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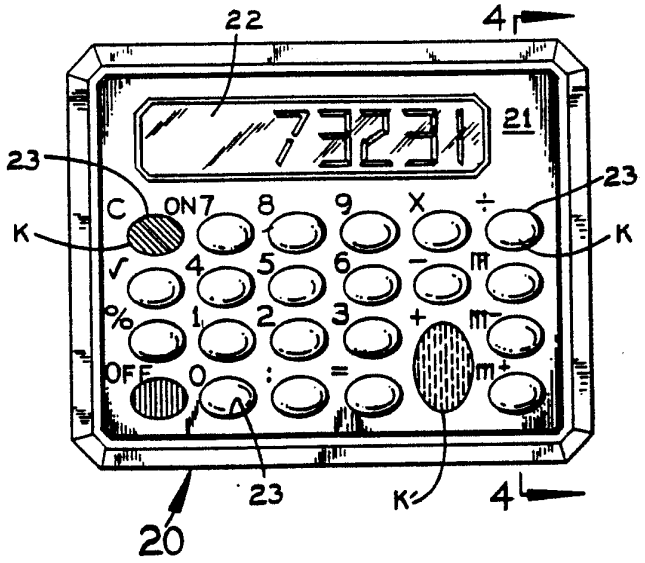
(54) Title: COMBINED HAND-HELD CALCULATOR ASSEMBLY AND JEWELRY ARTICLE



(57) Abstract

The casing of a hand-held electronic calculator of known design aas semi-precious or precious jewel stones as the calculator keys (k), providing both a hand-held calculator assembly and a decorative jewelry article.

* See back of page

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COMBINED HAND-HELD CALCULATOR ASSEMBLY AND JEWELRY ARTICLE

FIELD OF THE INVENTION

This invention relates generally to calculators and particularly to electronic calculators having jewel stones as the keys.

BACKGROUND OF THE INVENTION

Various electronic calculators small enough to be conveniently held in a person's hand have been on the market which have plastic keys that the user depresses with his or her fingers to enter numbers and computational operations.

SUMMARY OF THE INVENTION

The present invention has semi-precious or precious jewel stones as the keys of a hand-held electronic calculator which in other respects may be like the prior art calculators. The use of such ornamental jewel stones as the keys enables the calculator to double as a jewelry article attractive enough to be displayed in the most elegant surroundings.

A principal object of this invention is to provide a combined hand-held calculator assembly and jewelry article in which the calculator keys are semi-precious or precious jewel stones.

Further objects and advantages of this invention will be apparent from the following detailed description of several presently-preferred embodiments shown in the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

Figure 1 is a top plan view of a calculator with oval

cut semi-precious jewel stones as the keys, in accordance with a first embodiment of this invention;

Figure 2 is an end elevation taken from the right end of Figure 1;

Figure 3 is a front elevation of the Fig. 1 calculator;

Figure 4 is an enlarged cross-section taken along the line 4--4 in Fig. 1;

Figure 5 is a top perspective view of one of the keys in the Fig. 1 calculator;

Figure 6 is a bottom perspective view of this key with a foil layer on the bottom partly peeled away;

Figure 7 is a top plan view of a calculator according to a second embodiment of this invention, with emerald cut semi-precious jewel stones as the keys;

Figures 8 is an end elevation taken from the right end of Figure 7;

Figure 9 is a front elevation of the Fig. 7 calculator;

Figure 10 is an enlarged cross-section taken along the line 10--10 in Figure 7;

Figure 11 is a top perspective view of one of the keys in the Fig. 7 calculator;

Figure 12 is a bottom perspective view of this key with a foil layer on the bottom partly peeled away;

Figure 13 is a top plan view of a calculator in accordance with a third embodiment of this invention having all the number keys and some of the computational function keys of the same jewel stone and other function keys of different jewel stones; and

Figure 14 is a top plan view of a calculator in accordance with a fourth embodiment of this invention with most of the keys in diagonal rows, each of which has all keys of the same jewel stone different from those in the neighboring diagonal rows.

Before explaining the disclosed embodiments of the present invention in detail it is to be understood that the

invention is not limited in its application to the details of the particular arrangements shown since the invention is capable of other embodiments. Also, the terminology used herein is for the purpose of description and not of limitation.

