

[54] **MECHANICAL DEVICE WITH MANUALLY OPERABLE KEYS FOR SUPPLYING VOLTAGE TO OUTPUT CHANNELS IN PRESET FASHION**

3,432,635	3/1969	Soprani	200/166 BA
2,882,514	4/1959	Krantz	200/166 BA X
2,666,822	1/1954	Pelletier et al.	200/166 BA X
3,193,607	7/1965	Anderson	200/166 BA UX

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[30] **Foreign Application Priority Data**

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[51] Int. Cl. **H01h 9/26, H01h 5/06, H01h 1/30**

[58] Field of Search **200/5 E, 5 EA, 166 BA, 200/166 BH; 84/1.01, 1.04**

[56] **References Cited**

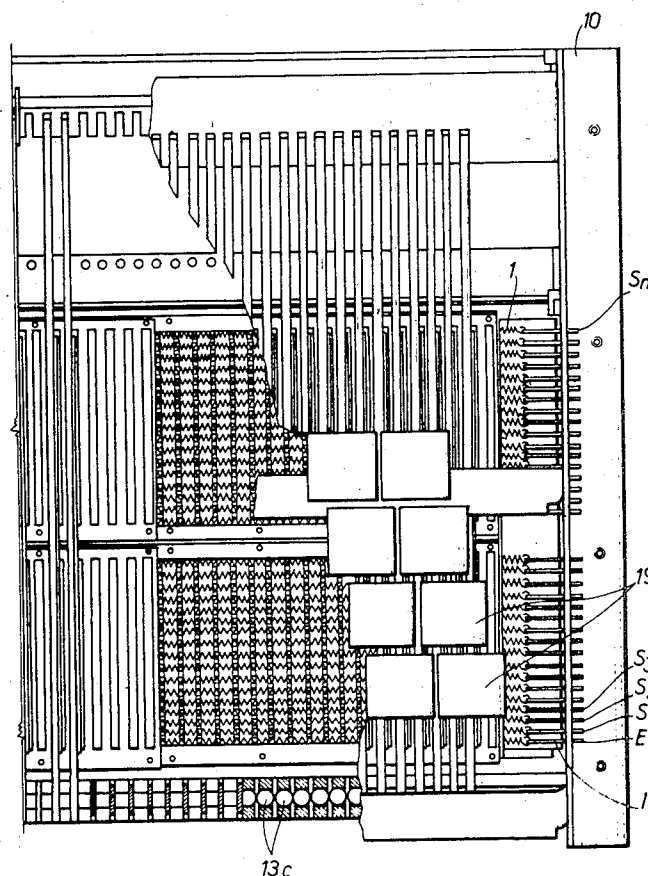
UNITED STATES PATENTS

3,494,550 2/1970 Hayes et al. 200/5 E

[57] ABSTRACT

Mechanical device with manually operable keys enabling a number of output connections to be supplied with an input voltage in preset fashion. An output connection is connected to a tightly coiled helicoid conductor resting on successive insulating projections. A movable, electrically conducting blade operable by means of a key is in registry with an opening or space between a pair of successive projections whereby to be able to establish an electrical contact with certitude between said blade, when it is driven downwardly by pressing the key and the helicoid conductor.

