

[54] APPARATUS ACTUATING AND NURSE CALL SYSTEM

3,651,512 3/1972 Summers 340/325

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[57] ABSTRACT

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Apparatus for use by incapacitated patients in hospitals and similar institutions and including breath-operated switch means by which any one of a plurality of devices may be energized in conjunction with a series of selectable visually and sequentially presented symbols each correlated with the particular apparatus selected for energization. Also included are means for initiating the sequential presentation of the reference symbols to a patient, upon actuation of the breath-operated switch.

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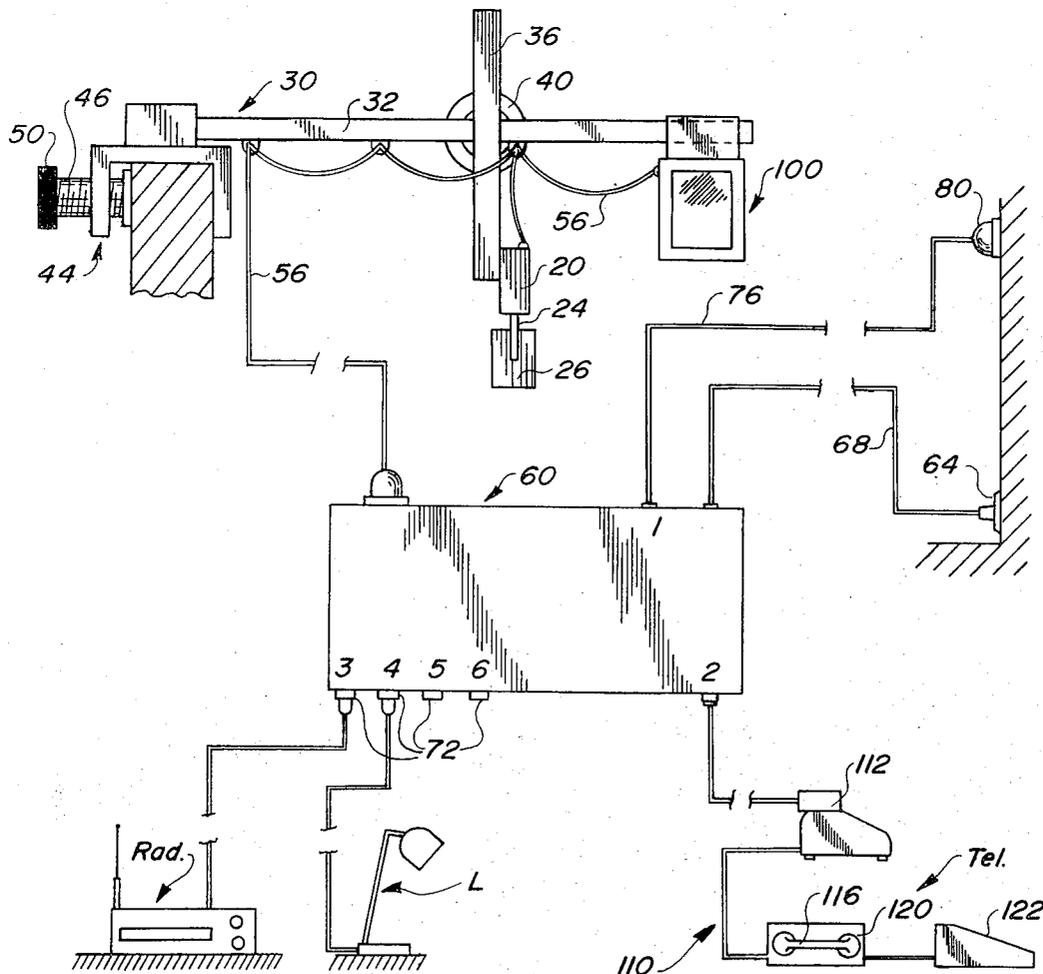
[58] Field of Search 340/325, 147 R, 147 MD, 340/164 R, 164 A, 164 B, 365 S, 274 C; 317/134

