SHARING APPARATUS AND SYSTEM

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Abstract

A plurality of switches is associated with a plate pivotally movable for selective operation of the switches. Plate pivotal movements are controlled by a like plurality of controllers inducing pivotal movement of the plate and associated pivotal movement limiting elements. The switches are operated by the plate in sequence according to the sequence in which the controllers are energized. In a time-sharing system, a time-shared device is connected to the plate and dependent elements are connected to the device through the switches.

9 Claims, 3 Drawing Figures
SHARING APPARATUS AND SYSTEM

FIELD OF THE INVENTION

This invention relates to apparatus and systems for time-sharing a single electrical circuit among multiple utilization devices and more particularly to time-sharing apparatus adapted for fulfilling demands thereon in the order of their occurrence.

BACKGROUND OF THE INVENTION

In various electrical applications, e.g., the supplying of power, the transmission of information signals, the use of computer time and the like, various considerations either permit or require certain single circuit means to be employed in common by multiple companion circuit means. For instance, where a plurality of companion circuits have intermittent need for energizing power, power supply circuit means redundancy may be reduced with resultant reduction in equipment cost by use of a single power supply in conjunction with time-sharing circuit means providing selective interconnection between the power supply and the companion circuits on a one-at-a-time basis. The cost alone of a given circuit means may at times dictate that only a single such circuit means be provided and be time-shared among plural users, as is customary, for example, in commercial computer time usage. Such shared usage of electrical circuit means is prompted in other instances by space limitations, primary power availability and like considerations.

A programming facility, i.e., a memory capacity whereby the demands of users for access to the time-shared circuit are noted and fulfilled in the order of their occurrence, is fundamental to time-sharing apparatus in all applications excepting those instances where time-sharing is of truly periodic nature, in which case simple cycling mechanism may be adequate. Such requirement for memory capacity accounts in large part for the complexity and cost of time-sharing apparatus.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide simplified apparatus having memory capability permitting use thereof in aperiodic demand-initiated time-sharing and enabling common usage of a single circuit means by multiple utilization devices.

It is another object of the invention to provide a simplified time-sharing system.

In brief summary, the apparatus of the invention includes a plurality of switches, an actuator supported for pivotal movement for operation of the switches, a like plurality of controllers selectively inducing pivotal movement of the actuator and means operating on the actuator and operative with the controllers to limit actuator pivotal movement such that the actuator operates the switches in sequence according to the sequence in which the controllers are energized.

The system of the invention provides for interconnection of a time-sharing circuit means with a plurality of utilization devices through the switches, each utilization device being provided with means for actuating one of the controllers.

The foregoing and other objects and features of the invention will be evident from the following detailed description thereof and from the drawings.
remaining power supply output line being connected to ground. First input lines 62, 64 and 66 of utilization devices 14, 16 and 18 are respectively connected to second contact members 52, 54 and 56 and the utilization device second input lines are connected to ground. One terminal of each of coils 34, 36 and 38 is connected by lines 68, 70 and 72, respectively, to one terminal of a power supply suitable for energizing the coils upon connection of the remaining terminals of the coils (through ground) to the grounded remaining terminal of this supply. The remaining terminal of each of coils 34, 36 and 38 is connected by lines 74, 76 and 78, respectively, to such ground through one of power request units 80, 82 and 84 connected by lines 86, 88 and 90 to utilization devices 14, 16 and 18, respectively. The request units each may include an operator-controlled switch, a first self-latching relay energized thereby and a second series relay adapted to deenergize the first relay upon receipt of a suitable signal on the line connecting the unit to its associated utilization device. The utilization device may provide such signal either by incorporating a time delay circuit adapted to clock its connection to the common power supply or by a switch actuated upon certain movements of members thereof indicating its completion of power need. Closure of such operator-controlled switch, e.g., by depression of a push button, provides for energization of the coil associated therewith. Evidently, such interconnection of apparatus 10 with power supply and utilization devices is definitive of a time-sharing system.

Operation of the time-sharing apparatus and system of FIG. 1 will be clear from a consideration of the most demanding practical performance required thereof, i.e., response to aperiodic demands applied successively thereto during a common time period as illustrated by controller coil states depicted graphically in FIG. 3. Such consideration will be enhanced by more detailed discussion of the exemplary application of the apparatus generally alluded to above.

