

June 15, 1965

C. P. BARNARD ET AL

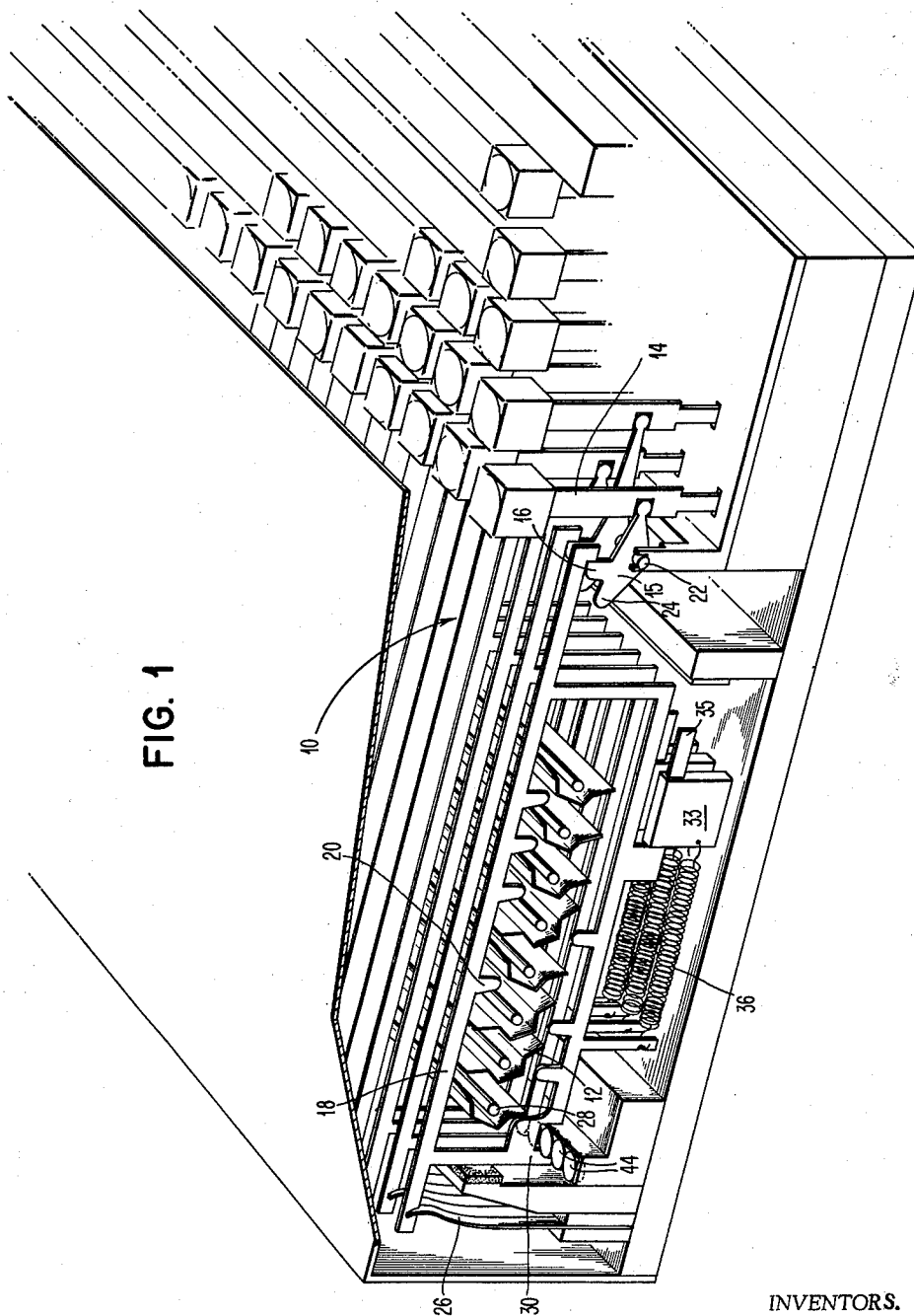
3,189,153

KEYBOARD

Filed July 3, 1962

2 Sheets-Sheet 1

FIG. 1



INVENTORS.
CECIL P. BARNARD
DONALD H. HEISER
BY *Otto Schmid, Jr.*
AGENT

June 15, 1965

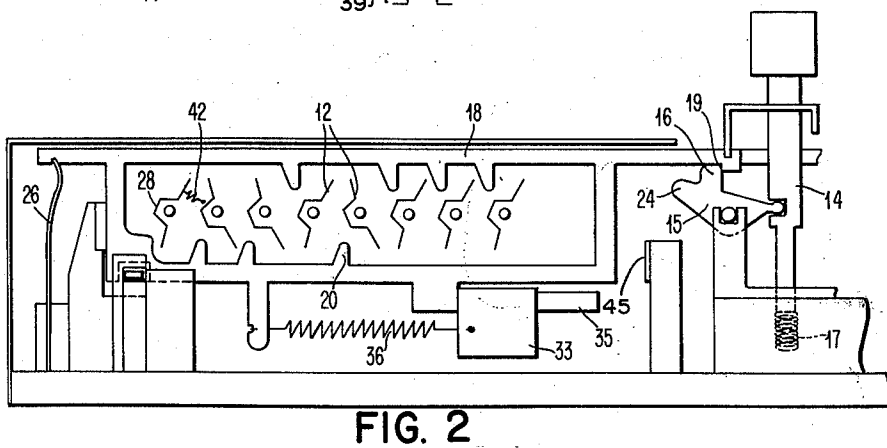
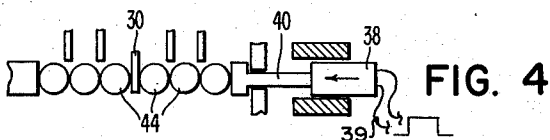
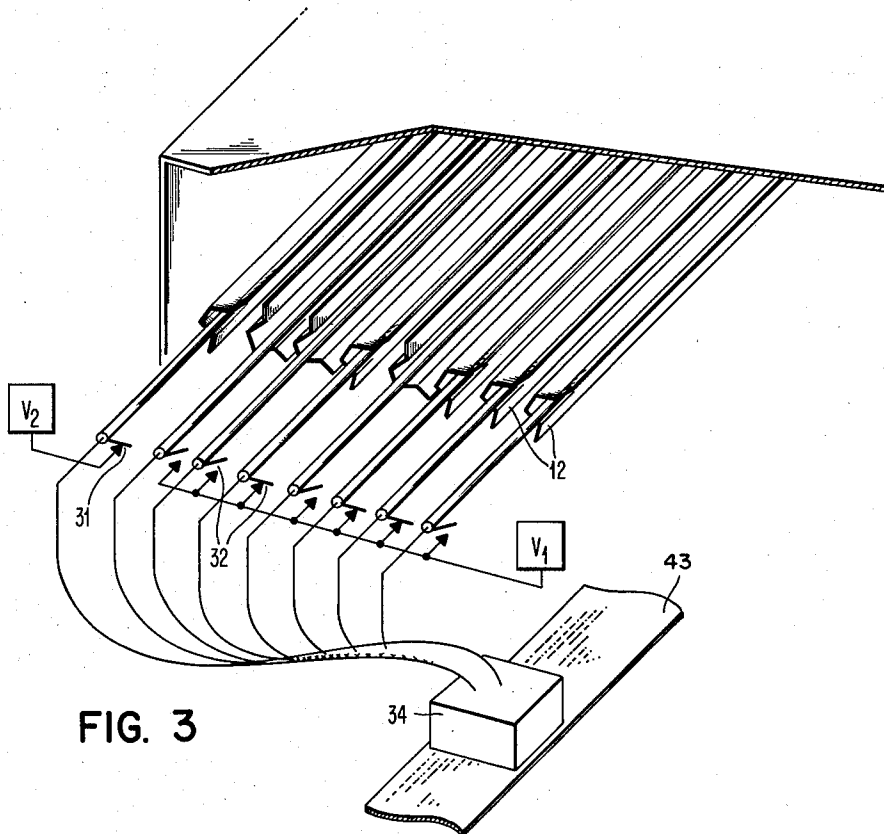
C. P. BARNARD ETAL

3,189,153

KEYBOARD

Filed July 3, 1962

2 Sheets-Sheet 2



1

3,189,153
KEYBOARD

Cecil P. Barnard, San Jose, and Donald H. Heiser, Los Gatos, Calif., assignors to International Business Machines Corporation, New York N.Y., a corporation of New York

Filed July 3, 1962, Ser. No. 207,213
2 Claims. (Cl. 197—98)

The invention relates to keyboards and more particularly to manually operated keyboards for entering data into an accounting or business machine although it is not limited to such machines.