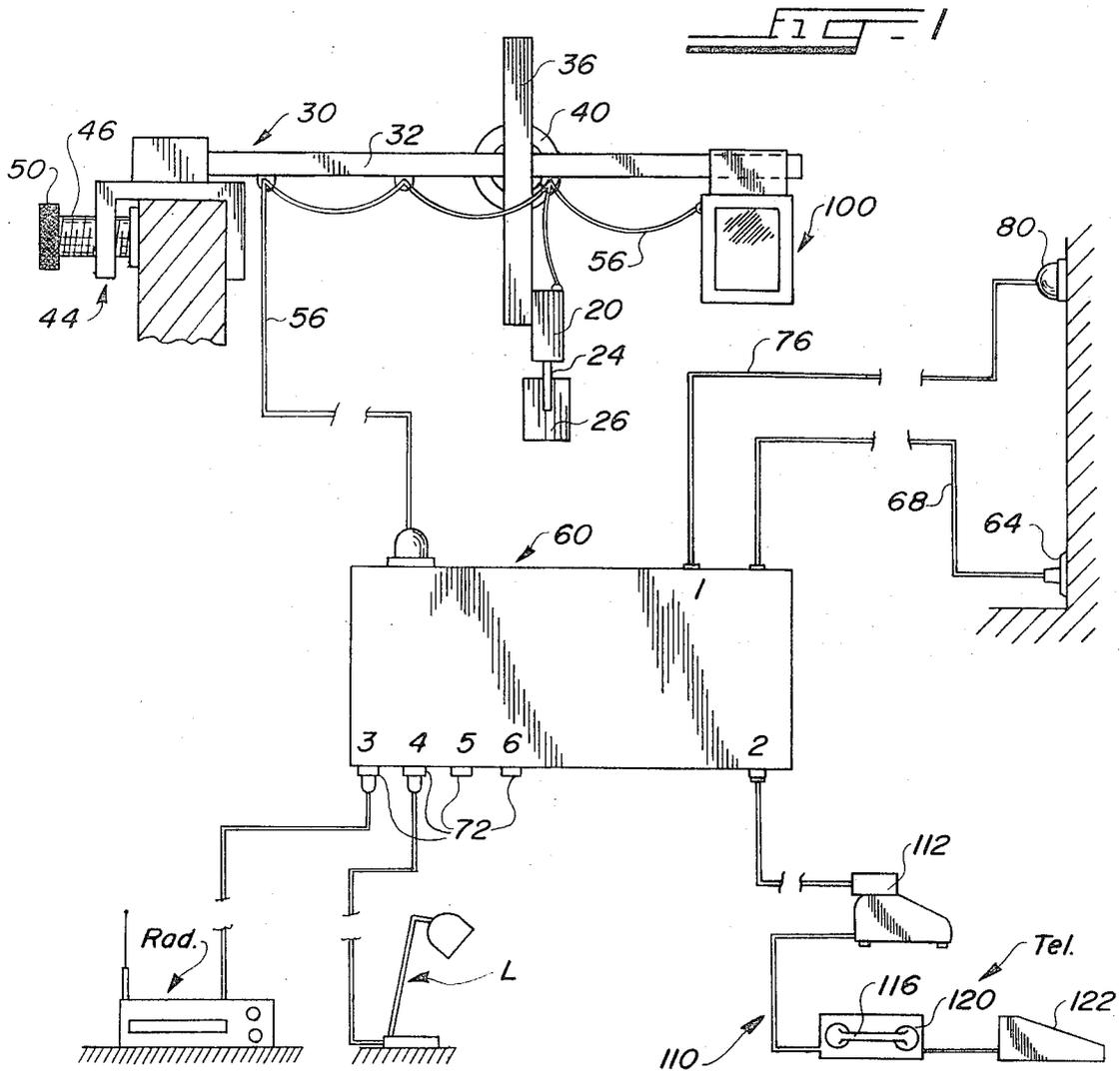
[56] References Cited

UNITED STATES PATENTS

3,587,051 6/1971 Hovey 340/274 C
3,600,637 8/1971 Bergkvist 340/164 A

4 Claims, 2 Drawing Figures





APPARATUS ACTUATING AND NURSE CALL SYSTEM

BACKGROUND OF THE INVENTION

The present invention finds utility as an important aid to that small group of highly incapacitated patients who can not utilize the existing call systems for communicating in the hospital. Such patients must remain passive and are totally dependent on the frequency of visits by the nursing staff for their most vital or trivial needs. The situation described imposes great demands on the nursing staff and poses serious problems in the effective and efficient care of the patients.