DETAILED DESCRIPTION

Referring to Figures 1-4, the calculator shown there has a generally rectangular casing 20 with a flat top wall 21 having a laterally elongated window 22 for displaying numbers and a plurality of oval openings 23 at which the calculator keys K are located.

As shown in Figure 4, the top wall of the calculator casing has a thin, flat, rigid, metal panel 21a covered on the outside by gold or silver plating 21b for a visually attractive appearance.

Each key is an oval-cut, cabochon, semi-precious jewel stone with a shape as shown in Figures 5 and 6. The jewel stone has a convex dome 24 on the top projecting up from an elliptical side edge 25 (Fig. 4) and an oval flange 26 on the bottom projecting laterally outward from the side edge 25 along its complete extent. The bottom flange 26 presents a flat top face 27 (Fig. 5) surrounding the side edge 25 and extending perpendicular to it. The bottom flange of each key has a flat bottom face 28 (Fig. 6) to which a thin, electrically conductive, metal foil 29 is adhesively bonded. This foil is the movable electrode of a capacitance switch of known design.

In Figure 1 all of the keys are the same size and orientation in the top wall of the calculator except a larger key K', which is the "+" key that a user depresses to add numbers. Key K' is larger than the other keys and it is elongated from front-to-back across the top of the calculator whereas the other keys K are elongated from side-to-side across the calculator. This larger key K' except for its size has the same shape as the other keys, with a domed top segment projecting up from an oval side edge and an enlarged, flat-bottomed flange below the side

edge.

Referring to Figure 4, the top wall panel 21a of the calculator casing is on top of a support frame 30 of rigid dielectric plastic material. Frame 30 is formed with a plurality of oval top openings 31 each of which is slightly larger than the corresponding key at its oval side wall 25, and oval bottom openings 32, each of which is slightly larger than the respective key at its bottom flange 26. Each bottom opening 32 in the frame intersects a corresponding top opening 31 at a respective downwardly-facing shoulder 33, which is engageable by the top face 27 (Fig. 6) of the bottom flange on the corresponding key to provide an upper limit stop for the key. Each key can be pushed down into the casing by the pressure of a person's finger, and when this happens the bottom flange 26 of the key slides down the bottom opening 32 in the support frame 30 inside the calculator casing directly below its top wall 21.

A flexible and resilient diaphragm 34 of suitable rubber-like material directly overlies a generally flat printed circuit board B that carries the electronic components and wiring of the calculator. This printed circuit board may be of known design. Below each key it carries the fixed electrode 35 of a capacitance switch of known design. The diaphragm 34 has a plurality of upwardly projecting cylindrical nodes 36, one beneath each key K or K'. Each node has a flat top wall 37 that engages the metal foil 29 on the bottom of the corresponding key. A pad 38 of relatively soft, compressible and resilient material is adhesively affixed to the bottom face of the top wall of each node 36 in the diaphragm.

Normally, as shown in Figure 4, the nodes 36 of the diaphragm hold the corresponding keys up against the downwardly- facing shoulder 33 in the frame 30 below the top wall of the casing. In this position of the parts, the soft pad 38 in each node is spaced above the corresponding fixed electrode 35 of the capacitance switch operated by

that key.

When any key is depressed manually, the corresponding upstanding node 36 of diaphragm 34 is flattened and its pad 38 moves down against the fixed switch electrode 35. The downward movement of the foil layer 29 on the bottom of that key toward the fixed electrode 35 directly below it produces a switching action in a well-known manner. When finger pressure is removed from the key that has been depressed, the node 36 below that key springs back to the position shown in Figure 4.

As indicated by the shading in Figure 1, all of the calculator keys except the "C, ON" key, the "OFF" key and the larger "+" key K' are substantially colorless, translucent crystal, the "C ON" key is jade, the "OFF" key is rose quartz or garnet, and the "+" key is amethyst. However, it is to be understood that all the keys may be of the same semi-precious jewel stone, such as amethyst, or they may be a variety of different semi-precious or precious jewel stones of different colors, such as amethyst, rose quartz, blue agate, aventurine, carnelian, mother-of-pearl, garnet, pearl, ruby, emerald, sapphire and diamond arranged in a predetermined multi-color pattern or arranged randomly.