Many keyboards are available in the prior art, and some of these keyboards are adapted to produce a coded output. However, prior art keyboards for producing a coded output have generally been too slow and attempts to avoid this limitation have resulted in relatively complex mechanical arrangements that are expensive to build and to maintain.

It is an object of the invention to provide a keyboard which can accept data at the highest speed attainable on a manual keyboard.

It is another object of the invention to provide a keyboard having a simple construction and a lower cost than prior art keyboards.

It is a further object of the invention to provide a keyboard having a binary coded output.

It is a still further object of the invention to provide a keyboard having reduced power requirements.

In accordance with the present invention, a keyboard mechanism is provided with a plurality of key means each selectively operable to actuate associated coding means so that a plurality of bistable indicia means is moved to one or the other of the stable positions to produce coded output signals corresponding to the selected key means.

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of a preferred embodiment of the invention, as illustrated in the accompanying drawings.

In the drawings, FIGURE 1 is an assembly view of a keyboard according to the invention.

FIGURE 2 is an illustration of a key section and the operation thereof according to the invention.

FIGURE 3 is a diagrammatic schematic view showing the relationship of the contact bails and the associated contact means.

FIGURE 4 shows the details of an alternate delaying means for the keyboard.

Referring to the drawings, the keyboard comprises a plurality of keys 14 each being coupled by suitable coupling means 15 to a coding means 16. Associated with each bit of the code to be produced by the keyboard is an indicia means and an associated contact means 32. The indicia means comprises bails 12 mounted to be moved to one of two stable positions. The coding means are arranged to intercept the code bails and each coding means has a portion positioned to move each contact bail to one of its stable positions. The coupling means is coupled to the coding means so that when a key is depressed the coupling means transmits the force to move the coding means forward and sets each of the code bails to either one of the two stable positions of the bail. The coding means is decoupled so that the coding means is returned to its original position even though the key has not been released. A control means 23 is provided to signify when a new character code is mechanically stored in the keyboard and ready to be electrically transferred into a utilization device by scan-

2

ning the bail contacts. Because a new character code can be set up in the board regardless of the bail position left by the previous character, it is not necessary to restore the bails between key strokes. Thus it can be seen that the keyboard operates with less power and in a shorter time than a conventional keyboard.

FIGURE 1 depicts a keyboard according to the invention having a plurality of key assemblies 10, each of which represents a particular character. A set of contact bails 12 is provided to produce electrical signals in accordance with a desired code by means of associated contacts 32 (FIG. 3) operated by the contact bails. One contact bail is provided for each bit of the output code, so any suitable code may be used. In the embodiment shown, the seven-bit IBM binary coded decimal code is used comprising numeric bits of 1-2-4-8, zone bits of X and Y and a check bit. Each of the key assemblies 10 comprises a key stem 14 which is coupled by a bell crank 15 to the corresponding code bar 18. The coding means comprises a code bar 18 for each key which is mounted to run the depth of the keyboard so as to intercept the contact bails. Each code bar has a central opening having a plurality of protrusions 20 extending into the central opening and the contact bails are mounted in the central opening of the code bars so that a protrusion is located behind either the top or the bottom of each of the contact bails according to the code for the character. A motion to the right (FIGS. 1 and 2) of a code bar will cause it to apply setting motion to all contact bails moving some into a switch closing position, moving others into a switch opening position and not moving some because they are already in the desired position with the movement determined by the position of the protrusions on the code bars. The motion of the code bar is obtained by depressing the corresponding key stem 14 which causes the bell crank to pivot about the point 22. When the code bar has moved sufficiently far forward it is cammed uncoupled from the bell crank by a protrusion 24 of the bell crank. When the code bar is thus uncoupled it is returned to its original position by a return spring 26 even though the key stem may still be depressed. Releasing the key stem allows the associated spring 17 to return the key stem which in turn allows the crank arm 16 to recouple with the notch 19 of the code bar. All contact bails stay in the position to which they are moved by the code bars except a control bail 28 which returns to normal position under tension of spring 42 as the code bar returns. The control bail contact 31 is adjusted to make only after all other bail contacts 32 have been made or broken so that the signal generated by closing the control bail contact can be used to designate that a new character code is mechanically stored in the keyboard and ready to be electrically transferred to a utilization device 34. The utilization device may comprise a magnetic recording assembly, for example, having a transducer for each bit position of the code. The closing of contact 31 by the movement of bail 28 causes the voltage source V_2 to be coupled to the utilization device to provide the control signal designating that a new character is ready to be recorded, and the closing of contacts 32 by the movement of bails 12 causes the voltage source V_1 to be coupled to energize the corresponding transducer and record data on the associated magnetic record member 43.