11 Claims, 6 Drawing Figures



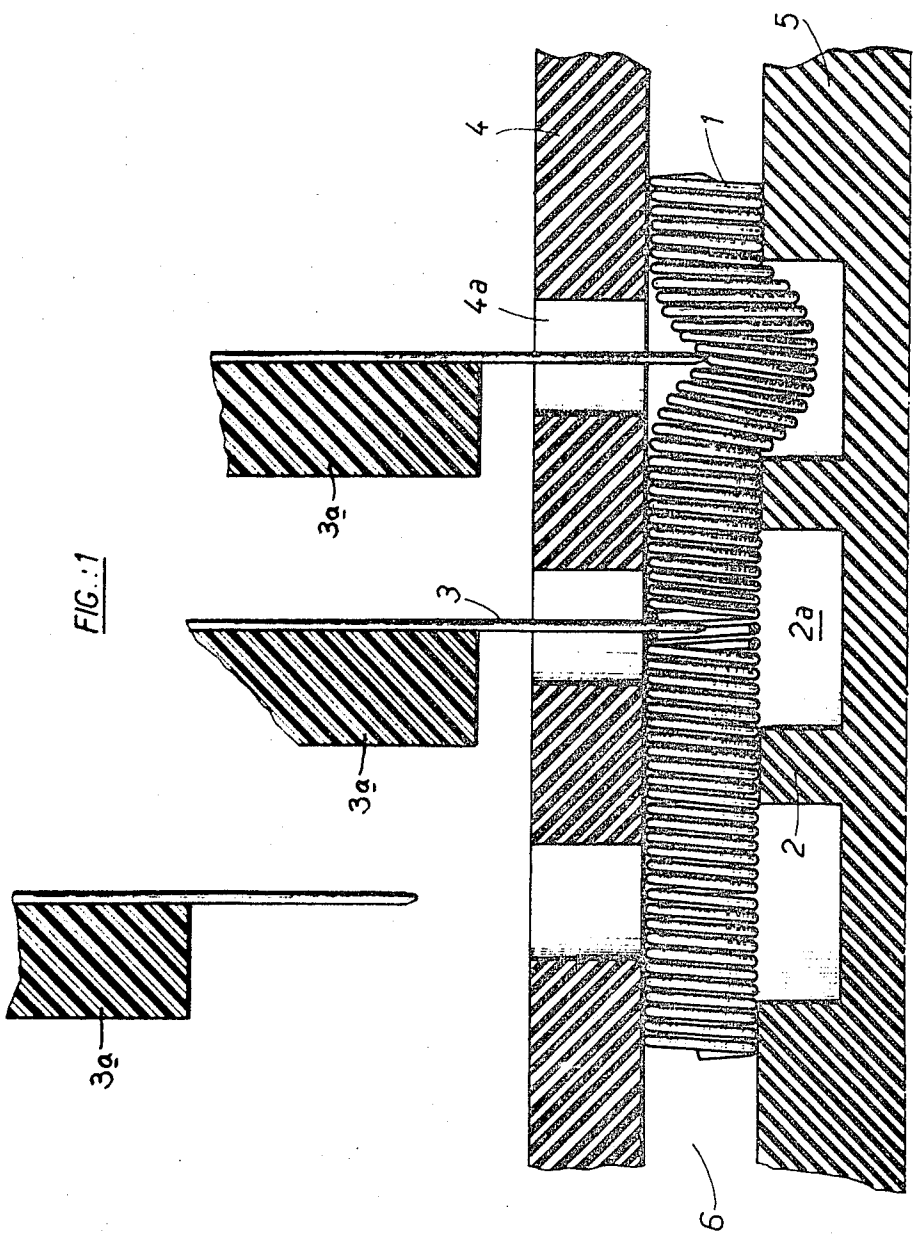


FIG. 2

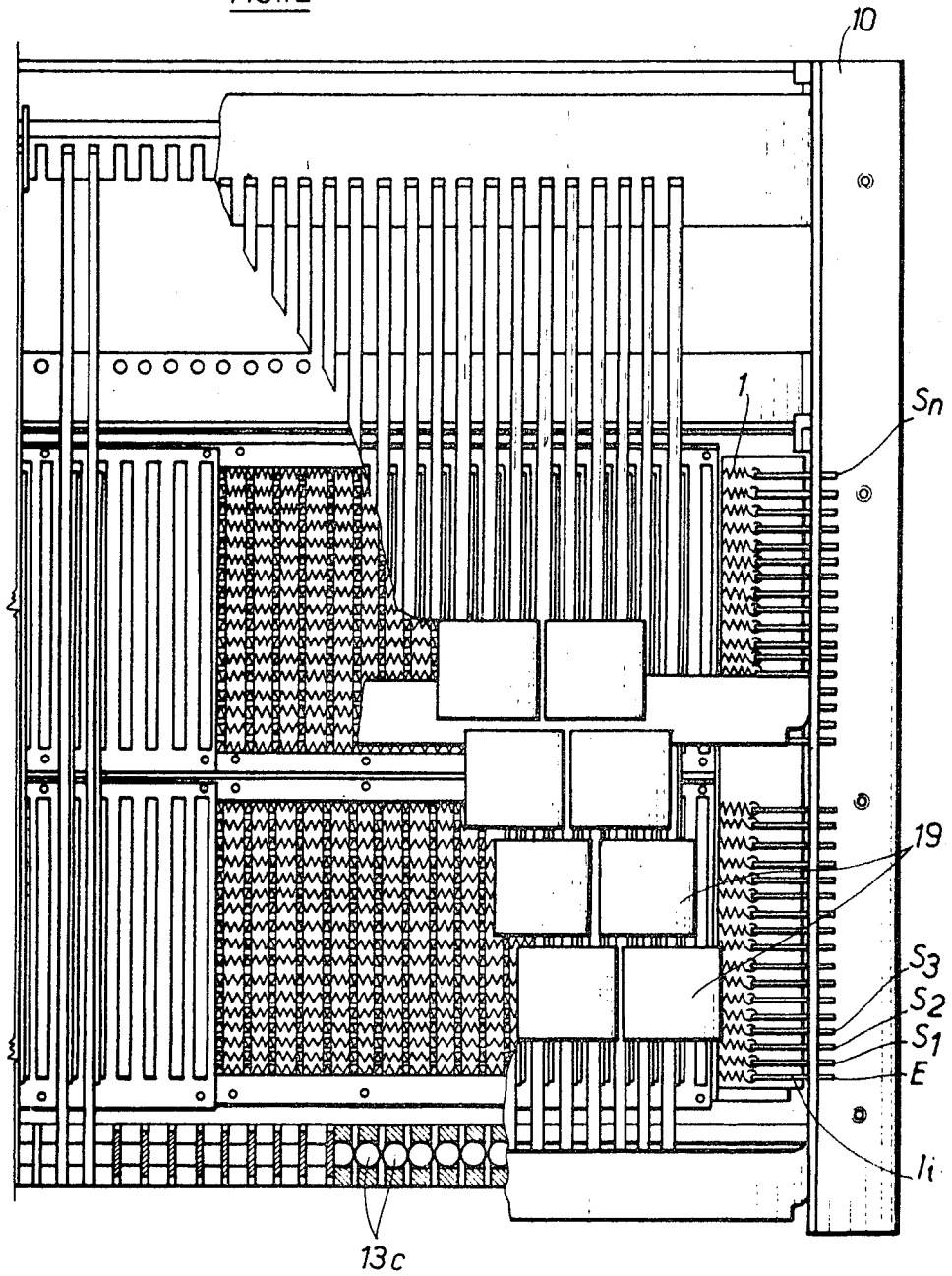


FIG.:3

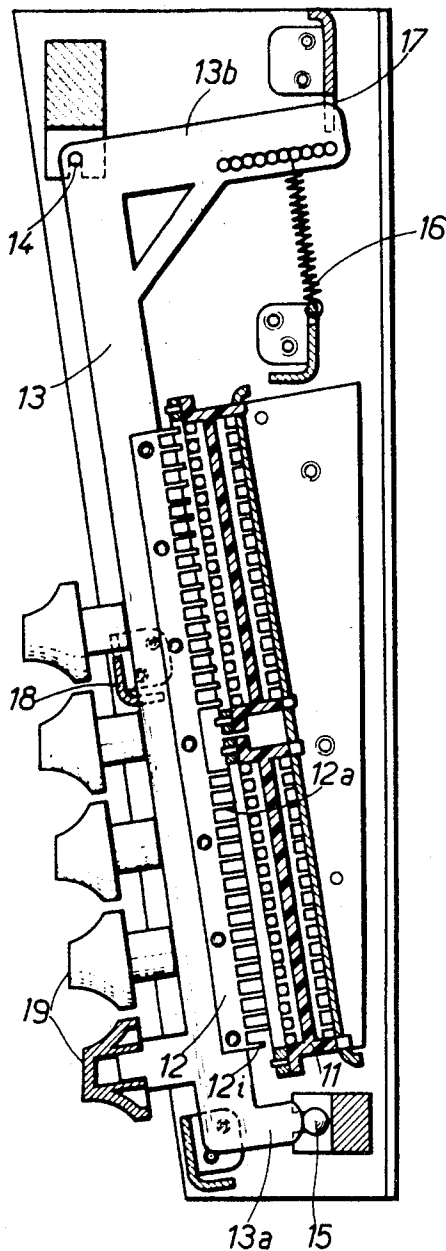


FIG.:3a

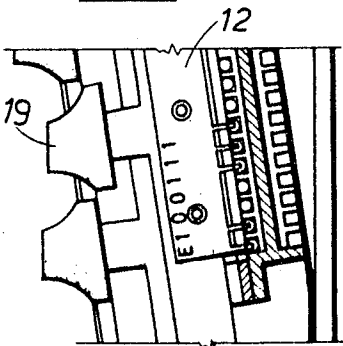


FIG.:4

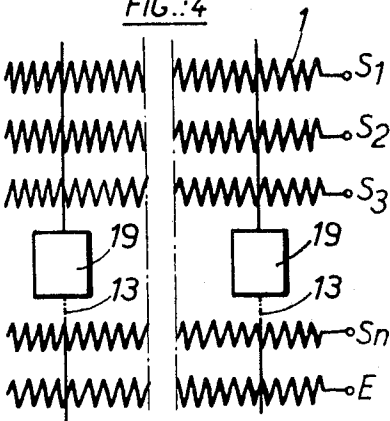
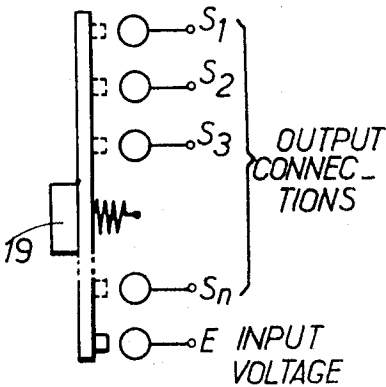


FIG.:5



MECHANICAL DEVICE WITH MANUALLY OPERABLE KEYS FOR SUPPLYING VOLTAGE TO OUTPUT CHANNELS IN PRESET FASHION

The present invention, which falls within the province of electric switches, relates to a keyboard, that is to say to a device with manually operable keys for supplying voltage to output channels in preset fashion by establishing the required electrical contacts.

It may be required to obtain, off a single input voltage, a combination for supplying a certain number of output channels among a plurality thereof that corresponds to a given code or meets certain needs. Such a combination is obtained by operating a specific key on the keyboard. Such a keyboard may comprise a plurality of keys of this kind, each corresponding to a different combination.

