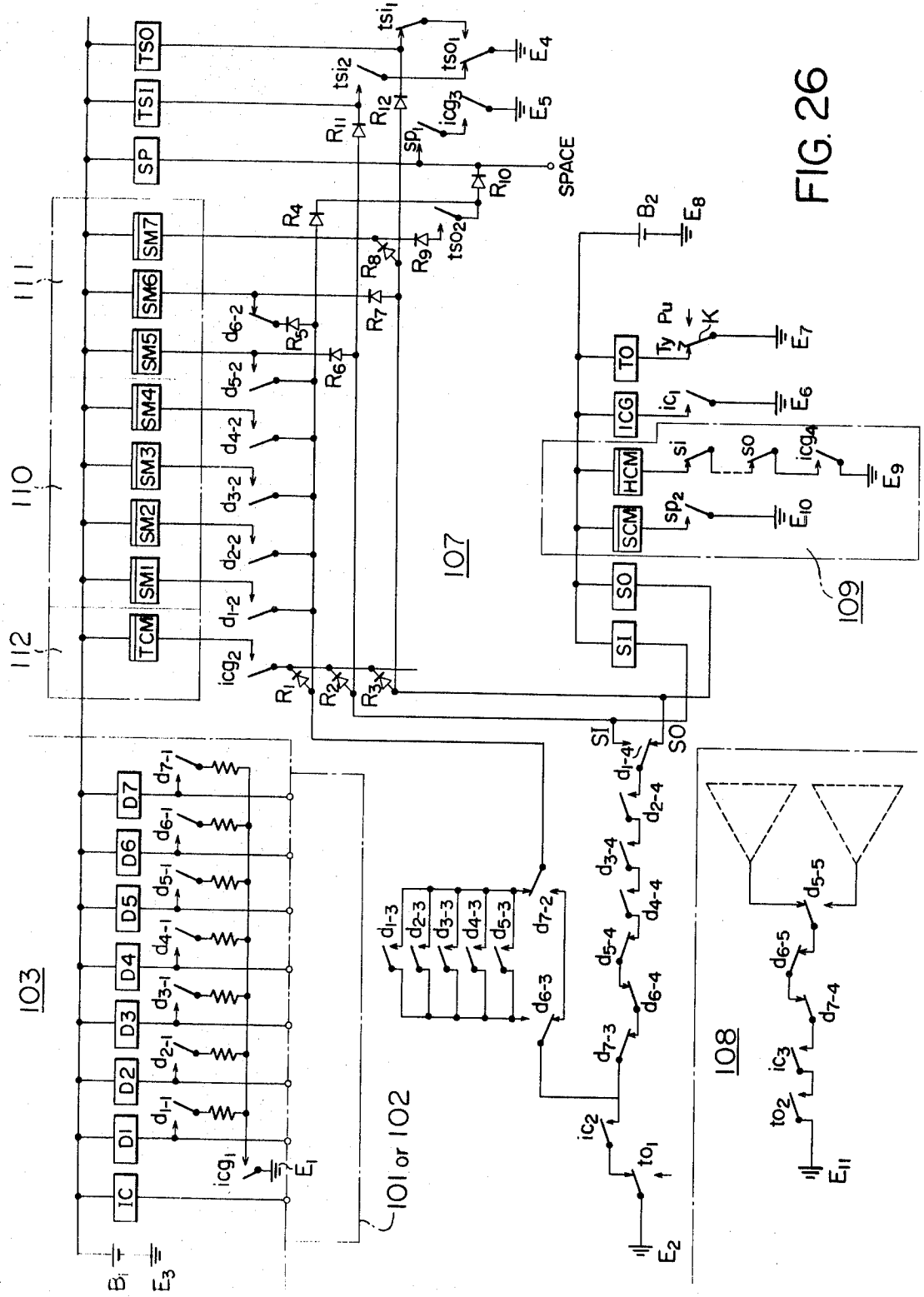

TSO
TSI
SP
SM7
SM6
SM5
SM4
SM3
SM2
SM1
TCM
111
110
112
tsi1
tsi2
tso1
tso2
icg3
sp1
R11
R12
R10
SPACE
E4
E5
R4
R8
R9
R7
R5
R6
d6-2
d5-2
d4-2
d3-2
d2-2
d1-2
icg2
R1
R2
R3
107
B2
E8
TO
ICG
HCM
SCM
SO
SI
Ty
Pu
K
E7
ic1
E6
si
so
icg4
E9
sp2
E10
109
SI
SO
d1-4
d2-4
d3-4
d4-4
d5-4
d6-4
d7-3
d7-2
d6-3
d5-3
d4-3
d3-3
d2-3
d1-3
ic2
to1
E2
108
d5-5
d6-5
d7-4
ic3
to2
E11
D7
D6
D5
D4
D3
D2
D1
IC
d7-1
d6-1
d5-1
d4-1
d3-1
d2-1
d1-1
icg1
E1
103
101 or 102
B1
E3

FIG. 26

# TYPEWRITING MECHANISM HAVING PLURAL TYPE WHEEL TYPE HEAD

This invention relates to improvements in and relating to a high-speed typewriting mechanism adapted for use at the input stage of a receiving plant or station arranged for receiving coded information, especially characters and symbols. Such a typewriting mechanism is advantageously used in the teletypewriting, perforation tape typewriting, modernized communication equipment, computers, and the like.

The main object of the present invention is to provide a high-speed typewriter using conventional typewheel means or typecylinder, capable of being selected out through the intermediary of a unique electromechanical selector mechanism which is highly simple in its design and reliable in its operation.

A further object is to provide a typewriter of the kind above referred to, capable of reducing mechanical errors to a possible minimum. These errors are caused by unavoidable inaccuracies in mechanical tolerances and in the cumulative way.

Another object is to provide a typewriter of the kind above referred to wherein its mechanical selector mechanism, which is adapted to operate depending upon the received coded input signals, is capable of providing sharply defined selector positions, with minimum movement of its mechanical operating members.

Still further object is to provide a typewriter of the kind above referred to which is provided with a compact and economical selector mechanism.

