United States Patent [19]

Anderson et al.

[11] **3,824,354**

[45] **July 16, 1974**

[54] **OPERATOR MEANS ASSOCIATED WITH MULTIPLE SWITCH ARRAY AND SIGNAL TO FUNCTION CORRELATOR MEANS**

[76] Inventors: **Norman G. Anderson; Norman L. Anderson,** both of 126 Westlook Cir., Oak Ridge, Tenn. 37830

[22] Filed: **Mar. 17, 1972**

[21] Appl. No.: **235,614**

[52] **U.S. Cl.** .... **200/1 R,** 200/18, 200/6 A, 178/23 R, 340/365 R

[51] **Int. Cl.** **H01h 9/00**

[58] **Field of Search** .... 200/6 A, 17 R, 1 R, 18; 340/345 R, 365 R; 178/23 A, 101; 235/145 R; 197/9, 11, 19, 98–100

[56] **References Cited**

UNITED STATES PATENTS

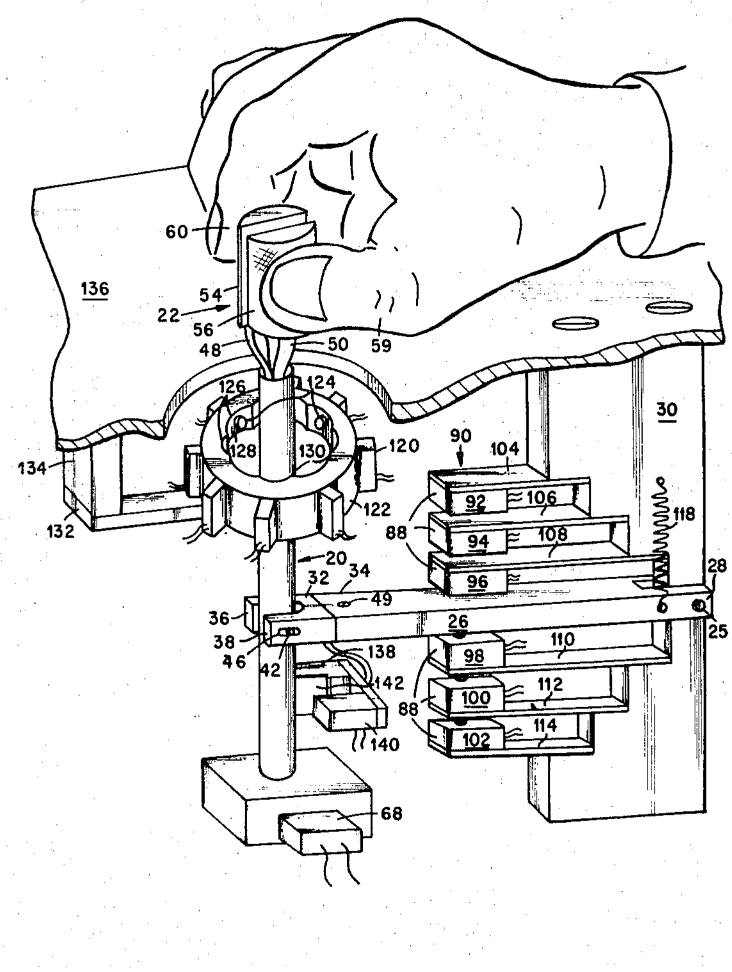
2,391,881	1/1946	Clay	200/6 A UX
2,841,659	7/1958	Eitel	200/6 A X
2,984,720	5/1961	Fisher	200/6 A X
3,022,878	2/1962	Seibel et al.	178/101 UX
3,238,316	3/1966	Voss	200/6 A
3,271,532	9/1966	Lopez	200/6 A
3,283,088	11/1966	Scow et al.	200/6 A
3,293,381	12/1966	Eitel	200/6 A
3,319,884	5/1967	Franklin	235/145 R
3,428,747	2/1969	Alferieff	340/365 R X
3,507,376	4/1970	Kafafian	178/101 X

Primary Examiner—James R. Scott
Attorney, Agent, or Firm—Fitch, Even, Tabin & Luedeka

[57] **ABSTRACT**

A man-to-machine interface system including activator or wand means which is movable, using generally the same musculature as in writing, to and/or through various combinations of vertical and lateral positions to develop at least two signals, one of which is representative of the vertical position of the wand and one of which is representative of the lateral position of the wand. These signals may be developed as by the wand means actuating switch means. These signals are paired by appropriate means and correlated with machine functions assigned to the various combinations of signals to provide input signals to the machine that cause it to perform those functions that correspond to those combinations of positions to or through which the wand is moved.