Having thus defined the function of the device, it will be clear that the latter can be devised by utilizing conventional mechanical switches. If however it is desired to use such a device for controlling a unit such as an electronic computer or the like, the contacts to be made must meet the following requirements in particular :

- they must be reliable and positive, that is, there must be no danger of making false electrical contacts or contacts established through appreciable contact resistance;
- they must be made virtually instantaneously and be definitive once the key is depressed; and
- they must be made simultaneously on all the selected output channels.

Subsidiarily, it will be of advantage to be able to readily modify at will the selected output channel combinations and to be able to enlarge the capacity of the device fairly easily, that is, the number of possible combinations available.

It will readily be appreciated that the prior art devices, which involve making contacts by means of blades cooperating with contact studs (which are the cause of rebound and sputtering), cannot satisfy these requirements.

Prior art methods also include making the contacts by means of knife edges striking wires, but this is not satisfactory for the more general case herein considered.

It is the object of this invention to overcome these various drawbacks and to accordingly provide a device in which each of the output channels or connections is electrically connected to a helicoid electrical conductor the tightly wound turns of which rest on successive insulating projections, and key-actuated blades acting as contacts are provided opposite helicoid between pairs of consecutive projections, means being provided to electrically connect these contacts to the input voltage shortly after depression of the blades is initiated.

The description which follows with reference to the accompanying non-limitative exemplary drawings will give a clear understanding of how the invention can be carried into practice.

In the drawings :

FIG. 1 shows on an enlarged scale the method of operating the contact;

FIG. 2 is a plan view of part of a keyboard according to the invention;

FIG. 3 is a corresponding cross-sectional view, the keys being shown in their resting position;

FIG. 3a is a portion of FIG. 3 shown with a key depressed;

FIG. 4 is a diagrammatic plan view of the keyboard of FIG. 2; and

FIG. 5 is a side elevation of the diagrammatic view of FIG. 4.