These and further objects, features and advantages of the invention will become more clear when read the following detailed description of the invention by reference to the accompanying drawings which constitute part of this specification.

It should be understood that the drawings are only for illustrative purpose and not construed as any definition of the invention.

FIG. 1 is a perspective view of a carriage mechanism of the typewriter according to this invention, said carriage carrying in turn a movable typewheel assembly, wherein, however, parts, especially those operable electronically, are omitted for simplification and several parts have been broken away for better display of inner working parts.

FIG. 2 is a perspective view of the typewheel assembly shown in FIG. 1.

FIG. 3 is a front view of a peripheral typewheel selector employed in which several parts, especially those operable electronically, have been omitted for simplification, parts being broken away for better display of inner working parts.

FIG. 4 is a similar view to FIG. 3, illustrative of an axial typewheel selector employed.

FIG. 5 is a cross-sectional view substantially taken along the section line V—V′ shown in FIG. 4.

FIG. 6 is a rear view of several operating parts shown in FIG. 5, when viewed from the right-hand side thereof.

FIG. 7 is a rear side view of the drive gear shaft incorporated in the typewheel assembly, especially shown in

FIG. 2 wherein, however, several parts are illustrated in a simplified manner and parts are broken away for better display of inner parts.

FIG. 8 is schematic elevational view of a typewheel illustrative of its rest and operated positions, respectively.

FIG. 9 is a rear side view of a typewheel and its several related parts.

FIG. 10 is a front view of the selector lever mechanism employed and adapted for controlling the peripheral character section movement of the typewheel assembly depending upon the input coded signal processed by a decoder and control circuit shown in FIG. 24.

FIG. 11 is a schematic representation illustrative of 16 selecting positions to be selected out by means of the lever mechanism shown in FIG. 10.

Fig. 12 is a similar view to FIG. 11, illustrative of the selector mechanism adapted for controlling the axial character section movement of the typewheel assembly.



FIG. 13 is a similar view to FIG. 11, illustrative of 8 selecting positions to be selected out by means of the lever mechanism shown in FIG. 12.

FIG. 14 is a front view of a key hole clutch shaft shown in FIG. 5 wherein, however, part is shown in section for better display of inner operating parts.

FIG. 15 is a perspective view of a part of FIG. 14, substantially showing a selector cam and a detent cam rigidly united with each other, and additionally fitted with a wing cam movable relatively to the united cam combination.

FIG. 16 illustrates at A, B, C and D four relative positions between the selector cam and the clutch key, destined in the shown order for "space holding," "mark-space transfer," "spacemark transfer" and "mark-holding" operation, respectively of the typewriter.

FIG. 17 is a side view of the sector and detent cam assembly shown in FIG. 15.

FIG. 18 is a front view of the cam assembly specifically shown in FIG. 17.

FIG. 19 is a side view of the wing cam shown in FIG. 15.

FIG. 20 is a front view thereof wherein, however, part is broken away.

FIG. 21 is a front view of the clutch key shown in FIGS. 5, 14 and 15.

FIG. 22 is a side view of the clutch key specifically shown in FIG. 21.

FIG. 23 is a perspective view of actuator spring cooperating with said clutch key.

FIG. 24 is a block diagram of the decoder and selection control circuit employed in the typewriter.

FIG. 25 is a table illustrative of relative relations between input coded signals and a number of characters formed on the typewheels.

FIG. 26 is a wiring diagram of the selection control circuit employed.

FIG. 27 is a table showing the mutual relationship among the input coded signals, selector magnets and type characters.

FIG. 28 is a schematic representation of a typewheel, showing a plurality of groups of four bits attributed to 16 type characters formed on the wheel.

Referring now to the drawings, especially FIGS. 1–5 thereof, the numeral 10 shows a carriage frame comprising a pair of sideplates 10*a* and 10*b*, a top plate 10*c*, a bottom plate 10*d* and a rear plate 10*e* rigidly fixed together, the latter plate having a smaller height, acting practically as a connecting bar bridging said sidewalls and being illustrated only schematically by chain-dotted lines in FIG. 5. Thus, the overall configuration of the carriage frame 10 represents substantially a rectangular box. The carriage cooperates with a platen which is shown only schematically by chain-dotted lines and mounted rotatably at its both shaft ends 18*a* and 18*b* in certain stationary upright walls, not shown, of the typewriter.

The carriage frame 10 is movable along a drive shaft 100 which is mounted in turn rotatably by said machine walls, not shown. As will be easily supposed form the foregoing that suitable bearing means are provided in the sidewalls 10*a* and 10*b* at the openings through which the drive shaft passes. For simplicity, these openings are not shown, because the provision thereof can easily be understood.

The numeral 11 represents a typewheel assembly which is mounted on a rotatable shaft 22 and movable therealong, as will become more clear as the description proceeds. The assembly 11 is shiftable to-and-fro axially when seen in FIG. 1. Although not shown, the carriage 10 is slidably mounted on a pair of stationary guide rails formed in the typewriter, for performing spacing, return, tabulating and other conventional machine operations.

The numeral 12 denotes a hammer cam which is rigidly mounted on a square shaft 13 for unitary rotation therewith, said shaft 13 passing with plays through the sidewalls 10*a* and 10*b* and being mounted in suitable bearing means, not shown, mounted in turn in the upright machine walls. As will be described, this hammer cam 12 cooperates with selected one of the typewheels contained in the assembly 11, so as to per-

form typewriting operation. The shaft 13 serves for guiding the movable carriage 10, in cooperation with said drive shaft 100. As shown, the typewheel assembly 11 comprises eight wheels in this specific embodiment.

There are provided seven clutch units 14*a*–14*g* of which those denoted 14*a*–14*d* are arranged to cooperate with a first selector lever mechanism 15 which is adapted for controlling the peripheral positioning of said typewheel assembly, while clutch units 14*e*–14*g* are arranged to cooperate with a second selector lever mechanism 16 adapted for controlling the axial positioning of the typewheel assembly, as will be more fully described hereinafter. It should be noted however that the first two clutch units 14*a* and 14*b* are not shown in FIG. 1, but shown clearly in FIG. 3.