6 Claims, 14 Drawing Figures



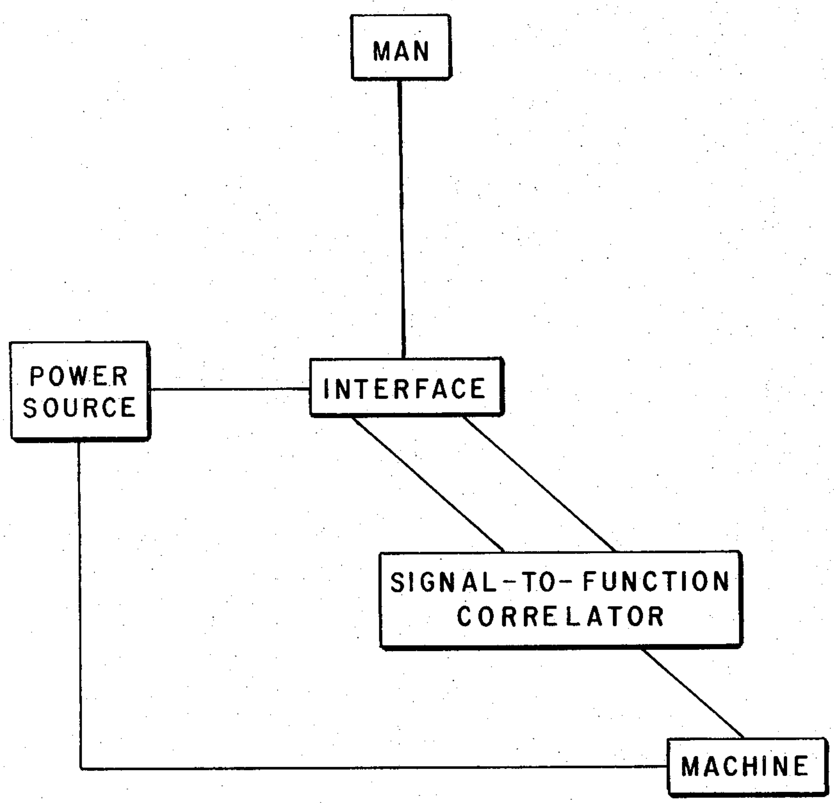

MAN
POWER SOURCE
INTERFACE
SIGNAL-TO-FUNCTION CORRELATOR
MACHINE

Fig. 1

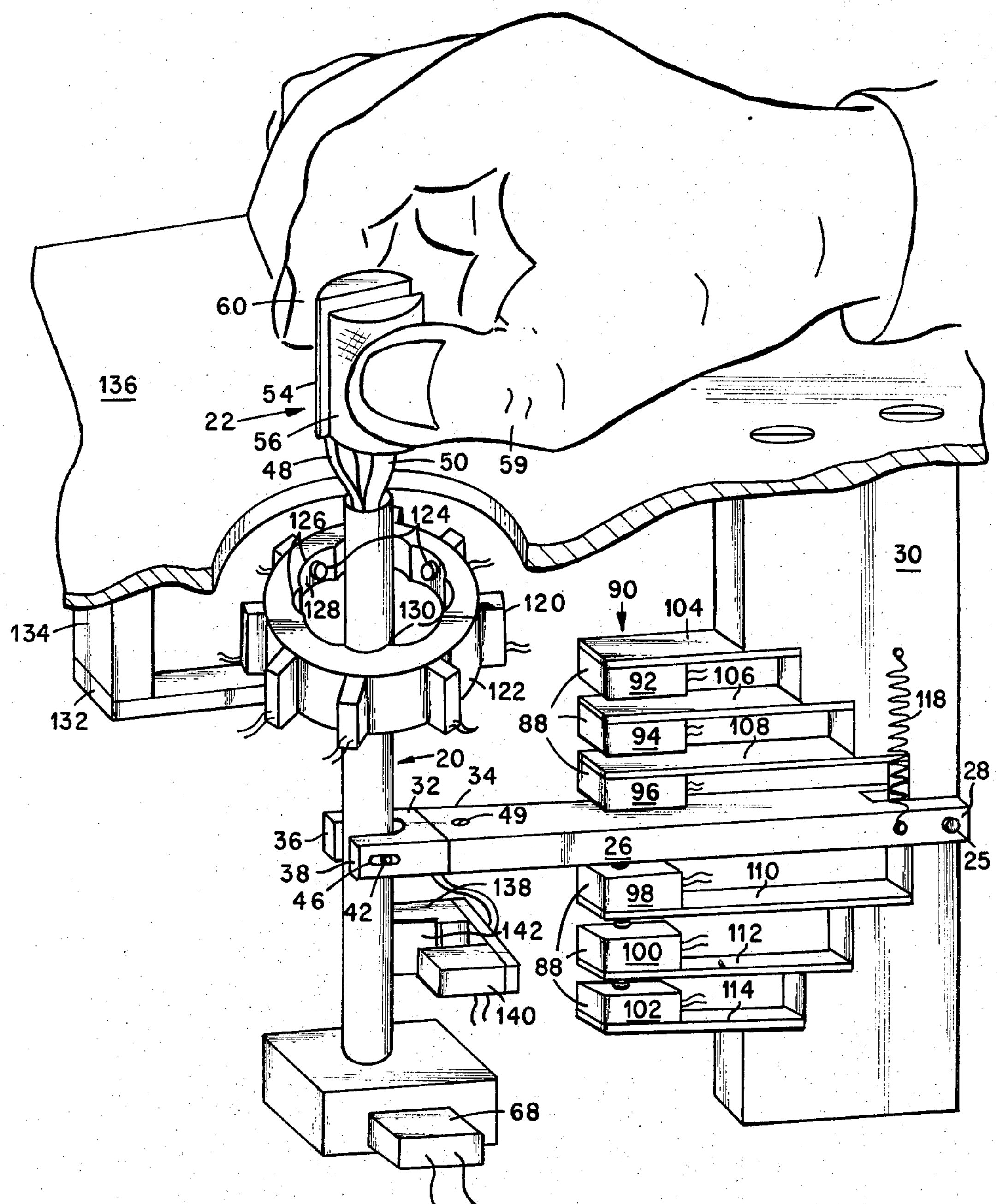

60
136
54
22
56
48
50
59
126
124
30
128
130
120
134
90
104
92
106
122
132
88
94
108
118
20
96
34
28
32
49
36
26
38
25
46
42
110
138
98
142
100
112
88
114
102
140
68