It is the aim of the present invention to obviate these difficulties and to provide a simple system which helps both the patient and the nurse to deal with any situation which may develop in the usual course of hospital treatment and care.

SUMMARY OF THE INVENTION

The apparatus of the invention enables a severely disabled person such as a high level quadriplegic, to summon attending personnel at home or in a hospital and to operate such electrical appliances as a heater, lamp, air conditioner, radio, television, an electrical door latch, or to answer the telephone. This control system enables bed-bound patients to become more self-reliant and promotes their well being as well as their safety.

It is a principal object of the invention to provide a system which permits a patient, through the use of a breath-actuated switch or slight physical movement, to actuate any of a series of selectable devices as well as to control the position of his bed, to call a nurse, or to answer the telephone.

It is a related object of the invention to provide a simple system whereby a patient, who does not have the use of his arms or legs may effectively actuate lights, turn on a radio, a television set, a page turner, or any other required mechanism or device.

Still another object of the invention is to provide a simple electrical system which makes it possible for a highly incapacitated patient to be essentially independent and self-reliant with respect to the operation of conventional electrically controlled devices and apparatus, whereby the morale of such patients is markedly improved and the demands on patient care personnel are greatly reduced.

Yet another object of the invention is to provide a control system for the energization of electrical apparatus by highly incapacitated patients, such apparatus being actuated through a switch which may be a breath-operated switch or one which is energized by a slight movement of the head, by the toe or finger.

It is still another object of the invention to provide a patient-operated switching device which may be connected to any of a selectable number of appliances each keyed to a numerical visual display which appears in sequence and which enables the patient to actuate a particular device by energizing the switch during the time a particular symbol appears on the visual display.

A related object of the invention is to provide a simple switching apparatus such as a breath-operated switch which may be used to initiate the sequential pre-

sentation of the symbols for selection by the patient of a particular appliance or apparatus to be energized.

The above and other and further objects of the invention will become evident upon consideration of the following specification and the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is described more fully and in greater detail herebelow by way of example with reference to the accompanying drawing in which:

FIG. 1 is a schematic view of the apparatus actuating and call system of the invention indicating the relationship and interconnection between the various component elements thereof; and

FIG. 2 is a wiring diagram of the circuitry of the actuating system of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The aims and objects of the invention are accomplished, as indicated schematically in FIG. 1, by providing in an apparatus actuating system a switch mechanism with an appropriate support, a chassis containing the required electronics and controls, a numerical or symbol displaying mechanism, a series of selectable attachments, including lights, a telephone answering mechanism, radio, television, and nurse call light connection. The various items are interconnected by suitable cables and plugs facilitating the ready transport and refitting when necessary.

The illustrative example provided in the drawing shows merely one form of the arrangement contemplated in the present development for effecting the purposes thereof. For the most part, the various components of the system are well known in themselves and no detailed description is provided herein. Rather, the present invention lies in the adaption of existing equipment and facilities in a unique and highly useful combination in which the components cooperate in a novel manner to achieve results not heretofore realized. The particular physical form or electrical configuration of any particular cooperating component does not constitute an essential part of the invention and, accordingly, no detailed description is provided herein, but merely an indication of the functional linkage and intercooperation.

Referring more particularly to the drawing, there is shown in FIG. 1 a switch 20 which is preferably of the "micro-switch" type having an actuating lever 24 actuable through a small operating force in the order of about 2 grams. In the particular preferred embodiment of the invention illustrated, a card or sail 26 is attached to the switch lever 24 whereby the switch may be operated by directing ones breath to impinge on the card 26. While other switches and other means for actuating the switch are possible, including air interruption switches, voice switches and others, the breath-operated switch is most convenient and effective and is greatly preferred.