There are further provided seven selector magnets, of which only one is shown at SM3 representatively in FIG. 1. These magnets are arranged in one-to-one relationship with said clutch units 14*a*–14*g* which are actuated by energization of the respective magnets, as will be later described more fully.

Next, the typewheel assembly 11 or briefly "typehead" will be described below with reference to FIGS. 1 and 2.

The typehead comprises a wheel frame made preferably of a rigid plastic such as polycarbonate and substantially comprising in turn sidewalls 11*a* and 11*b* and cover part 11*c*.

A hollow shaft 19 having a square-sectioned bore at 19*a* therethroughout is rotatably mounted in bearings 20 and 21 (FIG. 7) which are rigidly mounted in the sidewalls 11*a* and 11*b*, respectively, although these bearing means are omitted from FIG. 1 only for avoiding complexity of the drawing. The shaft 22 projects through the square bore 19*a* and fitted at its one end rigidly with a pinion 23, as shown in FIGS. 1, 3 and 4. This shaft 22 has been omitted however from FIGS. 2 and 7 for simplicity of drawing.

Hollow shaft 19 mounts rigidly thereon eight pinions 24*a*–24 at regular intervals as shown, for unitary rotation therewith. These pinions are meshing with intermediate pinions 25*a*–25*h*, respectively, which are in engagement with respective typewheel gears 26*a*–26*h*. Only one of these typewheel gears appears in FIG. 1 at 26*a*, others being hidden by the wheel cover 11*c*. Said gears 26*a*–26*h* are rigidly connected with respective typewheels 27*a*–27*h*, as easily supposed from FIG. 9 shown as a representative.

Typewheels 27*a*–27*h* are mounted on respective type levers 28*a*–28 at 27 (shown as a representative in FIG. 8), each of which has a configuration of a designed "y." Similarly, the intermediate pinions 25*a*–25*h* are rotatably mounted at 30 (shown as a representative in FIG. 8) on respective typewheel levers. The typewheel lever 28 is formed at its lower end with an arc-shaped boss arm 31 which is pivotably mounted on the hollow shaft 19, while the respective upper free ends 37*a*–37*h* are kept in slidable engagement with guide slots 32*a*–32*h* for correct guidance of the pivotable movement of respective levers 28*a*–28*h* around the hollow shaft 19.

The typewheel has a diameter of 23 mm. and formed on its peripheral surface with 16 characters in this specific embodiment, as was referred to hereinbefore. Therefore, all eight typewheels 27*a*–27*h* carry 128 characters and symbols as shown on the table in FIG. 27.

Typewheel levers 28*a*–28*h* are formed with respective motion-receiving arms 33*a*–33*h* which, when a respective typewheel has been selected out and brought into the position in registration with the hammer cam 12 by moving axially the type head in the manner to be described, can be rotated in clockwise direction in FIG. 1, upon actuation of the hammer cam in counterclockwise direction in the same figure, as will be described hereinafter. Each of said typewheel levers is formed with a slot 34, a return spring 35 being bridged under tension between said slot and said shaft 36, for urging the typewheel lever in counterclockwise direction in FIG. 1. These operating conditions will be easily and more clearly understood by reference to FIG. 8. Lever ends 37*a*–37*h* are normally kept in resilient abutment with the lowermost extremities of respective guide slots 32*a*–32*h* by the urging action of the return springs 35*a*–35*h*.

In FIGS. 3 and 4 the first and second lever mechanism 15 and 16 for controlling the rotary and axial selecting operation for the type head 11 as a whole, respectively.

It will be better for clear understanding of the invention to set forth a brief explanation of the principles embodied in these control modes by reference to FIGS. 10 and 11, and then to FIGS. 12 and 13, respectively, before entering into detailed and specific description with reference to FIGS. 3 and 4, respectively.

In FIGS. 10 and 11, *p*1, *p*2, *p*3 .....*p*16 illustrate 16 equidistantly selected positions which can be selectively occupied by the output or working end P of output lever 38 corresponding to 16 rotary divided positions of the type head 11, as shown representatively in FIG. 11. The opposite end of the output lever 38 is shown at Q. This lever end Q can occupy four different positions Q1, Q2, Q3 and Q4 as shown at the left-hand extremity of FIG. 11. The output lever is pivotably connected at its intermediate position R between the both free ends P and Q to a lower link 40, this linked point R being positioned at four different positions R1, R2, R3 and R4, as shown. As seen from the explanatory representation in FIG. 11, the output lever can thus occupy 16 different positions 38–1, 38–2, ..... 38–16, which provides above mentioned 16 different operating positions of the output lever end. There are provided four push-pull bars 41, 42, 43 and 44 which are movable vertically in FIG. 10, yet being linked with each other as shown.

First bar 41 is linked at 45 to said lower link 40 and third push-pull bar 43 is linkedly connected at 46 with the same link 40. In the similar way, second push-pull bar 42 is linkedly connected at 47 to upper link 39, and fourth push-pull bar 44 is linked at 48 to upper link 39. The upper link 39 and the output lever 38 are linked with each other at said end Q. In this way, a specific link lever mechanism is provided which is called "the first lever mechanism" referred to hereinbefore.

16 different operative positions of the lever ends Q correspond to respective 16 binary input signals such as shown at the right-hand extremity of FIG. 11. These input signals are also shown in FIG. 27 at 105', as consisting of four successive bits $b_1$–$b_4$.

Positioning of lever end Q at four different positions is brought about by the bar pair 42 and 44 each of which is arranged to occupy only two different and predetermined positions in accordance with incoming binary signals "0" and "1," respectively. With the space signal, the respective push-pull bar will occupy its upper position in the present specific embodiment. With the mark signal, the push-pull bar will be brought to its lower position. If, however, occasion may desire, these positioning modes may be reversed.

Positioning of the intermediate point R on the lower link 40 at four different positions R1, R2, R3 and R4 is brought about by the combined movement of the push-pull bar pair 41 and 43 which is arranged in the similar way as was described hereinabove with reference to bars 42 and 44.

Referring now to FIGS. 12 and 13, the second lever mechanism 16 which is arranged to operate in the similar manner as in the case of the first lever mechanism will be described.