Fig. 2

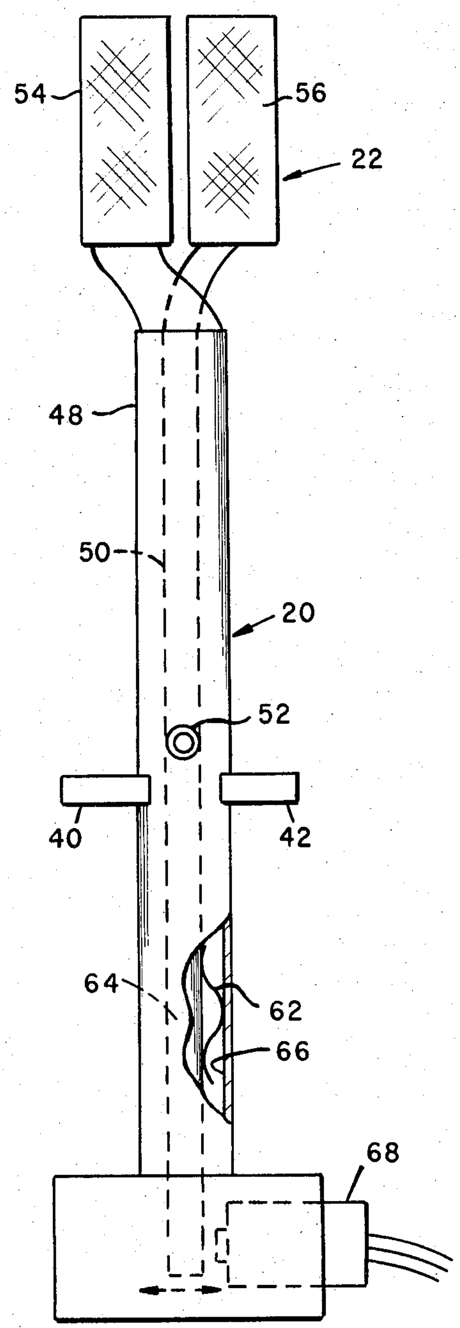


Fig. 3

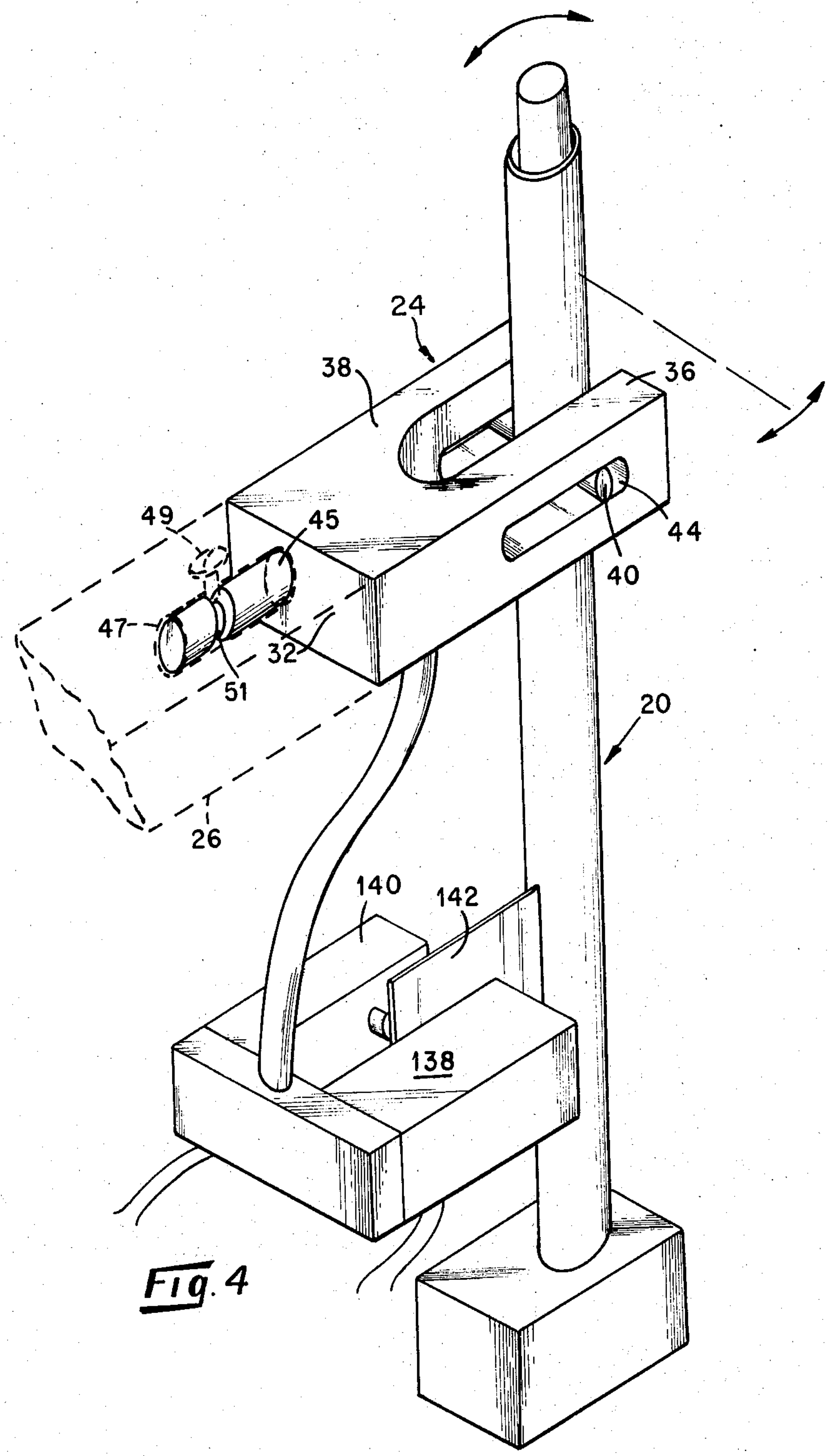


Fig. 4

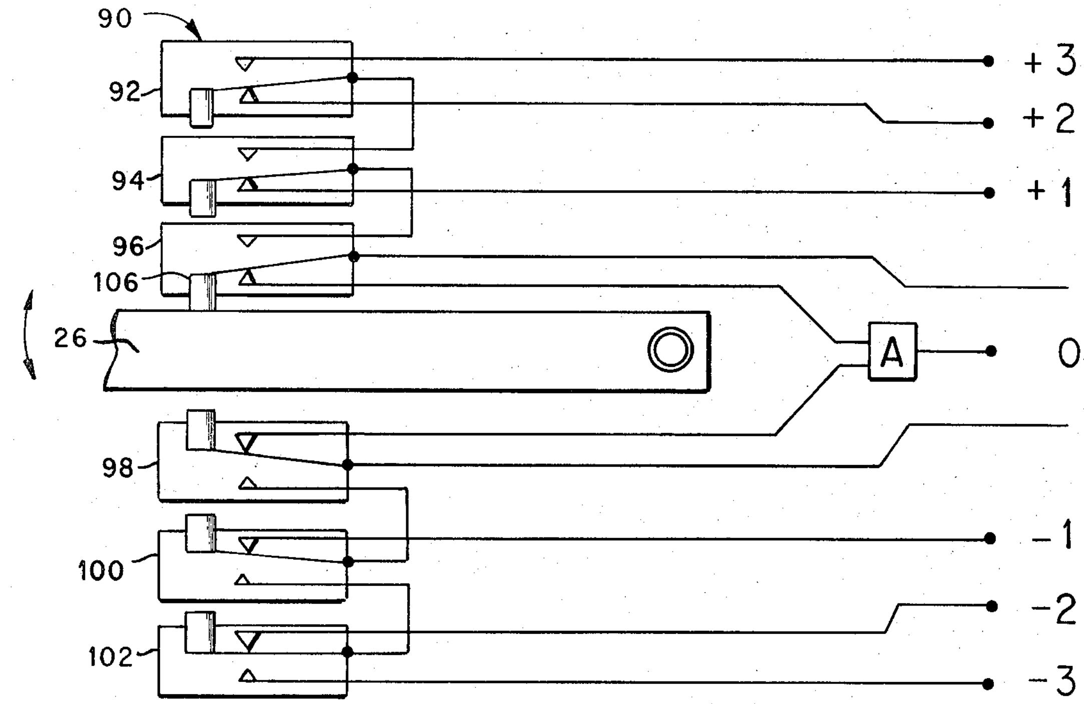

90
92
94
96
106
26
98
100
102
A
+3
+2
+1
0
-1
-2
-3

Fig. 5

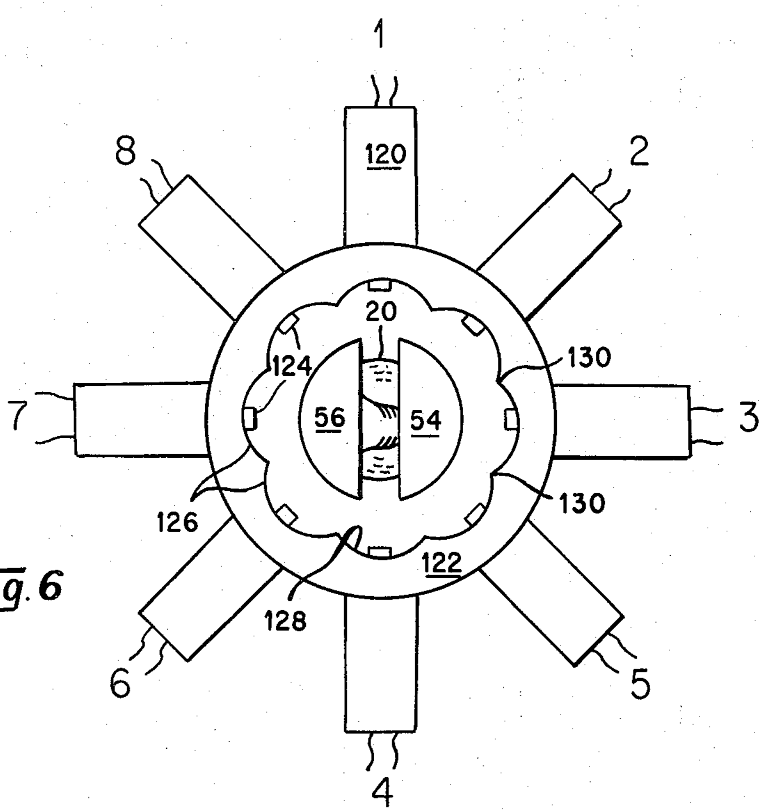

1
2
3
4
5
6
7
8
120
20
124
130
56
54
126
130
122
128

Fig. 6

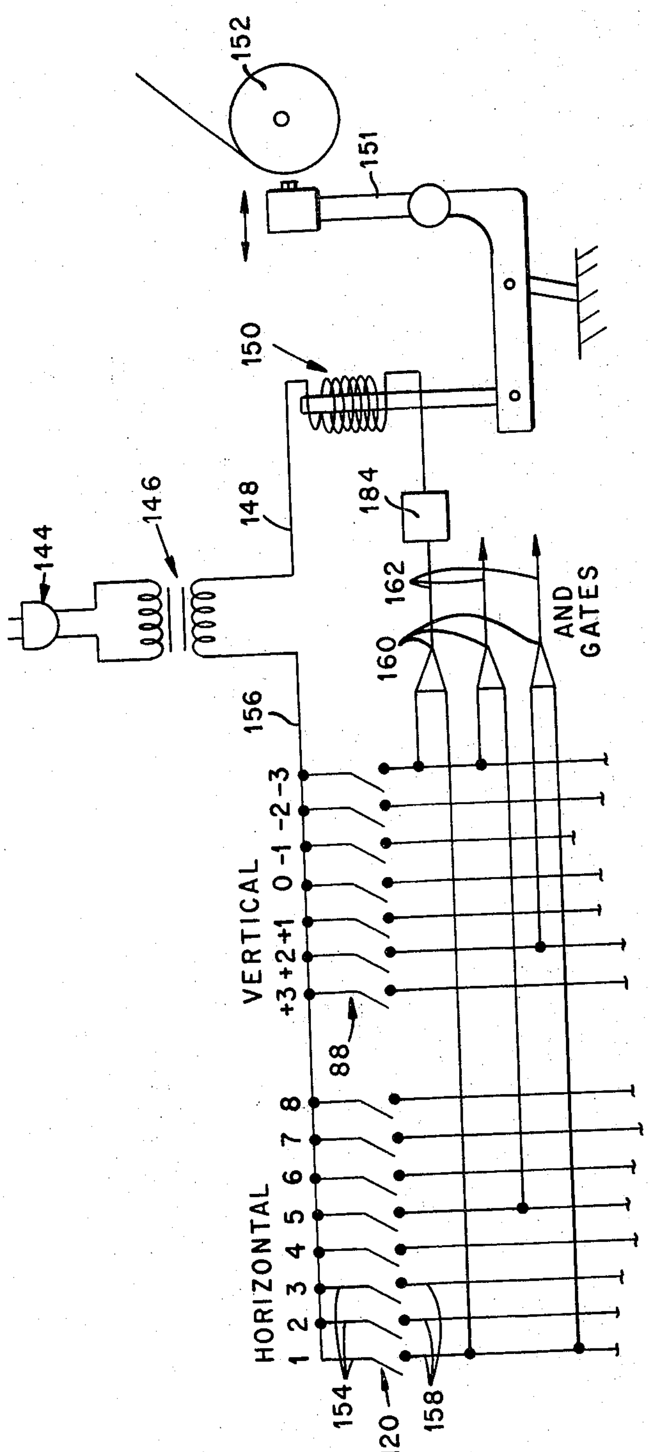

152
151
150
184
162
160
AND GATES