This exemplary application involves a manufacturing operation wherein a plurality of assemblers each produce like articles which, in the course of their production, are required to be subjected to ultrasonic sealing to join individual elements thereof. Utilization devices 14, 16 and 18 comprise commercially available ultrasonic sealing units, e.g., manufactured by Cavitron, Inc., Long Island City, N.Y. Customarily, each such unit is associated with its own power supply, also commercially available from this manufacturer. Since, in such manufacturing operation, the production time period requiring use of power from the power supply into the individual sealing unit is relatively small as compared with the overall production time cycle for each article of manufacture, i.e., numerous other steps are involved, it is evidently particularly desirable to share a single power supply among multiple sealing units, and to satisify demands thereon in accordance with the time of occurrence thereof. By use of the subject time-sharing apparatus and system, each assembler initiates such demand by operating the request unit associated with his sealing unit. Since this unit is self-latching, as discussed, the operator may proceed with other duties pending operation of his sealing unit.

In a typical assembly line, three assemblers respectively request sealing unit energization at times t1, t2 and t3 (FIG. 3) and coils 34, 36 and 38 are accordingly energized at these times. At t1, the assembler using sealing unit 14 registers his demand for power by depressing the pushbutton of request unit 80. Coil 34 is accordingly energized and applies a force to plate corner area 20d and, since corner areas 20c and 20f are free of restraints, coils 36 and 38 being unenergized, the plate moves pivotally and contact members 46 and 52 are closed. Electrical continuity is thereby provided between line 60 and line 62 through plate 10 and these contact members and sealing unit 14 is energized. Such continuity is maintained until t4 at which time assembly unit 14 completes its element joiner operation and releases associated request unit 80, thereby deenergizing coil 34. Contact members 46 and 52 are separated by plate pivotal movement at t4 as discussed below.

Prior to t4 and specifically at t2, the assembler using sealing unit 16 depresses the push-button of request unit 82 to initiate his power demand on time-sharing apparatus 10 whereupon coil 36 is energized. The force applied thereby to plate corner area 20e tends to pivotally move the plate so as to place this coil and plate corner area in mutual contact. However, the movement of corner 20e toward coil 36 is only partial, as abutment of side 20a with post 40 prevents corner 20e from moving all the way to coil 36 for closure of contact members 48 and 54. As a result, the plate merely tilts from its position of abutment with coil 34 only to a second position of abutment with coil 34 and post 40, plate corner area 20e and coil 36 being closer to one another in this second position but still spaced such that contact members 48 and 54 remain separated. Plate corner 20f and coil 38 are now further apart than corner 20e and coil 36 due to tilting. In the absence of post 42 the plate would evidently be free to pivotally move responsive to the coil 34 and coil 36 forces such that both the switch embodying contact members 46 and 52 and the switch embodying contact members 48 and 54 would be operated by the plate, which would be contrary to the objectives of the apparatus.

Again prior to t4, and specifically at t3, the assembler using sealing unit 18 depresses the push-button of unit 84 to initiate his power demand on time-sharing apparatus 10 whereupon coil 38 is energized. The force applied thereby to plate corner area 20f tending to place this coil and plate corner area in mutual contact is virtually ineffective to displace the plate from the aforementioned second position, being opposed by the forces then applied to the plate by coils 34 and 36 and the opposing forces of post 40 and hub 22. The relative dominance of control of plate pivotal movement by the coils, i.e., in the order 34, 36, and 38, is evidently explained by the action of pivotal movement limiting means, i.e., post 40 and central hub 22, and the electromagnetic phenomenon, i.e., an electromagnetic field exerts force on a magnetically permeable body varying inversely with the square of the distance between such body and the center of such field.

Upon deenergization of coil 34 at time t4, both of energized coils 36 and 38 influence plate pivotal movement and plate corner areas 20e and 20f tend toward respective mutual contact with these coils. Plate corner area 20e being closer to coil 36 at t4, coil 36 exerts a greater force on the plate than coil 38 and accordingly
plate corner 20e moves into contact with coil 36, operating the switch embodying contact members 48 and 54. The plate is now in a third position wherein the plate undersurface abuts against post 42 and contact members 50 and 56 have moved closer together but remain spaced from one another and contact members 46 and 52 are furthest apart. In the event that coil 38 had not been energized prior to $t_e$, the plate would have moved pivotally into a position of contact at corner 20d with corners 20d and 20f both equidistant from coils 34 and 38 respectively.