There are provided three parallel arranged push-pull bars 51–53 which are similar in their arrangement as well as operation to those denoted 41–44 in the first lever mechanism 15.

The respective upper ends U and X of push-pull bars 52 and 53 are linked to a connecting link 54 as shown, one end at V of the latter being linkedly connected with further link 57 at its one end. The opposite end at W of the link 57 is linked to further push-pull bar 51 at its upper end. At an intermediate point 55 between the both end extremities of said link 57, the latter is linked with output lever 58 formed into a bellcrank lever at an intermediate point of its lever arm 58*a*. The free end S of the remaining arm 58*b* of the bellcrank lever 58, which is pivotably mounted at T on the carriage frame, as will be more fully described with reference to FIG. 4 will occupy eight equidistantly remote different positions S1–S8 depending upon input binary signals, each consisting of three succes-

sive trailing bits $b_5$, $b_6$ and $b_7$, as shown by way of example in FIGS. 4, 12 and 13, respectively. Similar coded input signals are shown also in the part 113 of the table shown in FIG. 27.

The link end U can occupy two positions U1 and U2 by virtue of the push-pull bar 52 which can be positioned at any one of predetermined two axial positions.

Similarly, link end W can occupy only different positions W1 and W2 by virtue of two position bar 51.

The linked point X which corresponds to the upper end of push-pull bar 53 can occupy only two different positions such as at X1 and X2 on account of the two position bar 53.

Since the link end V is determined by the combination of two bistable bars 52 and 53, link end V can occupy four different positions such as V1, V2, V3 and V4 shown at the right-hand extremity of FIG. 13.

As referred to above, the link end W has two occupying positions and link end V has four different positions, it may be easily supposed that the linked point 55 which is situated at an intermediate point between the both ends of the connecting link 57 will occupy eight different positions. Therefore, the output end S of the bellcrank lever 58 will occupy correspondingly eight different positions such as at S1–S8 shown in FIG. 12 and 13, respectively.

Now returning to FIG. 3, the output end P of output lever 38 is linked thereat to an endless toothed belt 60 which is threaded around pinions 61 and 62 rotatably mounted on respective stationary supporting shafts 63 and 64, respectively. Pedestal boxes 65 and 66 are made integral with carriage sidewall 10*a* and house the pinions 61 and 62, respectively, said shafts 63, 64 being fixedly mounted in the sidewall, on the one hand, and in the end wall 65*a* or 66*a* of said respective pedestals 65 and 66. Gear 67 is made integral with said pinion 61 and meshes with said pinion 23.

It will be therefore understood that the positioning effect provided by the output end P of output lever 38 will be transmitted in the form of turning motion to the type head 11 through endless belt 60, upper pinion 61, gear 67, pinion 23 and rotatable square shaft 22. Two extreme outside positions of the output lever end P are shown in FIG. 3 at *p*1 and *p*16.

In FIG. 4, a mounting plate 68 is rigidly connected at the lower part of carriage frame sideplate 10*b* which mounts rotatably at T the bellcrank lever 58. The type head 11 is formed rigidly with a depending guide 69 having a longitudinal slot 69*a* which receives slidably the output lever end S through a pin-and-slot joint. Two extreme positions of the actuating end S of the bellcrank lever 58 are shown in FIG. 4 at S1 and S8, respectively.

As already mentioned, the rotary and longitudinal selection for the type head 11 is carried out by application of seven-bit binary control signal for each stepping operation, if the stepping is carried out in the combined rotary as well as longitudinal direction. For this purpose, there are provided seven push-pull bars, each of which corresponds to a bit of said binary signal. Each of said push-pull bars is actuated by an electromagnetically operated clutch unit, as shown representatively in FIGS. 5 and 6 in its side and rear elevational views. Thus, it will be seen that seven such clutch units are employed in the specific embodiment of the typewriting mechanism according to this invention.

Since these seven clutch units have the same design and function, only one of them will be described in the representative way by reference to FIGS. 5, 6, 14–23.

Electromagnet SM is fixedly mounted on the rear wall 10*e* of the carriage frame 10 by means of fixing screws 71 and 72, said electromagnet being provided with its armature 73 pivoted at 74 to the magnet through a mounting plate fixedly attached thereto.

Stationary lever shaft 76 is arranged below the carriage bottom plate 10*d* and in parallel relation therewith, there being provided a number of supporting tongues 77 which depends integrally from the bottom surface of the bottom plate 10*d*, although only one of said tongues is shown in FIG. 5 for simplicity of drawing. For better guidance, only a small part of said lever shaft is also shown in FIG. 1. A hook lever 78 is pivotably mounted on the shaft 76.

Detent lever shaft 79 is arranged in parallel to said bottom plate 10*d* and mounted rigidly at its both extremities in proper openings formed in the carriage sidewalls 10*a* and 10*b*, although these openings being omitted from the drawing for simplicity.

Detent lever 80 is pivotably mounted on the stationary shaft 79, said both levers 78 and 80 being urged by an urging spring 81 which is bridged there between so as to bring them towards to each other. The shaft 79 mounts a spacer and stop ring 82 against which a stop arm 78*a*′ formed on the hook lever 78 abuts so far as the magnet SM is deenergized and the clutch to be described is kept in its disengaged position.

Hook lever 78 is formed with a lower and notion receiving arm 78*b*′ which is normally kept in precise or substantial contact with the actuating end 73*a*′ of armature 73 when the electromagnet SM is in its deenergized condition. The hook end 78*c*′ of lever 78 is normally kept in pressure engagement with the tip end of the lower chord 83*a*″ of an elongated channel-shaped actuator spring 83 to which a generally I-shaped strengthening piece 84, when seen in FIGS. 5 and 23, by means of fixing screws 85 and 86. The piece 84 is rotatably mounted on an auxiliary stationary shaft 87 which is fixedly mounted in the carriage sidewalls 10*a* and 10*b*, although not shown.