148
146
144
156
VERTICAL
+3 +2 +1 0 -1 -2 -3
88
HORIZONTAL
1 2 3 4 5 6 7 8
154
120
158

Fig. 7

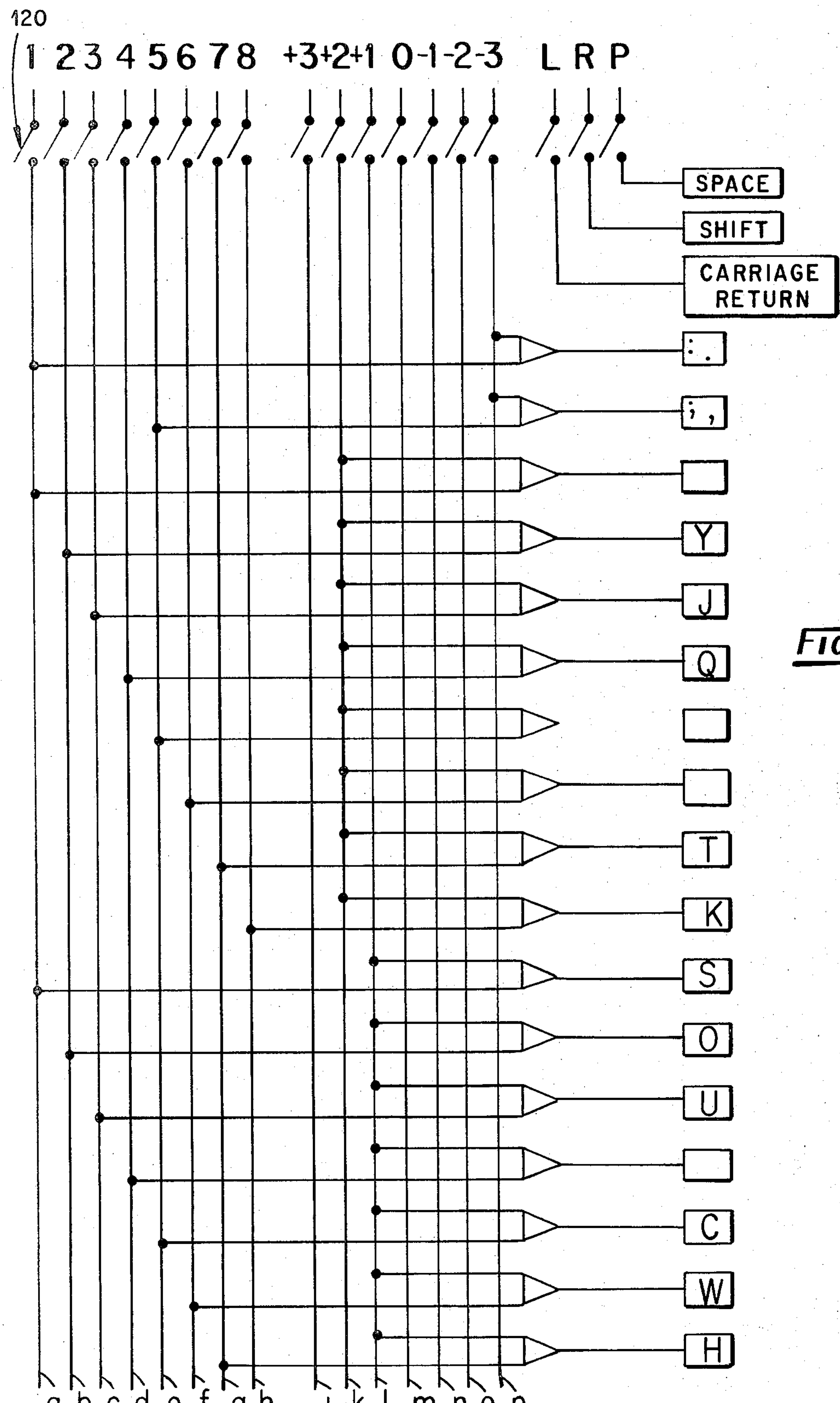


Fig. 8A

See Fig. 8B

See Fig. 8A

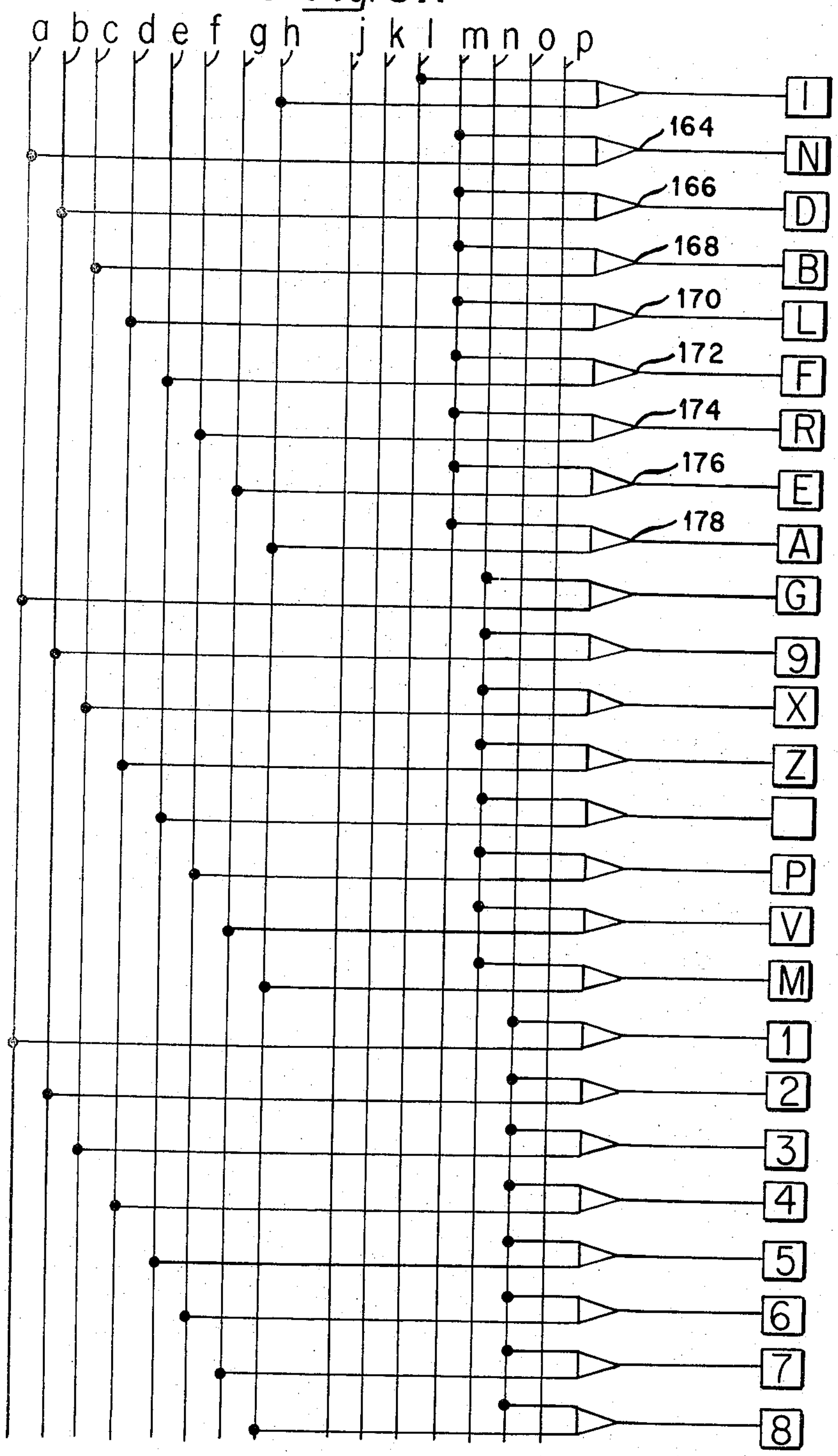


Fig. 8B

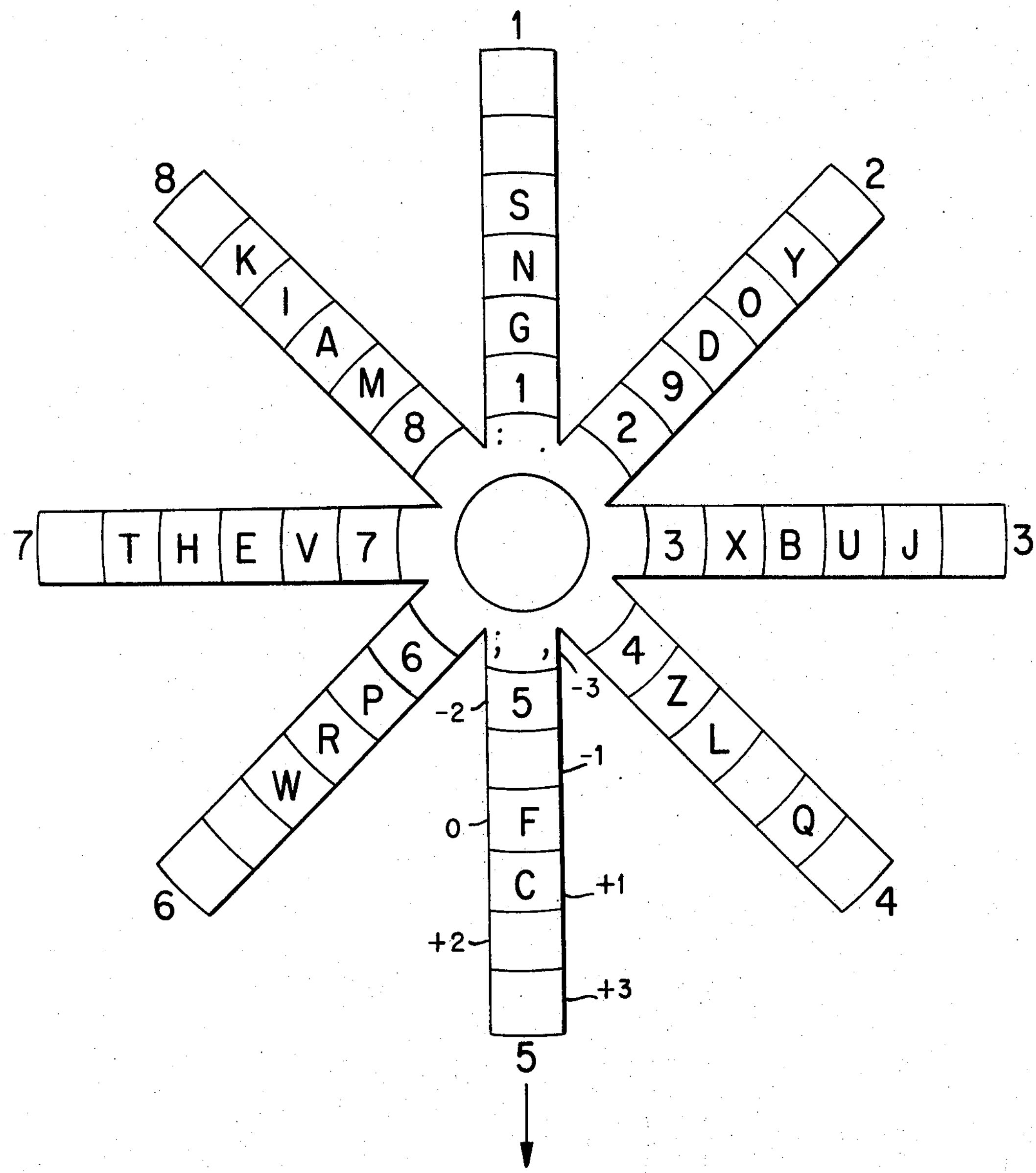

1
S
N
G
1
:
.
2
2
9
D
O
Y
3
3
X
B
U
J
3
4
4
Z
L
Q
4
5
;
,
-3
-2
5
-1
0
F
C
+1
+2
+3
5
6
6
P
R
W
6
7
T
H
E
V
7
7
8
K
I
A
M