Figure 7-12 shows a second embodiment of the invention which is essentially the same as the first embodiment (Figs. 1-6) except that the keys are emerald-cut semi-precious jewel stones instead of the oval cabochons of the first embodiment. The elements of this second embodiment are given the same reference numerals with a "-2" suffix added as the corresponding elements of the first embodiment so the detailed description need not be repeated.

As shown in Fig. 11 and 12, each key in the second embodiment of the invention has a thin, flat, bottom flange 26-2 projecting out laterally from a side wall 25-2 of the jewel stone that is rectangular in outline except for beveled corners 25a-2. Each key has a bevel-edged top segment 24-2 that normally projects above the top wall 21-2 of the calculator casing. The side wall 25-2 of the key

fits snugly but slidably in the corresponding opening 23-2 in the top wall 21-2 of the casing. The top face 27-2 of the bottom flange 26-2 of each key normally engages a corresponding downwardly-facing shoulder 33-2 provided by the frame 30-2 inside the calculator casing beneath its top wall 21-2. The bottom flange 26-2 of each key is snugly but slidably received in a corresponding bottom opening 32-2 in frame 30-2.

With this arrangement, any key can be pushed down by a person's finger to perform a switching function in the manner already described for the first embodiment of thee invention (Figs. 1-6).

As indicated by the shading in Figure 7, the calculator shown there has a multi-colored keypad including a rose quartz or garnet "C ON" key, a jade "5" key, an aventurine "%" key, a blue agate "OFF" key, a carnelian "+" key, and substantially colorless, translucent jewel stones for all the other keys. However, it is to be understood that any desired pattern of differently colored jewel stones may be provided in the key pad, such as by having amethyst as all of the number keys.

Figure 13 shows another embodiment of the invention which is like the embodiment of Figure 7 except that it has a larger window 22-3 for displaying the numbers.

Figure 14 shows a fourth embodiment which is like Figure 13 except that it has keys of differently-colored semi-precious jewel stones, with all the keys in a given diagonal row the same type of jewel stone. For example, starting at the upper left corner, the "C ON" key 40 is rose quartz or garnet, the diagonally aligned "7" key 41 and "5" key 42 are blue agates, the diagonally aligned "8" key 43, "4" key 44 and "%" key 45 are carnelians, the diagonally aligned "9" key 46, "5" key 47, "1" key 48 and "OFF" key 49 are amethysts, the diagonally aligned "X" key 50, "6" key 51, "2" key 52 and "0" key 53 are aventurines, the diagonally aligned "-" key 54, "-" key 55, "3" key 56 andd decimal point key "57" are garnets or rose quartzes,

the diagonally aligned "M " key 58 and "=" key 59 are blue agates, the larger "+" key 60 is an amethyst, the "M-" key 61 is a blue agate, and the "M+" key 62 in the lower right corner is a carnelian.

I CLAIM:

1. A combined hand-held calculator assembly and jewelry article comprising:

a casing for an electronic calculator, said casing having a wall with openings therein corresponding to individual numerical digits and computational operations;

a plurality of semi-precious or precious jewel stones snugly but reciprocably received individually in said openings and constituting the keys of said calculator;

and resilient means inside said casing biasing said jewel stones to positions projecting outside said wall of the casing, said resilient means being displaceable into the casing away from said wall at each of said jewel stones by the force of a person's fingers on said jewel stone.

2. A combined calculator assembly and jewelry article according to claim 1 wherein:

each of said jewel stones has an inner segment inside said casing which is larger than the corresponding opening in said wall of the casing;

and said resilient means is a diaphragm of rubber-like material biasing said inner segments of said jewel stones toward the inside of said wall of the casing around the edges of said openings.

3. A combined calculator assembly and jewelry article according to claim 1 wherein:

said plurality of jewel stones comprise a variety of differently-colored jewels.

4. A combined calculator assembly and jewelry article according to claim 1 and having:

a first jewel stone of a particular semi-precious jewel as the C/ON key of the caluclator;

and a second jewel stone of a different semi-precious jewel as the OFF key of the calculator;

said first and second jewel stones being of respective semi-precious jewels different from all the remaining jewel stones in said openings in said wall of the casing.