A wing cam 90 is fixedly mounted on a keyhole clutch shaft 88 which is journaled at 88*b* and 88*c* in sidewalls 10*a* and 10*b* as shown in FIGS. 3 and 4, respectively. Said wing cam 90 is made preferably of a rigid plastic material. For fixedly positioning of said wing cam 90 on the clutch shaft 88, a retaining pin 89 is used which pin projects through an opening 90*b*′ bored through the boss part at 91 of the wing cam, into a recess 88*a* formed in the shaft 88.

The lower chord 83*a*″ of actuator spring 83 is kept normally in flexed position as shown in FIG. 5 by virtue of contact with a wing 90*a*′ of cam 90, this flexed position being positively retained by the hook lever 78 the hook end 78*c*′ of which is kept in positive engagement with the spring chord 83*a*,″ as was referred to in the foregoing, while the upper chord is also tensioned in this case and kept in pressure engagement with a clutch key 92, shown in its entirety in FIGS. 21 and 22. The wing cam 90 is formed with a pair of diametrically opposed openings 90*c*′ and 90*d*′ through which the pin parts 92*a*′ and 92*b*′ project as most clearly shown in FIG. 14.

Cam assembly 14 comprises a detent cam 93 and an actuator cam 94 made integral with each other. With clutch key positioned in its full lined one shown in FIG. 14 and when the electromagnet SM is in its deenergized condition, cam assembly 14 is disconnected from driving connection by the shaft 88. At an intermediate position near the upper end, the detent lever 80 mounts rotatably a detent roller 95, a spring 96 being tensioned between the tip end of said lever 80 and a hanger shaft 97 which extends between carriage sidewalls 10*a* and 10*b*, said shaft being shown also in FIG. 1, yet only partially. There is provided a further spring 98 which is tensioned between said hanger shaft 97 and the lower chord 83*a*″ of actuator spring 83.

Guide slide 120 is slidably guided in slots 123 and 124 formed through carriage frame upper and lower plates 10*c* and 10*d*, respectively, said slide carrying rotatably a pair of follower rollers 121 and 122 which are kept in contact with the peripheral surface of actuator cam 94 for being driven thereby. The upper end of the push-pull bar which may be any one of said bars 41, 42, 43, 44, 51, 52 and 53, as is hinged at 125 to the guide slide 120.

When a mark bit of a coded input signal is fed to the electromagnet SM which may be any one of those denoted SM1–SM7 shown only schematically in FIGS. 3, 4 and 26, the magnet is thereby energized, thus its armature 73 being attracted magnetically thereto. Motion is thus transmitted from the armature to hook lever 78 through its motion-receiving arm 78*b*′, so as to swivel the lever in counterclockwise

direction in FIG. 5 against the action of spring 81 and thus to disengage the hook end 78c' from contact with the flexed spring chord 83a'. The spring action at 98 becomes effective under these operating conditions and the lower spring chord 83a'' is swiveled about its root portion in clockwise direction in FIGS. 5 and 15, thereby the clutch key 92 being urged to move from its full line position to its chain-dotted position shown in FIG. 14 for bringing cam assembly 14 into cooperating engagement with key hole clutch shaft 88, having a radial key hole at 88d. For this purpose, the cam assembly 14 is formed with a longitudinally extending key groove 99 adapted for receiving the clutch key which has been brought into its elevated position in the above mentioned manner. It should be noted that the lower spring chord 83a'' is formed at its tip end with a recess 83a' for allowing the chord to perform the above function without interference with the wing cam, although in the foregoing description by reference to FIG. 5 illustrative of the rest position of the electromagnetically operated clutch mechanism, wherein it was assumed that the cam wing 90a' is in contact with the spring chord 83a'', because such assumption is helpful to understand rather clearly the present complicated clutch mechanism when relying substantially upon the graphical representation of FIG. 5 wherein the viewer will see at a glance that the cam wing is practically in contact with the spring chord at issue. Such relief measure by the provision of recess 83a' can be best understood when reference had to FIG. 15.

Although not shown specifically, there is provided a main drive shaft which is arranged to rotate continuously upon closure of a main switch, not shown. A conventional one revolution one revolution clutch, not shown, is provided between the main drive shaft and the right-hand extremity, FIG. 1, of the drive shaft 100, the operation of said one revolution clutch being initiated by energization of clutch magnet, TCM shown in FIG. 26. With energization of said one revolution clutch, the drive shaft 100 will be caused naturally to rotate in counterclockwise direction as shown by an arrow shown in FIG. 1. Rotation is transmitted from the drive shaft 100 through a transmission gearing comprising gears 130–134 to the aforementioned keyhole clutch shaft 88. Said transmission gearing has an overall gear ratio 2 to 1, thus, with one complete revolution of drive shaft 100 the latter shaft 88 being caused to rotate just a half revolution in clockwise direction when seen from right-hand side of FIG. 1.

In FIG. 24, a preferred combination with the typewriting mechanism shown and described with an electronic circuit provided in the typewriter fitted with said mechanism as its main operating part is schematically shown.

In accordance with the present arrangement employed, a 7-bit coded system is utilized for denoting said 128 characters and symbols carried on the type head, although these specifically specified numerals are not in any way limiting. Coded input signals are fed from either keyboard 101, or telecommunication receiver or computer output 102, as the case may be, to buffer register 103.

On the table shown in FIG. 25, all 128 characters numerals and symbols on eight typewheels are represented in columns 2, 3, 4, 5 and 10, 11, 12, 13 of the main table section generally denoted by 104. Columns 0 and 1 include each 16 function symbols such as "NUL," "DLE" and the like which correspond respectively to telecommunication and typewriting functions such as "acknowledge" (ACK), "bell" (BEL), "cancel" (CAN), "backspace" (BS), "carriage return" (CR) and the like. Columns 6, 7, 9. 14 and 15 are empty. Column 8 is partially occupied by certain function symbols, other being empty.

Auxiliary table part, generally shown at 105, illustrates a series of bits $b_1$, $b_2$, $b_3$ and $b_4$ which occupies the leading part of the 7-bit coded signal, and adapted for controlling the rotary selection of the type head. On the other hand, auxiliary table part 106 illustrates the remaining bit part, $b_5$, $b_6$ and $b_7$, of the 7-bit coded signal, which bit group serves for the control of the axial selecting function of the second mechanical selector shown in FIG. 4. Bits $b_1$–$b_4$ control naturally the operation of the first mechanical selection shown in FIG. 3.