8
8

Fig. 9

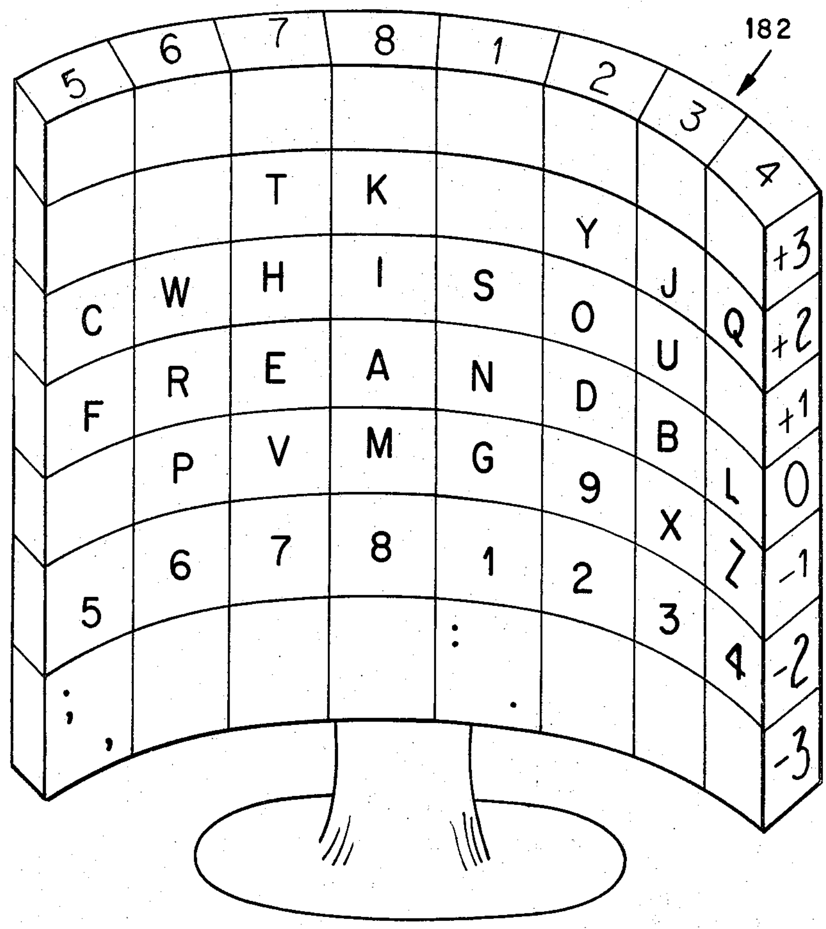

182
5
6
7
8
1
2
3
4
T
K
Y
W
H
I
S
J
C
O
Q
U
E
A
N
R
F
D
B
P
V
M
G
9
L
X
6
7
8
1
5
2
3
Z
4
:
;
,
.
+3
+2
+1
0
-1
-2
-3

Fig. 10

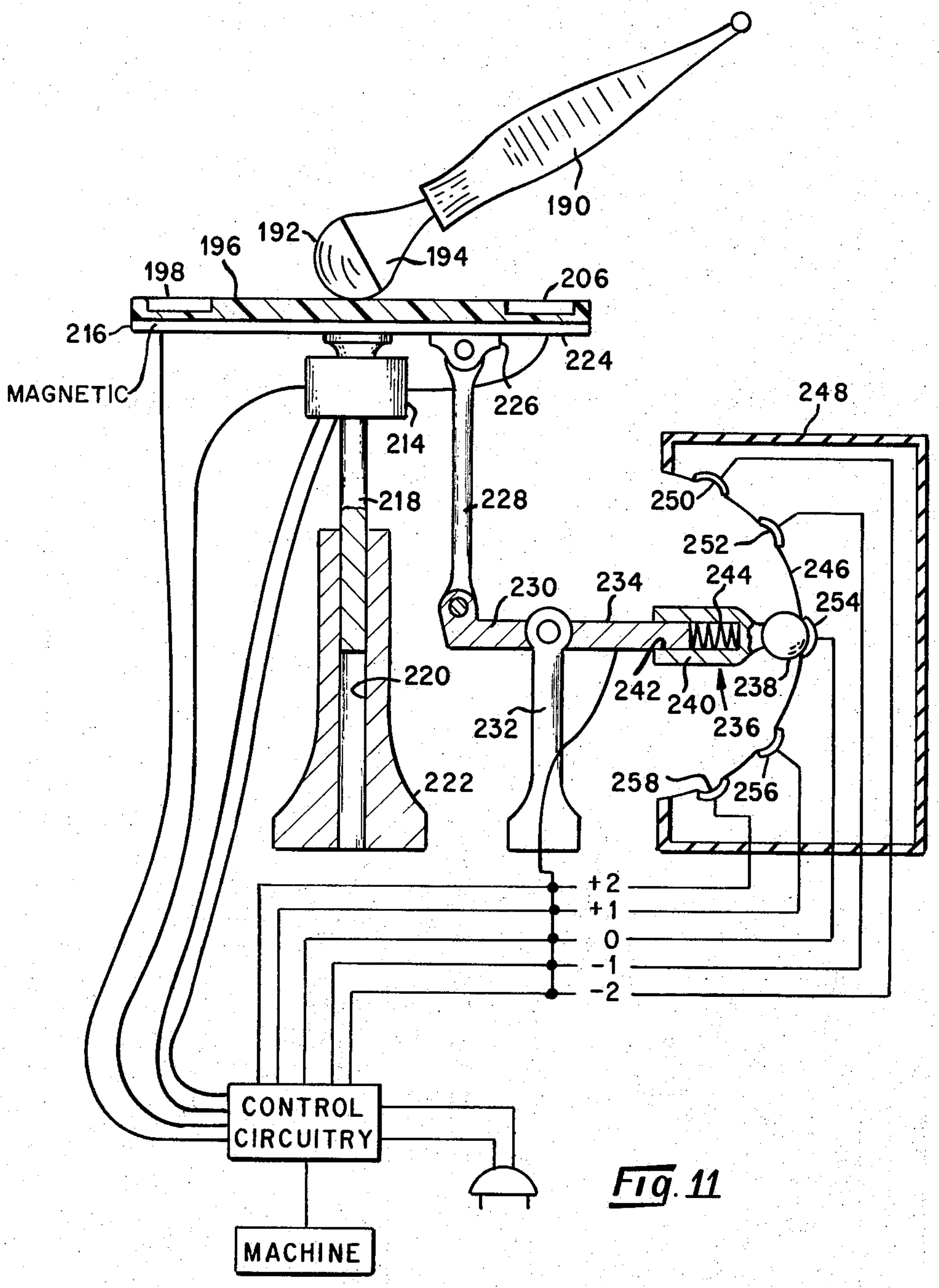

190
192
194
196
198
206
216
224
MAGNETIC
226
214
248
218
228
250
252
246
230
234
244
254
220
242
240
238
236
232
222
258
256
+2
+1
0
-1
-2
CONTROL CIRCUITRY
MACHINE