The micro-switch 20 is supported on a bracket assembly 30 which includes a rod 32 and a cross bar 36 connected through a swivel joint 40 to facilitate manipulation to achieve any desired positioning of the micro-switch and the card 26 with respect to the patient. Conveniently, the bracket assembly is secured to the headboard of the bed by means of a clamp 44 which, as illustrated, is a C-clamp with a threaded bolt 46 and a

knurled finger-turnable head 50. The bracket assembly allows the sail or card 26 to be positioned at any desired place and oriented as needed. Additionally the mounting assembly can easily be swung to the side to allow unobstructed access to the patient. As an alternative procedure, the card-carrying micro-switch may be supported by a stand similar to a microphone stand as a completely independent support. Only a slight air puff is required to cause movement of the card 26 and actuation of the switch 20.

The micro-switch 20 is electrically connected by means of a conductor cord 56 to a control console or case 60. The console 60 itself is, in turn, connected to a line voltage outlet 64 by means of a suitable electrical cord 68. Additionally the console 60 includes a series of outlets 72 to each of which any of a selectable series of appliances or devices such as a radio Rad., a lamp L, television set TV or a telephone Tel. may be connected, as required. The console is also connected by means of an electric cable 76 to the hospital call system by means of a suitable plug 80, all such interconnections being indicated schematically in the drawing.

The electronics case or console 60 houses the electrical circuitry (FIG. 2) which constitutes a functional part of the overall system. Such components as are contained in the console include a step down transformer 84, a DC power supply 86, a motor 88, a motor driven 4 deck rotary switch 90 and a set of latching relays 94. Each of these components is of the type well known in the electrical art and no further discussion or description is deemed to be required herein.

Also connected to the console is a numerical display unit 100. The display apparatus is conveniently fastened to the same bracket assembly 30 to which the micro-switch 20 is secured, within view of the patient. The numerals or symbols which appear on the display, in sequence, are of a suitable height for viewing by the patient and are preferably at least one half inch high.

In the particular embodiment of the invention illustrated the telephone answering attachment assembly 110 consists of a box-like device 112 which fits over the cradle of the telephone and is secured in place. A DC solenoid 114 is mounted inside the box and a dead weight bar is attached to the solenoid plunger. The telephone receiver 116 is placed in the cradle 120 of a telephone loud speaker device. All of the above, including the loud speaker 122, consists of equipment available from the telephone company or electronic supply shops, and no further description is necessary.

SYSTEM OPERATION

While the general operation of the apparatus actuating and call system is believed to be evident from the foregoing description of the mechanical and electrical components thereof, a somewhat more detailed description of the actual operation is set forth herebelow. Initiation of the operation of the apparatus is effected by gently blowing on the card 26 to actuate or close the micro-switch 20 to complete a circuit. The completion of the circuit for a period of one second or less initiates a slow sequence which consists of the appearance, at the display device 100, of a series of numerals or other indicia which correspond respectively to the numbered or keyed electrical outlets 72 of the console 60. In the particular form of the invention described, the numbers appear in sequence at 10 second intervals. The status

of any appliance or fixture plugged into a given outlet can be changed from "on" to "off" or vice versa upon actuation of the micro-switch while the corresponding number appears on the display 100. For example, number 1 would normally be assigned to the nurse call, and number 2 for answering the telephone, as indicated. The remaining electrical outlets may be conveniently numbered 3, 4, etc., 3 being shown as connected to a radio and 4 to a lamp.

The switch on each electrical appliance is left in the "on" position while the actual switching is performed in the console 60. The switching circuit itself is extremely simple. Deck No. 1 on the four deck rotary switch 90 is allocated to driving the motor 88. All of the contacts with the exception of the starting position are shorted and connected in series with the 24 VAC supply and to the motor through the wiping arm of the rotary switch. Deck No. 2 of the rotary switch 90 is the sequence starting deck. The starting position is connected in series with the motor and the AC supply through the micro-switch 20 and the wiping arm. When the contacts on the micro-switch close this deck will supply the motor until the wiping arm of the switch 90 makes contact on deck No. 1. Each position on deck No. 3 is connected to the coil of a latching relay 94. The contacts of each relay are connected to an electrical outlet on the console and to the 115 volts supply. With each additional actuation of the relay coil the contacts "make" or "break", thus energizing or de-energizing outlets 72 of the console 60.