Now returning to FIG. 24, the coded signal fed to the register 103 is temporarily stored therein for a predetermined period for better and accurate operation of various downstream circuit elements.

As shown in FIG. 26, the register 103 comprises eight relays IC and D1–D7, as shown. Relays D1–D7 are arranged for memory of signal bits while relay IC is arranged for receiving a special function signal from the register 103 for maintaining the register circuit. Battery $B_1$ is connected at its positive side to the circuit for energization of the aforementioned register relays. The opposite or negative side of the battery $B_1$ is connected to earth at $E_3$.

The register relays are arranged to control their relay contacts according to the following table:

Table 1

| Relays | Relay Contacts |
|---|---|
| IC | $ic_1$–$ic_3$ |
| $D_1$ | $d_{1\text{-}1}$–$d_{1\text{-}4}$ |
| $D_2$ | $d_{2\text{-}1}$–$d_{2\text{-}4}$ |
| $D_3$ | $d_{3\text{-}1}$–$d_{3\text{-}4}$ |
| $D_4$ | $d_{4\text{-}1}$–$d_{4\text{-}4}$ |
| $D_5$ | $d_{5\text{-}1}$–$d_{5\text{-}3}$ |
| $D_6$ | $d_{6\text{-}1}$–$d_{6\text{-}3}$ |
| $D_7$ | $d_{7\text{-}1}$–$d_{7\text{-}4}$ |

The signal released from the register 103 is fed to both selector magnets control 107 and decorder 108. The output signal from the decorder 108 is supplied to function control 109 for the control of a plurality of communication and typewriting operations such "line feed" (LF), "tabulation" (TAB), "backspace" (BS), "hammer cut" (HC) and "-spacing" (SC) and the like.

These circuits 107, 108 and 109 are specifically shown in FIG. 26.

Auxiliary table 106 is divided into two sections "SI" and "-SO" which means "shift-in" and "shift-out." If a coded signal "1111000"requiring a "shift-in" operation is fed from the register 103 to selector magnets control 107, thence to selector magnet groups 110 and 111 (FIG. 24). In this case, magnets $D_1$–$D_4$ are energized and one of its contacts $d_{1\text{-}4}$ is transferred to its opposite side.

Therefore, seventh bit magnet SM7 is deenergized and a code convertion in accordance with the left-hand side of the table part 113 shown in FIG. 27 is brought about.

In the similar way, a coded signal "0111000" requiring a "shift-out" operation is fed to the control 107, a code convertion in accordance with the right-hand side of the table part 113 is realized. In this case, magnet SM7 is kept always in its energized position.

Simultaneously with feeding of a coded 7-bit input signal to the relay group D1–D7 shown in FIG. 26, a signal is applied to the function control relay IC which is thus energized ans all of its contacts $ic_1$–$ic_3$ are thereby closed. By closure of $ic_1$, time delay relay IGG, FIG. 26, is energized so as to close its contacts $icg_1$–$icg_4$. By closure of relay contact $icg_2$, earth potential at $E_2$ is applied through relay contacts $to_1$, $ic_2$, $d_{6\text{-}3}$, any one of closed contacts $d_{1\text{-}3}$.....$d_{5\text{-}3}$, contact $d_{7\text{-}2}$, diode $R_1$ and now closed relay contact $icg_2$ to said clutch magnet TCM, thereby the latter being energized by current from battery $B_1$. By this operation, the one revolution clutch is engaged as above briefly described, so as to drive the shaft 100 just a complete revolution and to rotate the clutch shaft 88 just a half revolution. Therefore, at this stage of operation, the cam assembly 14 is rotated in unison with the shaft 88, because the latter is in engagement with the cam assembly. Since the detent roller 95 has been kept in pressure engagement under spring action at 96 with one of the detent recesses 93a' and 93b' formed in

the peripheral surface of cam **93**, rotation of the latter is carried out through forced disengagement of said roller from the related detent recess as at **93***b*′. Upon a half revolution of the shaft **88**, a retent engagement of roller **95** with another recess such as **93***a*′ is positively brought about.

By the half rotation of selector cam **94** in unison with the detent cam **93**, the lower cam follower **122** is urged to move together with guide slide **120** and further with the push-pull bar attached thereto downwards in FIG. **5** a predetermined distance equal to the designed cam rise which is in turn equal to the moving stroke of the bar.

FIG. **16** illustrates in A, B, C and D, four relative positions of clutch key **92** and selector cam in somewhat enlarged display. The position A corresponds to that shown in FIG. **5**, where the related push-pull bar is positioned in its upper or "-space" position.

The relative position shown at B in FIG. **16** is such that the selector magnet SM has been energized and the hook lever **78** has been disengaged from cooperation with the actuator spring **83**, thus the clutch key being elevated in position, but in advance of half revolutional movement of the shaft **88**.

Upon the aforementioned half revolutional movement of the shaft **88**, the relative position will be that shown at C in FIG. **16**.

During the aforementioned half revolutional movement of the shaft **88** which period corresponds to the transient period between the successive stages B and C, another cam wing **90***e*′ is brought into engagement with the spring chord **83***a*′′ and then the hook lever **78** is brought into meshing with its hooked end **78***c*′ therewith.

When a mark bit signal is again supplied to said magnet SM, which is naturally energized, and thus the clutch key is elevated in its upper position, as shown at D in FIG. **16**. Therefore, the cam assembly **14** is made loose relative to the shaft **88**. Then, this shaft is caused to make a further half revolutional movement in the same direction. Since there is no coupled relation between the shaft and the cam assembly **14**, there is no alteration at the side of the latter. Therefore, the push-pull bar is kept in its marked position.

When the mechanism shown in FIG. **5** is under the conditions shown at D in FIG. **16** and a space bit signal is applied to the magnet SM, the engaged condition between hook lever **78** and spring chord **83***a*′′ is subjected to no alteration and the upper chord **83***b*′ of the spring will act upon the clutch key which is therefore lowered in its position, thereby the clutch key being brought again into engagement as shown at C. When the clutch shaft rotates a half revolution, then the relation is transferred from the stage C to that shown at B. Therefore, the related push-pull bar will return to its upper or space position.