Fig. 11

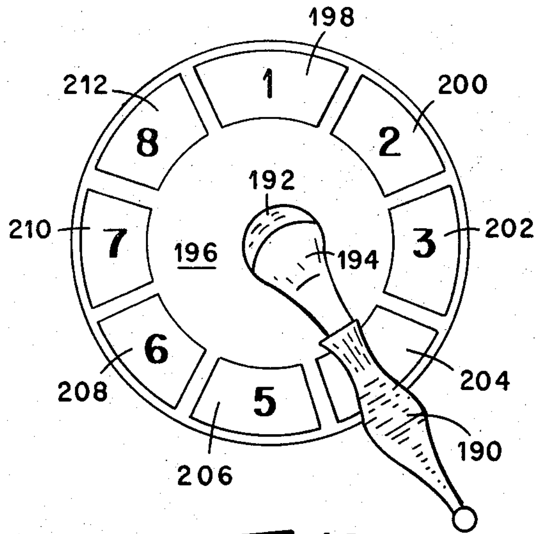

198
1
212
8
200
2
192
210
7
196
194
3
202
6
204
208
5
190
206

Fig. 12

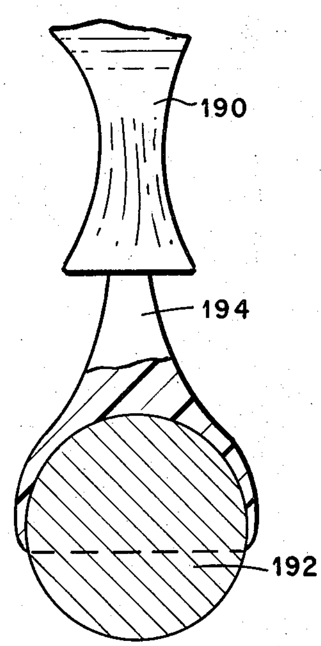

190
194
192

Fig. 13

OPERATOR MEANS ASSOCIATED WITH MULTIPLE SWITCH ARRAY AND SIGNAL TO FUNCTION CORRELATOR MEANS

This invention relates to a man-to-machine interface system. More specifically, the system of the present invention concerns conversion of natural writing musculature to signals useful for controlling, instructing, and/or operating a machine such as an electric typewriter, computer or the like.

A man-to-machine interface as used in the present disclosure refers to that which combines or ties together the functioning of the man and the machine to produce a desired result or product from the machine.

Previously described interfacing devices or systems fall into three general classes, the first of which includes the typewriter in which one key stands for one or two symbols, and where, except for the shift key, only one key is depressed at a time. The second class, exemplified by the stenotype, has the same invariant key-symbol relations but more than one key may be depressed at a time yielding simultaneously printed letter groupings. The third class of interface uses multiple simultaneous inputs from a multiplicity of keys to code for a single letter, digraph, or even word. With ten fingers, and each finger having choice of two or more keys, 1,024 or more possible choices exist. One such system of this class is disclosed in U.S. Pat. No. 2,532,228. Interfaces of the third class have not come into general use because, while the hand positions described are natural, the complex movements described are not; the codes are extremely difficult to teach, the charts used to teach them complex, and unlike the typewriter where one can visually check a key before depressing it, no direct visual check has been possible. Moreover, such interfaces are inoperable by certain physically handicapped, paraplegic or similar individuals, where the fingers may be present in insufficient numbers, may be deformed or lack proper control. Such individuals, as well as blind persons, who have difficulty learning keyboard positions and what they represent, also experience considerable difficulty with multiple-key type keyboard interfaces.

It is therefore an object of the present invention to provide a man-to-machine interface system, particularly such a system wherein the natural writing movements of a man are employed to advantage. It is also an object to provide a man-to-machine interface system which is relatively uncomplicated in construction and mode of operation and which is compact and adaptable for use with various machines in various environments. It is a further object to provide a man-to-machine interface system which requires a minimum of movable human body members for functioning of the system. It is a further object to provide a system of the type described including a display of the progress of the system functioning, making the system readily self-taught. It is a still further object to provide a system of the type described which functions speedily and has a large capacity.

Other objects and advantages will be recognized from the following description including the drawings in which:

FIG. 1 is a diagram of a man-to-machine arrangement including the disclosed system;

FIG. 2 is a representation of a system depicting various features of the invention;

FIG. 3 is a representation of a wand as employed in the disclosed system;

FIG. 4 is a representation of a gimbal-type mount for the wand of FIG. 3;

FIG. 5 is a representation of a vertical bank of switches as employed in the disclosed system;

FIG. 6 is a fragmentary top view of the wand of FIG. 3 and a plurality of circumscribing microswitches;

FIG. 7 is a schematic diagram of various circuitry and other components of the disclosed system;

FIGS. 8A and 8B are a schematic diagram depicting the relationship of various microswitches, AND gates and the machine function associated therewith;

FIG. 9 is a plan layout of the relationship of various lateral wand positions with various vertical wand positions;

FIG. 10 is a representation of a display of the various possible machine functions;

FIG. 11 is a representation of a further embodiment of a system in accordance with the disclosure;

FIG. 12 is a fragmentary top view of the wand and writing surface of the system shown in FIG. 11; and

FIG. 13 is an enlarged fragmentary view of the wand shown in FIG. 11.

In accordance with the present system, a multiple-function machine is operated by a man acting through an interface to develop signals useful to cause the machine to function. In general, the interface system includes activator or wand means which is movable, using generally the same musculature as in writing, to and/or through various combinations of vertical and lateral positions to develop at least two signals, one of which is representative of the vertical position of the wand and one of which is representative of the lateral position of the wand. These signals are paired by appropriate means and correlated with machine functions assigned to the various combinations of signals to provide input signals to the machine that cause it to perform those functions that correspond to those combinations of positions to or through which the wand is moved.

Advantageously, the wand represents a single locus of control, as distinguished from multiple keys. Its movements extend through only limited excursions in three dimensions so that the usual highly developed writing musculature is used in bringing about the desired functioning of the machine. Consequently, good accuracy and speed of the operator is realized.

The thumb and forefinger of man are capable of the most refined movements of all musculature, and during life a large amount of time and effort is spent in all societies refining and extending skills related to these fingers, while very little attention is paid, except in musical studies, typewriting and the like, to developing sequential movement patterns involving all fingers. In the present system, use of motor pathways highly developed during evolution is combined with motor skills normally learned, in an advantageous manner to provide machine inputs.

In one embodiment of the present system, the activator means comprises a pencil-like wand which is movable to a plurality of vertical postions and to a plurality of lateral positions while in each such vertical position. In each selected vertical position, the wand actuates a switch means such as a microswitch, to develop a signal representative of such vertical position. While located in a selected vertical position, the wand is moved laterally to one of its plurality of possible lateral positions whereupon another switch means is actuated and there is developed a further signal representative of its lateral position. These signals are paired by appropriate means to develop an input signal to the machine which causes the machine to perform a function which is representative of the vertical and lateral positions of the wand. Sequential movement of the wand between various positions results in sequential functioning of the machine. Notably, at least two signals are employed to provide a resultant suitable input signal to the machine, contrary to the prior art systems such as electric typewriters where depression of a single key develops a single input signal to the machine, requiring large keyboards and unnatural finger movements for their operation and resulting in limited speeds of operation.

Whereas it is recognized that actuation of a switch does not literally "develop" an electrical signal, for the present purposes, the actuation of a microswitch by the wand is referred to as "developing" an electrical signal that is "fed" to other electrical apparatus. Such wording is chosen in part for convenience of expression but also with the intent to include other alternative electrical or nonelectrical components that may be used in lieu of the microswitches. For example, instead of an electrical system, it is permissible to employ a fluidic system in which case valves would be used in place of the microswitches. In either event, the functioning of the wand is substantially the same.

With reference to FIG. **1**, the disclosed system functionally connects a man to a machine through an interface and a signal-to-function correlator, there being provided a source of power for the interface and for the machine.