FIG. 1 illustrates the physical phenomenon on which this invention is based. It was found that if a wire 1 was tightly coiled into a helix over a series of projections 2 formed on the bottom of an insulating housing and that if contact blades 3 positioned above and opposite the openings or spaces 2a between consecutive projections 2 are moved downwardly by insulated key means 3a or the like, a clean-cut unambiguous electrical contact is obtained with certainty, that is to say without exception, between a blade 3 and the helical wire 1. For as shown for example for the middle blade in FIG. 1, either blade 3 penetrates directly between two consecutive turns, and, because of the obliquity of the turns, it quickly positions itself with friction between the two turns into which it penetrates, at the same time as it straightens these turns; or else, what is less frequent but may nevertheless happen (see righthand blade in FIG. 1), the blade impacts a coil turn exactly in its middle and pushes it forward without passing through the turns. This latter possibility is accommodated by virtue of the spaces 2a between two consecutive projections 2, that is to say that because of the elasticity of the coil formed by wire 1, the coil is distorted as it penetrates into the space. In this latter contingency, nevertheless, excellent electrical contact is still ensured by virtue of the heavy pressure exerted by the blade on the wire.

Accessorially, in order to effectively guide the helicoid wire 1, an insulating plate 4 may be positioned above and embody openings 4a through which the moving blades 3 extend. Readily devisable lateral and longitudinal insulating stops can likewise be provided to locate the coil; alternatively, plate 4 and base 5 may be integral and be drilled with at least one cylindrical passage 6 into which the helically wound wire 1 fits and the wall of which is formed with transverse indentations 2a.

Obviously, the wire 1 must be made of a relatively flexible, good electricity conducting material such as copper or silver or a good conducting alloy.

This method of making contact can be used in various ways for devising a keyboard in accordance with a preferred embodiment of the invention as shown in FIGS. 2-5.

To that end wires 1 are stretched parallel to one another on a frame 10 and rest on a notched case 11 made of moulded insulating material. Above are provided rakes 12 made of metal or some other good electricity conducting material, as already indicated in connection with the wires themselves.

Each rake carries a set of identical teeth 12a, the first one 12i of which is shorter than the others. In FIG. 3, all the identical teeth 12a are in position, but it will be appreciated that only the teeth corresponding to a given combination of output channels coinciding with the depressed key 19 are allowed to subsist, all the others being cut off (see, for instance, FIG. 3a, which shows four teeth).

Each of rakes 12 is bolted to a supporting bar 13 curved at 13a and 13b at either end, and, apart from the number of teeth left in place or cut off, the rakes are all identical, whereby all that is necessary in order to effect a new combination in place of an obsolete one

is to take a new rake, break off the appropriate teeth, and substitute it.

Each of bars 13 (hence each of the associated rakes) can be actuated by the key 19 assigned to that particular combination. The position of the key 19 will depend on the rake; obviously, this is by no means compulsory, and it would be possible to retain the same position for all the rakes, in which case it would be necessary to mutually space the rakes by the width of a key at least, which would result in a lengthwise disposed keyboard with wasted space; hence with the arrangement shown in FIG. 2, in which the keys are staggered lengthwise it is possible to ensure minimum spacing between the rakes, the overall size of the keyboard is reduced, and the length of wire 1 is not lengthened unnecessarily.

In order to allow the rake to be inserted substantially perpendicularly to notched case 11 irrespective of the position of the key on the bar 13, the arrangement shown in FIG. 3 is adopted for the preferred embodiment.

In this arrangement the bar 13 pivots about an axle 14. The bar 13 is provided at one end thereof with a cranked extension 13a which is adapted to be inserted between two balls 15 of a series of balls arranged side by side (this is a device for avoiding simultaneous engagement of two keys). At its other end near the axle 14, the bar 13 is provided with another cranked extension 13b which is urged back by a spring 16 and passes through a guiding element 17. Another guiding element 18 is also shown.

The first wire 1i is connected to the input voltage E, the other wires 1 to the output channels or connections S1, S2 Sn. This means that no voltage will appear on the output channels corresponding to the combination selected by a depressed key until the shortest tooth 12i of the depressed rake touches the coiled conductor of wire 1i. The difference in length between this shorter tooth 12 and the other remaining teeth 12a on the same rake is chosen so that tooth 12i should inevitably encounter the coiled conductor, while contact is already surely established in the case of the other teeth 12a.