5. A combined calculator assembly and jewelry article according to claim 1 wherein:

a majority of said openings in said wall of the casing are arranged in neighboring diagonal rows spaced apart in succession across said wall;

and in each of said diagonal rows of openings the jewel stones are the same as each other and different from the jewel stones in the remaining diagonal rows of openings.

6. A combined calculator assembly and jewelry article according to claim 1 wherein:

each of said jewel stones is an oval cabochon.

7. A combined calculator assembly and jewelry article according to claim 6 wherein:

each of said jewel stones has an inner segment inside said casing which is larger than the corresponding opening in said wall of the casing;

and said resilient means is a diaphragm of rubber-like material biasing said inner segments of said jewel stones toward the inside of said wall of the casing around the edges of said openings.

8. A combined calculator assembly and jewelry article according to claim 1 wherein:

each of said jewel stones is an emerald-cut, generally rectangular stone with beveled corners.

9. A combined calculator assembly and jewelry article according to claim 8 wherein:

each of said jewel stones has an inner segment inside said casing which is larger than the corresponding opening in said wall of the casing;

and said resilient means is a diaphragm of rubber-like material biasing said inner segments of said jewel stones toward the inside of said wall of the casing around the edges of said openings.

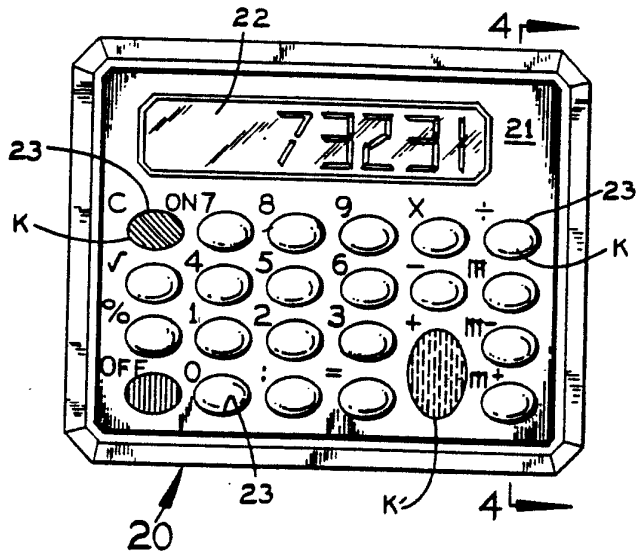

FIG.1

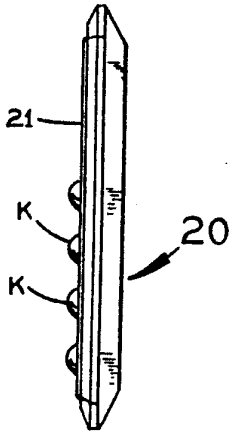

FIG.2

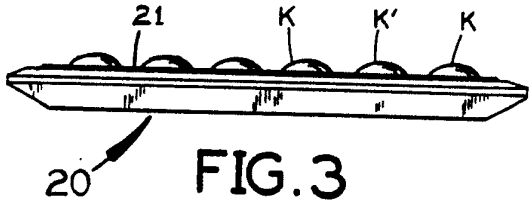

FIG.3

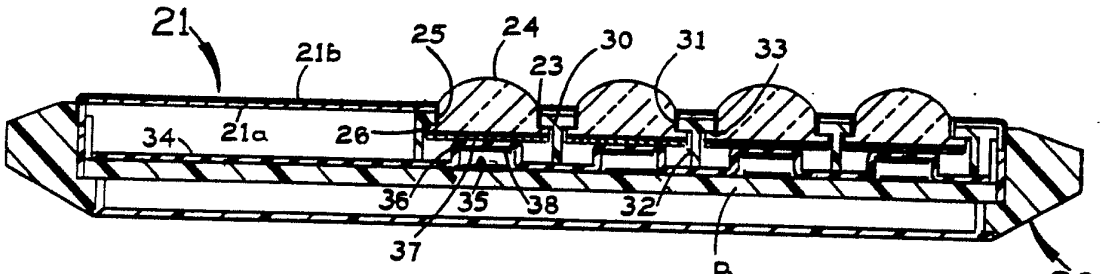

FIG.4

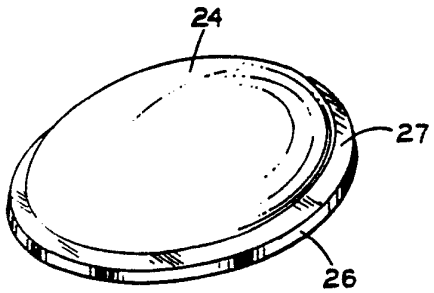

FIG.5

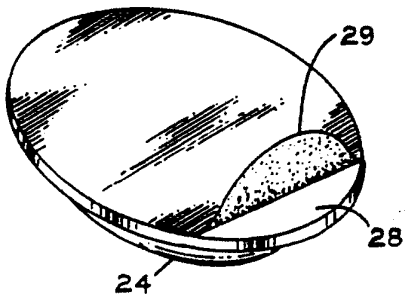

FIG.6

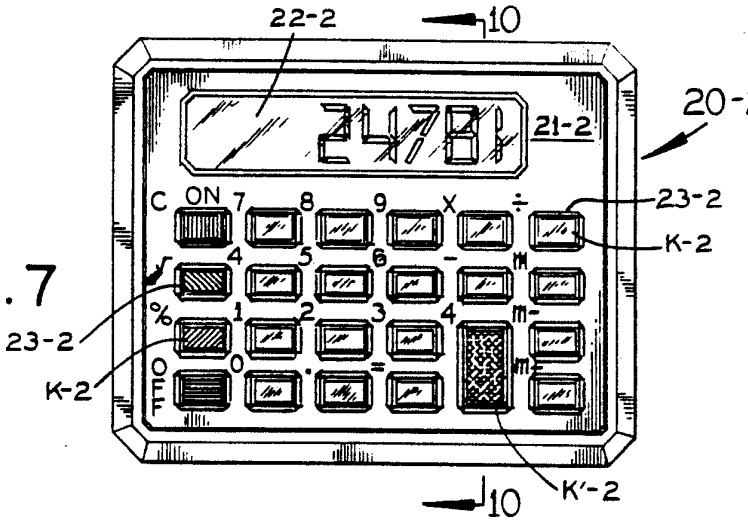

FIG. 7

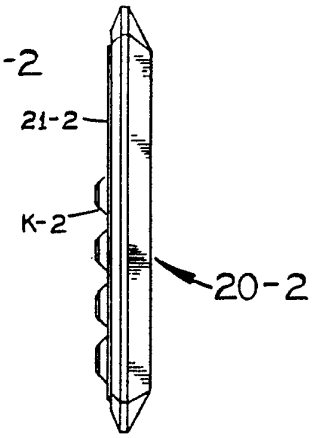

FIG. 8

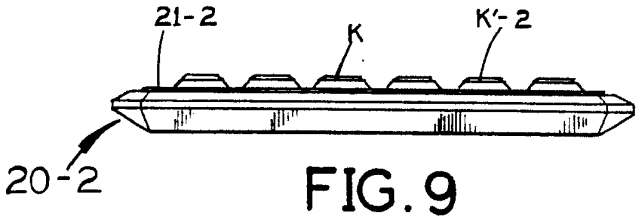

FIG. 9

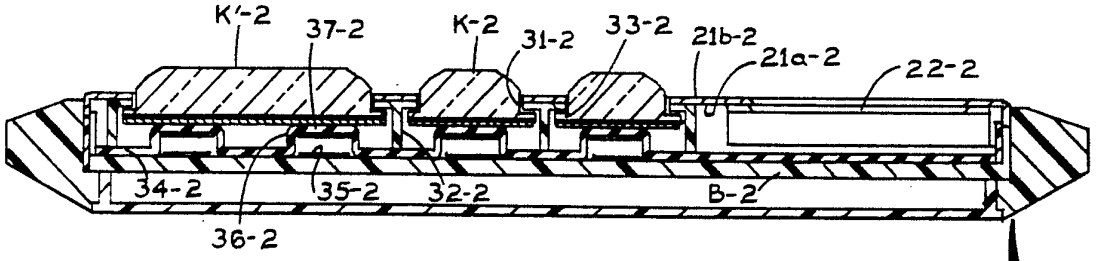

FIG. 10

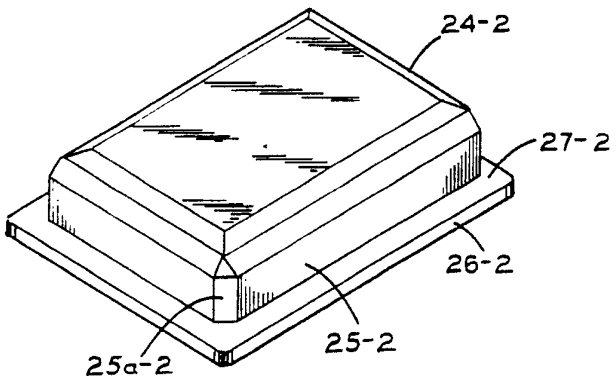

FIG. 11

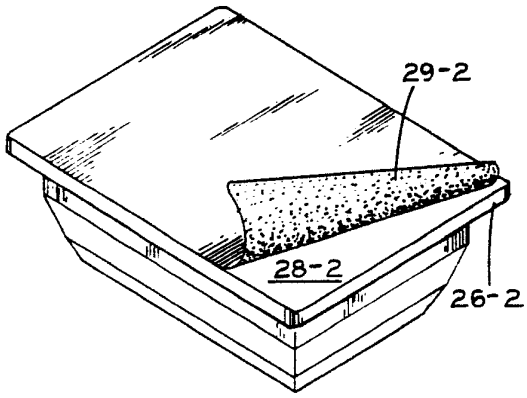

FIG. 12

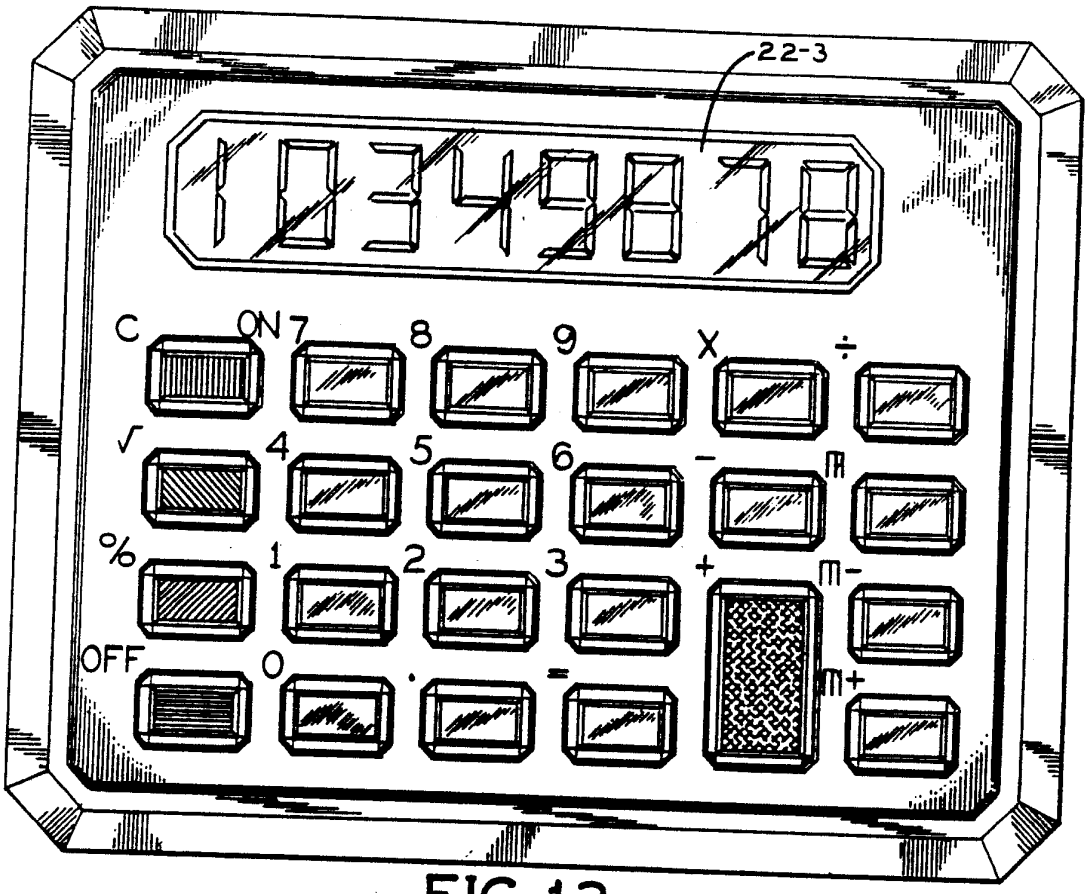
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FIG.13