In the illustrated embodiment, the apparatus of the disclosed system comprises an upstanding elongated wand **20** which is anchored in a manner that permits vertical movement of the wand and which also permits pivotal or lateral movement of the upper end **22** of the wand. As shown in FIGS. **2** and **4**, such anchoring of the wand is accomplished by a gimbal-type mounting **24** including an arm **26** pivotally mounted at one of its ends **28** to a fixed bracket **30** as by pin means **25** and having a yoke **32** on its unattached end **34**, the legs **36** and **38** of which receive the wand **20** therebetween. The wand is pinned to the yoke **32** as by pins **40** and **42** (only one pin is visible in FIG. **2**) which reside in elongated slots **44** and **46** in the legs **36** and **38**, respectively, of the yoke to permit at least limited rotational movement of the wand. As noted, the arm **26** is pivotally mounted so that the wand **20** is provided with vertical freedom of movement. In addition, the yoke **32** is pivotally connected to the arm **26** by means of a shaft **45** fitted in a bore **47** in the outboard end **34** of the arm. This shaft is retained in the bore as by means of a screw **49** threadly received in the arm **26** and engaging a circumferential slot **51** on the shaft so that the shaft, hence the yoke is held in the bore but is free to rotate about the axis of the shaft. By means of this mounting and the pins **40** and **42** that reside in slots **44** and **46**, the wand is provided with lateral freedom of movement.

The depicted wand (FIGS. **2** and **3**) comprises two elongated elements **48** and **50**, the first element **48** of which comprises a hollow tube which receives the other of the elongated elements **50** therein. The second or inner element **50** is pivotally secured as by a pin **52** to the outer tubular element **48** at a location approximately half-way between the ends of the inner element **50.** The two elements **48** and **50** are coterminal at the upper end **22** of the wand and are provided with knurled knobs **54** and **56** respectively, adapted to be grasped, as between the thumb **59** and forefinger **60,** to effect movement of the wand between its various positions using generally the same musculature as that used in normal writing. A spring **62** secured to the lower leg **64** of the inner element **50** bears against the inner wall **66** of the tubular element at a position such that the knob **56** of the inner element is spring-biased away from the knob **54** on the tubular element and the lower end **64** of the inner element **50** is spring-biased away from a microswitch **68** whose function will be referred to hereinafter.

The arm **26** which serves as a gimbal-type mount for the wand also serves to actuate one or more of a plurality of microswitches **88** disposed in a vertical bank **90.** In the depicted bank of microswitches, there are three microswitches **92, 94** and **96** mounted above the arm and three microswitches **98, 100** and **102** mounted below the arm. More or less microswitches may be provided in the bank either above and/or below the arm. Each of the microswitches is mounted on the end of a leaf spring **104, 106, 108, 110, 112** and **114** with the leaf spring of each of the two microswitches **96** and **98** nearest the arm (one above and one below) being of the same length to give them substantially equal spring constants. The leaf springs of the next two microswitches **94** and **100** in the vertical bank are likewise matched as are the leaf springs of subsequent pairs of microswitches in the bank.

As illustrated in FIG. **5**, when the wand **20** is moved upward, the arm **26** is also moved upward and contacts the microswitch **96** to actuate this microswitch. By reason of the spring constant of the leaf spring **108** on which the microswitch **96** is mounted and the force required to physically move the spring-biased contact element **106** of the microswitch **96,** there is a definite resistance imposed against the arm which tends to restrict upward movement of the arm **26.** This resistance is discernible by the operator through his finger and thumb that holds the wand. The resistance is not so great that it is not readily overcome by a lifting force applied to the wand by the operator, but it is definite and discernible so that the operator can readily detect when he has contacted or moved out of contact with the microswitch **96.** Each of the additional microswitches **94** and **92** in the upper part of the bank **90** exerts a further and greater incremental resistance against the arm **26** as such additional microswitches are contacted by moving the arm further upward to bring the first microswitch **96** into contact with the second and third microswitches **94** and **92,** respectively. Similar incremental resistance to vertical movement of the arm in a downwardly direction is provided by the microswitches in the lower part of the bank. Accordingly, the operator can feel at all times the vertical level at which the wand is located, using the total resistance exerted against the wand or by keeping account of the increments of increased resistance. The arm **26** is biased by a spring **118** to a neutral position wherein it does not actuate any one of the microswitches in the vertical bank.

In the illustrated apparatus, the wand **20** is circumscribed by a plurality of microswitches **120,** eight in the depicted apparatus, mounted in a horizontally oriented ring bracket **122.** Each of the microswitches is spaced radially apart from the upstanding wand but each is secured sufficiently near the wand to permit the microswitch to be actuated upon its being contacted by the wand as the wand is moved laterally by the operator. By reason of the continuous cylindrical surface of the wand **20,** once it is moved into a contact with a switch, the wand may be moved vertically either up or down, without losing contact with the switch as will be discussed further. The lateral microswitches **120** in the illustrated apparatus are individually separated by positioning the contact element **124** of each microswitch within a concavity **126** on the inner wall **128** of the bracket **122.** The joinder between adjacent concavities defines a raised detent **130** between the adjacent concavities which forces a slight radially inward movement of the wand before it can be moved from one microswitch to another. The horizontal position of the bracket **122** is maintained by means of a support member **132** which serves to mount the bracket **122** on one wall **134** of an appropriate housing **136** which is shown only in part in the drawings.

From the foregoing description, it will be apparent that the wand is movable by an operator to one of several lateral positions to contact and actuate the microswitch located in such lateral position. By reason of a greater weight provided on the bottom leg of the wand and the gimbal-type mounting of the wand, the wand is biased toward a "neutral" lateral position wherein the wand is not in contact with any one of the microswitches **120** which circumscribe the wand. Thus, actuation of any microswitch requires positive action by the operator.

Other microswitches **138** and **140** are actuatable by rotation of the wand in a clockwise or counterclockwise direction so as to move a lug **142** mounted on the wand into contact with one of such other microswitches **138** and **140.**

In the illustrated system, there are seven vertical levels designated **+3, +2, +1, 0, −1, −2,** and **−3,** reading from the top microswitch down and designating the neutral position as **0.** For each vertical level, there are eight possible lateral positions of the wand. As referred to hereinbefore, by reason of the cylindrical shape of the wand where it contacts the lateral microswitches, the wand may be held in contact with a selected microswitch and moved up or down to select a different vertical level, hence a different machine function.

As will appear more fully hereinafter, the actuation of a microswitch, (whether it be opening or closing of the switch is a matter of choice) completes an electrical circuit to pass a signal to appropriate electrical apparatus. The described wand is thus capable of actuating at least one microswitch to develop a signal representative of the lateral position and while so holding such microswitch actuated, to actuate at least one other microswitch to develop a further signal which is representative of the vertical position of the wand.

With reference to FIG. **7,** each of the microswitches of the depicted apparatus is connected in an appropriate electrical circuit including a source of electrical power **144** which is fed through a transformer **146** to the system. One lead **148** from the transformer is connected to a solenoid **150** adapted to act upon apparatus such as a typewriter key **151** and cause it to function as by striking a roll **152** and printing a letter. Each of the several microswitches has one of its poles **154** connected to a further lead **156** from the transformer **146.** The second pole **158** of each microswitch is connected to an AND gate **160** whose output lead **162** is connected to the solenoid **150.** As depicted, each AND gate **160** requires an input signal from each of two microswitches **120** and **88** before it develops an output signal. In accordance with the present system, one input to an AND gate is provided by a microswitch **120** whose signal is representative of the lateral position of the wand and the other input signal is provided by a microswitch **88** whose signal is representative of the vertical position of the wand. Accordingly, the AND gate output is representative of both the lateral and vertical positions of the wand so that the machine function which is effected by the AND gate **160** is also representative of such lateral and vertical positions of the wand. Conversely stated, the functioning of the machine is chosen by choice of the lateral and vertical positions of the wand.

It will be recognized that the circuitry depicted in FIG. **7** is fragmentary and intended to be representative of the functioning of the individual components of the present system. In the total circuitry, there is one AND gate provided for each desired machine function and at least two microswitches connected to each AND gate. One suitable combination of AND gates and switches for producing inputs to an electric typewriter, for example, is shown in FIGS. **8** and **9.** In these Figures, the eight microswitches whose respective actuation is representative of lateral positions of the wand are designated **1** through **8,** with number **1** being in the 12 o'clock position relative to the operator, and the six microswitches in the vertical bank are designated **+3, +2, +1, −1, −2,** and **−3.** The neutral position of the arm **26** is designated as **0** as referred to above. The right (clockwise) rotational position of the wand wherein the lug **142** actuates microswitch **140** is designated R and the left (counterclockwise) rotational position wherein the lug **142** actuates microswitch **138** is designated L. The letter P is used to designate the position of the knurled knobs **54** and **56** when they are pinched or pressed together to cause the inner element **50** of the wand to actuate the microswitch **68.** In the illustrated system, the single signal developed upon actuation of the microswitches **138, 140** or **68** (position L, R, and P, respectively) is fed directly to the machine without the use of an AND gate. As depicted, positions L, R, and P effect carriage return, shift to capital letters, and spacing functions of the typewriter, respectively.