It is to be noted that the keyboard may be made very long, thus enabling a large number of keys, and hence combinations, to be accommodated, and furthermore it is possible to juxtapose a plurality of frames by interconnecting the mutually lengthened wires 1i as well as the remaining wires 1, whereby the growth potential of the capacity of such a keyboard is very great.

It goes without saying that many changes and substitutions of parts may be made in the specific exemplary embodiment described hereinabove, without departing from the scope of the invention.

I claim:

1. A switching device, comprising a helicoid electrical conductor resting by one side thereof on a support which comprises successive insulating projections separated by openings which will permit deflection of said conductor into said openings, an electrically conducting blade which is positioned on the other side and clear of said conductor and in registry with an opening between a pair of successive projections and which is directed and movable towards said conductor at right angles to the axis of the latter, an actuation key fixed to said blade for its manual actuation, whereby under the pressure of the blade by means of the key an electrical contact is established with certitude between said blade and the conductor, the possible local deformation

of the helicoid conductor being accommodated in the opening in registry.

2. A switching unit having the form of a keyboard with manually operating keys comprising a plurality of switching devices according to claim 12, and a source of input voltage electrical supply means with a delay arrangement which interconnect any actuated blade of said switching device with the source of input voltage after establishment of contact between any actuated blade and a corresponding helicoid conductor of said switching device, whereby the depression of one key ensures that one of said output connections is supplied with the input voltage in preset fashion.

3. A switching unit according to claim 13, wherein a plurality of said switching devices are arranged parallel with one another and wherein said unit includes mechanical interconnection means for simultaneously actuating by means of the same key a plurality of conducting blades of said switching devices each of which cooperates with one of said helicoid conductors of said switching devices.

4. A switching unit according to claim 13, wherein a plurality of said helicoid conductors of said switching devices are arranged parallel with one another and wherein said switching unit includes mechanical interconnection means for simultaneously actuating by means of the same key a plurality of conducting blades each of which cooperates with one of said helicoid conductors, said mechanical interconnection means being formed by a plate fast with the key and said blades by teeth dependent therefrom, said plate and said blades being made of electricity conducting material.

5. A switching unit according to claim 4, which includes a plurality of said plates respectively fast with an actuating key and arranged transversely in relation to said helicoid conductors, whereby to permit activation of different combinations of the output supply voltages by depressing the corresponding keys.

6. A switching unit according to claim 4, which includes a plurality of identical rakes, arranged transversely in relation to said helicoid conductors so as to permit activation of them by depressing the corresponding keys, said rakes having specific teeth broken off whereby to obtain the several desired combinations of output voltage.

7. A switching unit according to claim 4, comprising movable supporting bars wherein said supply means include a tooth shorter than the others that cooperates with a helicoid conductor similar to the others but connected to the input voltage.

8. A switching unit according to claim 4, wherein said tooth-bearing plates are fixed to said movable supporting bars in readily removable fashion, such as by being bolted thereto.

9. A switching unit according to claim 8, comprising a fixed axle for pivoting said supporting bars, means for guiding and resiliently returning the same and members for avoiding the simultaneous engagement of two bars.

10. A switching unit according to claim 8, wherein said bar is formed at its ends with integral extensions at right angles, said switching unit comprising a return spring cooperating with one of said extension and a series of balls arranged side by side, each of them at least cooperating with one of the other said bar extensions so as to form a removable obstacle and avoid the simultaneous engagement of two bars.

11. A switching unit according to claim 8, comprising a frame, an insulating member mounted in said frame and shaped to support the helicoid conductors stretched across said frame, and means mounted on the frame for supporting the bars at their thrust points.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,745,269 Dated July 10, 1973

Inventor(s) Tibor ARVAI

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 54, "helicoid" should read -- openings or spaces --.
Column 3, line 38, "12" should read -- 12i --. Column 4, line 5, claim 2, "claim 12" should read -- claim 1 --; Column 4, line 13, claim 3, "claim 13" should read -- claim 2 --; Column 4, line 21, claim 4, "claim 13" should read -- claim 2 --; Column 4, line 34, claim 5, "helicord" should read -- helicoid --.

Signed and sealed this 6th day of August 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

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