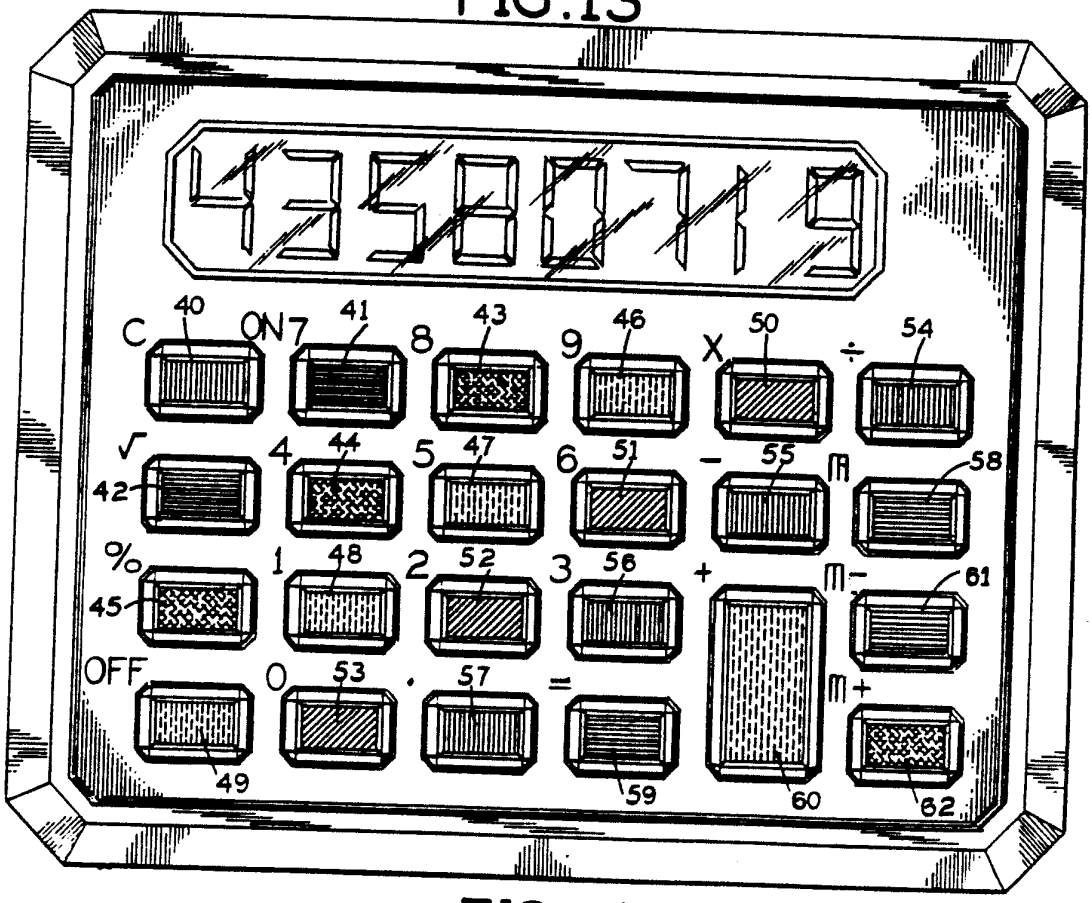
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FIG. 14

INTERNATIONAL SEARCH REPORT

International Application No PCT/US90/05440

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC (5): G06F 1/00
U.S. CL: 235/10

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
U.S.	235/10,145R; 200/5A,5R; 206/305,563,564,566; 364/708

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
Y	US, A, 4,560,845, Published 24 December 1985 (TAKAMURA ET AL.) See entire document.	1-9

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IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]

13 DECEMBER 1990

Date of Mailing of this International Search Report [2]

04 FEB 1991

International Searching Authority [1]

ISA/US

Signature of Authorized Officer [20]

for BRIAN W. BROWN

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