In one example of operation of the present system, the wand is positioned in the neutral vertical position (position **0** in FIGS. **5** and **8**) to feed a signal to AND gates **164, 166, 168, 170, 172, 174, 176** and **178.** The wand is next moved laterally into contact with microswitch **120** (position **1** in the circuitry of FIG. **8**) to send a further signal to AND gate **164.** These two signals are fed to the AND gate **164** and cause it to develop an output signal which when received by the typewriter causes it to print the letter N. Other letters are caused to be typed by moving the wand to other positions, either laterally, vertically or both. Appropriate conventional circuitry (not shown) provides control over the number of times a letter is typed per each output from an AND gate. By reason of the placement of the microswitches with respect to the wand, the wand is readily moved to any of its various positions, laterally or vertical (including rotation and pinching together of the knobs), through the use of generally the same musculature as employed in writing, that is, laterally as in forming written letters or figures and vertically as in lifting a writing instrument off a paper or in accentuating the written letters by varying the pressure on the writing instrument. This use of the more developed motor pathways enhances the speed at which the wand can be moved, making the present system faster and more efficient than prior art devices or systems.

The present system is readily learned, even being amenable to self-teaching. As depicted in FIG. **10**, preferably the present system includes a visible indication of the position (lateral and vertical) of the wand before the machine responds by typing that letter represented by the wand position. This is accomplished by causing the outputs of the several AND gates to be directed through a display panel **182** which gives a visual indication of each possible machine function (letters and numbers in the illustrated apparatus). As a particular machine function is ordered, the corresponding function on the panel is lighted, for example, for ready recognition by the operator. A further feature includes a variable delay **184** in the electrical circuitry between each AND gate and the machine. In accordance with this delay, if the operator moves the wand to an incorrect position and detects such by observing the visible indication on the display panel, he has time to move the wand to correct his error prior to the machine functioning. The time of delay preferably is variable so as to allow longer times for beginners to interrogate a position and make a correction if necessary. For more experienced operators, the delay can be substantially eliminated.

In a further embodiment of the disclosed system, a wand **190** is tipped with a ball **192** of a magnetic material which is mounted in a socket **194** in the end of the wand such that the ball will rotate as it is moved over a circular "writing" surface or plate **196**. The writing surface is of a nonelectrically conductive material, such as a plastic, and has eight individual sectors **198, 200, 202, 204, 206, 208, 210** and **212**. In FIG. **12**, these sectors are designated **1** through **8**, respectively, in the same manner as the lateral microswitches described hereinbefore.

In this latter embodiment, when the ball **192** is rolled into contact with a sector **198**, for example, a signal (corresponding to the actuation of a microswitch as described earlier) is developed as by an increase in the capacitance of the sector or through some other electrical property of the sector. Through circuitry readily provided by one skilled in the art, when a signal is developed through the ball contacting a sector, a solenoid **214** mounted beneath and concentric with the writing surface is actuated to draw the ball from the sector to the approximate center of the writing surface, such being the neutral lateral position of the ball, i.e. the wand.

Beneath the sector-containing surface of the writing plate, there is provided a like-sized sheet of permanently magnetic material **216**. This magnetic material attracts the ball and keeps it in contact with the writing plate. The writing plate and its magnetic sheet is mounted on a central rod **218** which is slidably received in a central bore **220** of a pedestal **222**, thereby mounting the plate **196** in a manner which permits it to move up or down. Inasmuch as the ball **192** is held in contact with the plate **196** by the magnetic attraction between the ball and the magnetic sheet **216**, the operator can select or change the vertical position of the plate **196** at will (corresponding to the vertical wand movements described before).

The bottom surface **224** of the plate **196** is provided with a lug **226** to which there is pivotally connected 0ne end of a link **228**. The other end of the link **228** is connected to a rocker arm **230** that is centrally pivoted to a mounting pedestal **232**. The outboard end **234** of the rocker arm **230** is provided with a contact element **236** comprising a rounded tip **238** secured to or integrally formed with a sleeve **240** having a central bore **242**. The sleeve is fitted on the outboard end **234** of the rocker arm **230**, the rocker arm end being received in the bore **242** of the sleeve **240**. A spring **244** is inserted in the bore of the sleeve prior to its being fitted onto the rocker arm so as to bias the sleeve, hence the rounded contact tip, away from the rocker arm and into contact with an arcuate surface **246** on a bracket **248** which has a plurality of electrical contacts **250, 252, 254, 256** and **258** mounted therein. These contacts are exposed at spaced apart locations along the arcuate surface **246** so that the rounded tip **238**, the arcuate surface **246** and the contacts define a type of sliding rotary switch **246** wherein one of the contacts is touched by the tip **238** at each of five different vertical levels of the plate **196** to close an appropriate circuit between the rocker arm **230** and the contact and develop a signal representative of the vertical position of the plate **196**. The curvature of the surface **246** is chosen so that the radial distance between the surface **246** and the pivotal connection of the rocker arm **230** to the pedestal **232** decreases as the tip **238** moves in either direction away from the central contact **254** thereby compressing the spring **244** and increasing the resistance to vertical movement of the plate by the operator to provide him with an indication of the vertical position of the plate **196**.

The operation of this alternative embodiment is substantially identical to the previously described embodiment in that the operator moves the wand to various combinatons of vertical and lateral positions to develop pairs of signals which bring about functioning of the machine.

By way of example, in the alternative, the signals from the several AND gates may be fed to conventional apparatus adapted to utilize such signals for purposes other than operation of a typewriter. Similarly, appropriate circuitry and/or apparatus may be interposed between the AND gates and the machine to provide any of several desired results. In a specific example, the operator may utilize the English language in moving the activator through appropriate locations to "type" a message in English. The signals from the AND gates in such example may be fed into conventional equipment for translating the "English" message into another language so that the machine types or prints the message in the new language.

While the present description has included specific examples and embodiments, it will be understood that there is no intent to limit it by such disclosure, but rather, it is intended to cover all modifications and alternate constructions falling within the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. A man-to-machine interface system including activator means adapted to be moved to a plurality of lateral and vertical positions, said activator means occupying not more than one lateral position and one vertical position at any given time,

a first plurality of switch means disposed in spaced apart relationship to each other and in operative proximity to said activator means, each of said first plurality of switch means being responsive to a single lateral position of said activator means to translate said lateral position of said activator means into a signal that is representative of such lateral position,

a second plurality of switch means disposed in spaced apart relationship to each other and in operative proximity to said activator means, each of said second plurality of switch means being responsive to a single vertical position of said activator means to translate said vertical position of said activator means into a signal that is representative of such vertical position, signal-to-function correlator means receiving said signal that is representative of the lateral position of said activator means and said signal that is representative of the vertical position of said activator means, said correlator means including a plurality of means each of which is adapted to pass a selected signal representative of the lateral position of said activator means and a selected signal representative of the vertical position of said activator means to provide an input signal to a machine adapted to perform a plurality of individual functions each of which is adapted to be actuated upon receipt of an input signal representative of an assigned combination of one lateral and one vertical position of said activator means.

2. The interface system of claim **1** wherein said plurality of switch means responsive to vertical positions of said activator means are disposed in an upright bank with individual ones of said switches being spaced from each other in a vertically stacked array, and including a contact member operatively connected to said activator means and interposed in said bank of switches whereby vertical movement of said contact member moves said contact element into actuating relationship with a first one of said switch means in said bank and further movement of said contact member moves said first one of said switch means into actuating realtionship with a further one of said switch means.

3. The interface system of claim **1** and including housing means receiving and mounting said plurality of switch means responsive to lateral positions of said activator means in positions concentrically and spaced apart from said activator means within respective cavities defined by said housing so that movement of said activator means from one lateral position to another lateral position requires radially inward movement of said activator means prior to changing of its lateral position.

4. The interference system of claim **1** including housing means for supporting said activator means in operative relation to each of said plurality of switch means wherein said activator means comprises a hollow cylindrical upright member mounted in said housing means and adapted to engage individual ones of said pluralities of switch means, a further cylindrical upright member disposed within said first hollow cylindrical member, said second member being pivotally mounted with respect to said first member, and switch means disposed adjacent the lower end of said second member whereby pivotal movement of said second member within said first member functions to bring said lower end of said second member into actuating relationship with said switch means, said second member being biased out of actuating relationship with said switch means.

5. The man-to-machine interface system of claim **1** and including means connected to said signal-to-function correlator means for receiving and visually displaying said input signal to said machine.

6. The man-to-machine interface system of claim **5** and including signal delay means interposed between said visual display means and said machine for providing a discrete time delay in the transmission of said input signal from said visual display means to said machine whereby said input signal is displayed during said time delay.

* * * * *