When, again, a space signal is fed to the magnet SM, which is naturally in its deenergized condition, therefore the mutual engagement between the hook lever **78** and the actuator spring **83** is not affected and thus the clutch key is lowered in its position under the action of the actuator spring. Therefore, the relative position is transferred from stage B back to stage A.

When the clutch shaft is rotated a half revolution at this stage, the selector cam is not rotated in any way and thus the push-pull bar remains in its space position.

Now assuming that a binary coded signal "1010110" which corresponds to the selection of a numeral "5" as an example is fed to the buffer register **103**, FIG. **24**, from keyboard **101** or telecommunication receiver or computer output **102**, it will be clear that relays D1, D3, D5 and D6 and IC are energized. Therefore, relay contacts $d_{1\text{-}1}$, $d_{3\text{-}1}$, $d_{5\text{-}1}$ and $d_{6\text{-}1}$ are turned to "on" for performing respective memory functions, and similarly, contacts $ic_1$ and $ic_2$ of the function control relay IC. Therefore, type clutch magnet TCM is ready for energization. Relay contacts $d_{1\text{-}3}$, $d_{3\text{-}3}$, $d_{5\text{-}3}$, $d_{1\text{-}2}$, $d_{3\text{-}2}$ and $d_{5\text{-}2}$ are turned to make, while relay contact $d_{6\text{-}2}$ is turned to off. Relay contact $d_{6\text{-}3}$ is transferred to its opposite side from that shown.

Therefore, earth potential $E_2$ will applied through $to_1$–$ic_2$–$d_{6\text{-}3}$–any one of $d_{1\text{-}3}$, $d_{3\text{-}3}$ and $d_{5\text{-}3}$–$d_{7\text{-}2}$–$R_1$–$icg_2$ to magnet TCM which is therefore energized. By closure of relay contacts $d_{1\text{-}2}$, $d_{3\text{-}2}$ and $d_{5\text{-}2}$, the related selector magnets SM1, SM3 and SM5 are energized.

Therefore, the same selector magnets SM1, SM3 and SM5 schematically shown in FIGS. **3** and **4** are actuated, while other sector magnets SM2, SM4, SM6 and SM7 shown also Schematically in these figures are maintained in their deenergized condition. Under these conditions, push-pull bars **42** and **44** are lowered, while push-pull bars **41** and **43** are maintained in their upper position in the first lever mechanism **15**. In the similar way, push-pull bar **51** is lowered, while push-pull bars **52** and **53** are kept in their upper position in the second lever mechanism **16**.

Therefore, the output lever **38** of the first lever mechanism will occupy a specifically selected position shown by **38–4** in FIG. **11**, thus the selected output position in this being "*p*4." Similarly, the output lever **58** of the second lever mechanism will provide a specifically selected output point "*s*4" shown in FIG. **13**.

Now further assuming that the type wheels of the head **11** have been occupied at the end of the foregoing typewriting operation such position as been adapted for presenting a character "Q" which is formed on the second typewheel **27***b* when counted from right to left in FIG. **4**. Since the present selection is directed to a numeral "5" which is carried on the fourth typewheel **27***d*, the desired selection must be carried out to rotate four steps the whole typewheel elements in clockwise direction in FIGS. **1** and **8**. For attaining the desired selection, it is necessary in this to shift two steps the type head **11** in the right-hand axial direction in FIGS. **1** and **4**.

In this case, the rotary selection is carried out in such a way that the output end P of output lever **38** is lowered four steps from its former position *p*8 to the presently selected-out position *p*4. This four step adjusting motion is transmitted from the lever end through belt **60**, pinion **61**, gear **67** and pinion **23** to the square shaft **22** to rotate the type wheels as a whole. More specifically, rotation is transmitted from the shaft **22** through hollow shaft **19**, pinions **24***a*–**24***h* and intermediate gears **25***a*–**25** to typewheel gears **26***a*–**26***h* which are integral with respective typewheels **27***a*–**27***h*, thereby the latter being rotated about their respective shafts generally shown by a common reference numeral **29** only for simplicity.

For carrying out the axial selection, the output lever end S, must be transferred from the former position *s*2 to the selected position *s*4. This two step motion is transmitted by the newly selected-out position *s*4 of the output lever **58**. The necessary motion is directly transmitted from the bellcrank lever **58** to the slotted guide **69** attached rigidly to the type head **11**. The thus selected-out axial position of type head **11** is shown in FIG. **4**.

The necessary cooperating action between the hammer cam **12** and the typewheel unit assembly for carrying out the typewriting operation can be easily understood without further analysis when reference be had to our prior application Ser. No. 576,000, filed Aug. 30, 1966 in the name of Sanae Amada et al., now U.S. Pat. 3,353,648, especially FIGS. **3**, **4**, **6** and **7** and its related disclosure.

In order to spare the longitudinal selection period, a two-block shift system is employed.

When a "shift-in" function signal consisting of a series of binary digits "1111000" as tabulated in auxiliary tables **105** and **106**, FIG. **25**, is fed to the circuit block **103**, FIG. **26**, relays D1–D4 and relay IC are energized so that their relay contacts $d_{1\text{-}}$, $d_{2\text{-}1}$, $d_{3\text{-}1}$, $d_{4\text{-}1}$, $d_{1\text{-}2}$, $d_{2\text{-}2}$, $d_{3\text{-}2}$, $d_{4\text{-}2}$, $d_{1\text{-}3}$, $d_{2\text{-}3}$, $d_{3\text{-}3}$, $d_{4\text{-}3}$, $d_{2\text{-}4}$, $d_{3\text{-}4}$ and $d_{4\text{-}4}$ are turned to make and relay contact $d_{1\text{-}4}$ is transferred from the position shown.