Activation of the relay coil occurs when the micro-switch 20, which is not disconnected from the motor starting deck, is closed, making a circuit from the 24 VAC supply through the wiping arm of the third deck of the rotary switch 90 and the coil of the corresponding relay 94. The positions on the fourth deck of the rotary switch 90 are connected to the numerical display 100. For example, when numeral 5 appears on the display, the wiping arm is on position No. 5 on all four decks of the rotary switch 90. Upon closure of the micro-switch contacts under these conditions, relay number 5 will be activated and change the status of outlet No. 5. The contacts of relay No. 2 supply low voltage to the telephone attachment jack 2. The relay contacts in position 1 are connected to the hospital call cord and perform the same switching function as does the pushing of the bell button on the regular cord. As an alternative operating procedure, it is contemplated that the motor 88 may run continuously to produce a continuously changing series of numbers on the numerical display 100. In this modification of the apparatus the motor starting circuit is not necessary.

To answer the telephone, the patient, upon hearing the telephone ring, will puff on the micro-switch card 26 and start the sequence. When the numeral 2 appears on the display he will puff again. This will cause the solenoid 114 on the telephone cradle to lift the bar off the hook. Now conversation can proceed through the loud speaker. To terminate the call, the patient has merely to recycle again, wait for number 2 to appear, and puff. This will disconnect the solenoid supply and the bar will drop on the switch hook as if the receiver were placed on the cradle.

The specifications of the apparatus described above are summarized in the following table so that those familiar with this art may be able readily to assemble the apparatus for use in accordance with the invention.

- Step down transformer -115V-24V.
- Power supply - 24 volts DC, 40 Volt amperes
- Motor - 1 rpm, 24 volts AC, 40 inch-ounce
- Rotary switch - 4 Deck continuous rotation, make before break contacts. 5
- Latching relay - coil 24 Volts AC, contacts 120 volts AC, 60Hz, 10 amps DPST
- Micro-switch - normally open SPST 2 grams actuating arm, 24 volts AC
- Numerical display - 24 volts AC, 1/2 inch numerals. 10
- Solenoid - 24 volts DC, pull type, continuous duty, 3/8 inch stroke, 10 ounce minimum lift

While the invention has been described in detail with reference to a particular preferred embodiment, it is obvious that many variations in the component elements and the mode of interconnection are possible, all within the scope of the inventive concept set forth. It is also apparent that many other devices may be interconnected in the system including such devices as a page turning machine. Other types of telephone attachments are possible including a dialing "operator" attachment utilizing a rotary solenoid. The full manipulation of television controls is also readily feasible. 15

With the teachings of the present invention before them, those skilled in the art will be able to deduce many substantially equivalent variations of the invention, none of which constitutes a material departure from the teachings thereof. It is, therefore, desired by the following claims to include within the scope of the invention all such variations and modifications by which substantially the results of this invention may be obtained through the use of substantially the same or equivalent means. 20

What is claimed is:

1. A switching and display mechanism comprising, in combination, 25
 single switch means for closing and for opening a pair of electrical contacts associated therewith, thereby to complete and to break an electrical circuit, means for adjustably supporting said switch means 30
 near a patient, 40

visual display means for sequential presentation, for a finite time interval each, of a series of reference symbols, each said symbols being correlated with a particular selectable apparatus to be controlled by said switch means,
 a switching mechanism for selectively energizing a particular apparatus,
 electrical means interconnecting said display means with said switch means and with said switching mechanism,
 whereby actuation of said single switch means during the appearance of any and each particular selectable symbol is effective to switch "on" and "off" apparatus correlated with each specific reference symbol displayed.

2. The structure as set forth in claim 1 wherein said means for adjustably supporting said switch means includes means for securing said display visual means in view of a patient.

3. The structure as set forth in claim 1 and further comprising starter circuit means for initiating sequential presentation of said reference symbols to a patient, upon actuation of said switch means.

4. The structure as set forth in claim 1 wherein said switch means comprises a pressure-sensitive switch, and further comprising lever means linked functionally to a first of said pair of electrical contacts of said switch,

sail means connected to said lever means for controlling the movement thereof,

said sail means being responsive to pneumatic forces impressed thereon to effect a positive mechanical displacement of said lever means and to shift the first electrical contact between a position of contact with and a position of separation from the second electrical contact of said switch;

whereby the physical force of one's breath directed toward and impinging upon said sail means actuates said switch to control an electrical device connectable thereto.

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