Interlocking means are provided to insure that only one code bar at a time may be displaced and, therefore, two keys cannot be depressed simultaneously. The interlocking means comprises a plurality of disks 44 mounted in a channel. An interlocking portion 30 of each code bar is disposed to move between the disks when the code

3

bar is moved to the right (FIGS. 1 and 2). The spacing of the disks in the channel is such that the insertion of one tab 30 will cause all the disks to closely abut one another thereby preventing the operation of another code bar at the time one code bar is displaced. A second key may be depressed as soon as the tab portion 30 of the first code bar of the previous key has returned to normal. However, this type of operation may be too fast for some applications since the time cycle of the utilization device may not be fast enough to accept the first character before the code bail contacts are reset for the second character. A delaying means is provided to insure a minimum time interval between key strokes to insure that the code bail contacts remain set a sufficient time before a second character is started. The type of delaying means shown in FIG. 1 comprises a mass 33 mounted for movement upon a bottom longitudinal portion 35 of the code bar. The movement of the mass is restrained by means of a spring 36. Thus, when the code bar is moved to the right (FIGS. 1 and 2), the contacts 32 are moved to a switch closing position. The code bar motion is terminated by stop 45, but the inertia of the mass tends to keep the code bar to the right (FIGS. 1 and 2). By proper selection of mass and spring tension, the code bars can be adjusted to stay in the forward position any desired minimum operating time. Another type of delaying means is shown schematically in FIG. 4. This delaying means comprises an electromagnet 38, the armature 40 of which is mounted to apply compression on the end of the disk interlock row when a code bar has been moved forward. Electromagnet 39 is actuated to move armature 40 in the direction of the arrow in FIG. 4 by applying a suitable voltage pulse to winding 39. This pressure holds the code bar forward and thereby interlocks the keyboard until de-energization of the electromagnet removes the compression force. Thus, it can be seen that the keyboard can be adjusted to hold a bail pattern long enough to transfer electrical signals to a utilization device even though the key stem has returned to normal position.

While the invention has been particularly shown and described with reference to a preferred embodiment thereof, it will be understood by those skilled in the art that the foregoing and other changes in the form and details may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. A keyboard comprising
 - a plurality of data keys,
 - a plurality of code bars operable in response to the movement of the corresponding data keys,

4

- a plurality of bistable code bails adapted to be moved by said code bars to one or the other of the stable positions in predetermined combination representative of the selected data key,
 - switch means responsive to the movement of said code bails for generating data signals, and
 - delaying means responsive to the movement of said code bars in a switch closing direction for holding the switch means against release for a predetermined time so that said data signals are available to a utilization device for said predetermined time.
2. A keyboard comprising
 - a plurality of data keys,
 - a plurality of code bars operable in response to the movement of the corresponding data key, each of said code bars having means for slidably mounting a mass,
 - a plurality of bistable code bails adapted to be moved by said code bars to one or the other of the stable positions in predetermined combinations representative of the selected data key,
 - switch means responsive to the movement of said code bails for generating data signals, and
 - delay means comprising a mass slidably mounted upon said mounting means of said code bars responsive to the movement of said code bars in a switch closing direction for holding the switch means against release for a predetermined time so that said data signals are available to a utilization device for said predetermined time.

References Cited by the Examiner

UNITED STATES PATENTS

2,110,506	3/38	Griffith	178—79 X
2,236,413	3/41	Pirnat et al.	197—107
2,255,030	9/41	Tholstrup	197—107
2,660,617	11/53	Hajek	178—79 X
2,690,249	9/54	Higonnet et al.	197—19
2,767,584	10/56	Franzel et al.	73—304
2,831,410	4/58	Walden	95—4.5
3,038,577	6/62	Ryan et al.	197—99 X

FOREIGN PATENTS

448,846	6/36	Great Britain.
691,761	5/53	Great Britain.
216,549	1/42	Switzerland.

OTHER REFERENCES

- IBM Technical Disclosure Bulletin, p. 44, vol. 3, No. 11, April 1961 (copy in Division 17).

ROBERT E. PULFREY, *Primary Examiner*.