Then, earth potential at $E_2$ is conveyed through the thus established conducting passage: $to_1$–$ic_2$–$d_{7\text{-}3}$–$d_{6\text{-}4}$–$d_{5\text{-}4}$–$d_{4\text{-}4}$–$d_{3\text{-}4}$–$d_{2\text{-}4}$–$d_{1\text{-}4}$–$R_2$–$icg_2$ to type clutch magnet TCM, and through $d_{1\text{-}4}$–$R_6$ to selector magnet SM5, and further through $d_{1\text{-}4}$–$R_{11}$ to shift-in memory relay TSI so as to energize the latter, thereby

opening its contact $tsi_1$ and closing its contact $tsi_2$. Thus, the relay TSI is self-maintained.

By energization of relays TCM and SM5, push-pull bar 51 is lowered in its position and an output selection point $s4$ has been preliminarily selected.

When a binary coded "shift-out" signal "01111000" is introduced into the register 103, relays D2, D3, D4 and IC are actuated so that relay contacts $d_{2\text{-}1}$, $d_{3\text{-}1}$, $d_{4\text{-}1}$, $d_{2\text{-}2}$, $d_{3\text{-}2}$, $d_{4\text{-}2}$, $d_{2\text{-}3}$, $d_{3\text{-}3}$, $d_{4\text{-}3}$, $d_{2\text{-}4}$, $d_{3\text{-}4}$ and $d_{4\text{-}4}$ are turned to make.

Earth potential $E_2$ is therefore conveyed as before to contact $d_{1\text{-}4}$, then however through diode $R_3$ to type clutch magnet TCM; and further from $d_{1\text{-}4}$ through $R_7$ to selector magnet SM6. Still further from $d_{1\text{-}4}$, earth potential is conveyed through diode $R_8$ to selector magnet SM7. Similarly, conductive passage will be established from $d_{1\text{-}4}$ through $R_{12}$ to relay TSO which acts as the type shift-out memory and is thereby energized. Relay contact $tso_1$ is transferred and contact $tso_2$ is turned to make. Relay TSI is therefore restored while relay is maintained.

By closure of contact $tso_2$, magnet SM7 is made ready for energization upon arrival of a type selection signal.

Therefore, upon arrival of a coded binary signal, both magnets SM6 and SM7 are simultaneously energized.

Thus, push-pull bars 52 and 53 are brought to their respective lower positions, while bar 51 is elevated to its upper position. Under these conditions, the output end S of output lever 58 will bring the type head 11 into such provisionarily selected position where selected position $s5$ is brought into the typing position.

For understanding further operations, reference may be had to FIGS. 25 and 27, from which a code conversion in the case of "shift-in" and "shift-out" operation can be easily understood without further analysis.

As seen from the foregoing, each of the push-pull bars is linked by mounting or connecting, thus avoiding the provision of an elliptic opening for receiving the mating end of relating link or similar member, thereby assuring a more positive and accurate operation and easy manufacture of the constituent parts.

According to our practical experiments, the output end of the output lever can occupy a plurality of equidistant selection points, thereby further increasing the selective operation for positioning the typewheels. Therefore according to this invention, a highly precise selection control for the positioning in the axial as well as in the radial direction of the type head can be realized.

As will be easily understood from the foregoing, the typewriter mechanism according to this invention employs a plurality of push-pull bars, a connecting lever mechanism for cooperation with said bars, and a key hole clutch mechanism for each of said levers, for carrying out both the axial as well as the rotational position selecting operations, thereby providing an easy capability of providing an accurate and compact mechanism even with use of a large number of type characters and symbols with which the typewriter must operate.

Therefore, even with a large number of bits constituting a coded binary signal used for a separate position control operation, the mechanism according to this invention can operate without difficulty, yet with a simplified construction.

If it is intended to use electromagnetic means which are arranged for reception of binary bits for the energization thereof and for actuating directly the selector mechanism constituents, a considerably large amount of energy is required to use for the proper operation of the selector mechanism. In accordance with the teaching of the present invention, actuating magnets are arranged to cooperate with respective actuating cam through the intermediary of proper link mechanism means and clutch key means. Therefore, the necessary drive is borne by the drive cam means. By this means, the actuating magnets can be made into highly compacted construction.

In addition, considerably large displacements of the output lever can be realized with smaller control measurements of said electromagnet means.

Although in the preferred embodiment of this invention a 7-bit binary code is used, it can readily be seen that a code of any number of bits can be used and the number of electromagnets and cam assemblies can be adjusted accordingly.

What we claim is:

1. A typewriter mechanism comprising:
   a. a rotatable platen,
   b. a carriage frame,
   c. a first shaft, said carriage frame slidably mounted thereon,
   d. a typewheel head comprising a plurality of typewheels arranged in series at regular intervals,
   e. a second shaft rotatably mounted in said carriage frame, said typewheel head slidably mounted on said second shaft,
   f. first and second lever mechanisms, each comprising a plurality of parallel push-pull bars, each push-pull bar having two stable positions,
   g. first and second link mechanisms connecting in a linked relation said push-pull bars of said first and second lever mechanisms,
   h. an endless toothed belt mechanically connected to said second shaft for rotating said shaft, thereby rotatably positioning all of said typewheels,
   i. a first output bar linked at one end to said typewheel head at the other end to said first link mechanism,
   j. a second output bar linked at one end to said endless toothed belt and at the other end to said second link mechanism,
   k. a cam shaft rotatably mounted in said carriage frame,
   l. a plurality of cam assemblies capable of being operatively positioned with respect to said cam shaft,
   m. a plurality of first connecting means for operatively connecting each of said cam assemblies to one of said push-pull bars,
   n. a plurality of clutch keys slidably mounted in the radial direction in said cam shaft,
   0. electromagnetic means,
   p. electronic circuit means electrically connected to said electromagnetic means for supplying a binary coded signal to said electromagnetic means,
   q. second connecting means for connecting said electromagnetic means to each of said clutch keys, whereby when said electromagnetic means are activated, one of said clutch keys brings one of said cam assemblies into an operative relation with said cam shaft thereby operating one of said first connecting means whereby a related push-pull bar is operated.

2. Typewriter mechanism of claim 1, wherein said electromagnetic means comprises a plurality of electromagnets, each of said electromagnets associated with one of said cam assemblies.