At $t_e$ continuity is thus initiated between line 60 and line 64 through the plate and contacts 48 and 54 and power is supplied to sealing unit 16.

Upon deenergization of coil 36 at $t_e$ coil 38 is unopposed in acting upon the plate and pivotally moves the plate into contact with coil 38, thereby closing contacts 50 and 56, providing continuity between line 60 and line 66 and energizing sealing unit 18. This condition persists until $t_2$ at which time coil 38 is deenergized and the plate is biased to its neutral position. Evidently, further power demands registered prior to $t_2$ will be fulfilled in the order of their occurrence in manner similar to that described above.

From the foregoing description of operation of apparatus 10, it will be seen that posts 40, 42 and 44 coat with coils 34, 36 and 38 to permit the plate to actuatingly close that set of contact members associated with the coil which was energized earliest in time among the coils then energized to move the plate closer to the coil which was energized next earliest and to position the plate furthest away from that coil energized last. As a result, the plurality of switches embodying the contact members is operated in sequence corresponding with the sequence of energization of the coils. Evidently, where assembler demands of apparatus 10 and fulfillment thereof occur in non-overlapping time relation, a corner, e.g., 20f, coats with the exclusively energized coil, e.g., coil 38, and the posts and remaining coils are inoperative.

Whereas the apparatus and system of the invention have been illustrated by way of a particularly preferred embodiment, the same is intended in a descriptive and not in a limiting sense, and the invention contemplates those changes and modifications of the illustrated apparatus and system which will be evident to those skilled in the art. In this connection, by way of example, actuator plate 20 need not integrally include the first switch contact members which may alternatively be embodied along with the second contact members in unitary switches operated upon by the plate. Similarly, the invention is not restricted to providing a time-sharing function for the illustrated three companion circuit means, but may readily service two companion circuits or more than three companion circuits, for example, by stacking plurality time-sharing apparatus of the illustrated type or by other modification to such apparatus. The true spirit and scope of the invention will be evident from the following claims.

What is claimed is:
1. Apparatus for use in time-sharing, comprising:
   a. a plurality of switch means;
   b. an actuator supported for plural pivotal movements;
   c. a plurality of controllers, each corresponding to one of said switch means and operative on energization to impart pivotal movement-inducing force to said actuator; and
   d. pivotal movement limiting means operating one said actuator and providing for actuator operation of those of said switch means, whose corresponding controllers are energized for a common time period, in an operating sequence according with the time sequence of energization of said controllers.
2. The apparatus claimed in claim 1 wherein said actuator comprises a plate having plural extremities comprised of magnetically permeable material and wherein said controllers each comprise an electromagnetic coil having a field of influence embracing one of said plate extremities.
3. The apparatus claimed in claim 1 including means biasing said actuator to a neutral position and wherein said pivotal movement limiting means includes a hub supporting said actuator for said plural pivotal movements and a plurality of post elements secured in spaced relation to a surface of said actuator when in said neutral position and selectively abutable with said surface upon predetermined pivotal movement thereof.
4. The apparatus claimed in claim 1 wherein said switch means each comprise a first contact member supported by said actuator and a second contact member fixedly supported relative to said actuator.
5. The apparatus claimed in claim 3 wherein said actuator is a triangular plate and wherein said post element plurality comprises three post elements, each juxtaposed with said actuator plate surface intermediate a pair of corners thereof.
6. Apparatus for use in time-sharing, comprising: a plurality of switch means; an actuator for operating said switch means; a plurality of controllers each corresponding to one of said switch means and responsive to input signals for imparting predetermined pivotal movements to said actuator and thereby providing actuator operation of those of said switch means, whose corresponding controllers are energized for a common time period, in an operating sequence according with the time sequence of occurrence of said input signals; each said controller including input terminals receiving said input signals, circuit means connected to said input terminals and responsive to an input signal received at said terminals to impart pivotal movement-inducing forces to said actuator and means for selectively limiting actuator pivotal movements induced by said forces imparted to said actuator.
7. Apparatus for use in time-sharing, comprising:
   first, second and third switches; a plate for operating said switches; means biasing said plate to a neutral position and supporting said plate for plural pivotal movements from said neutral position; first, second and third controllers operative on energization to impart first, second and third pivotal movement inducing forces to respectively different positions on said plate; and first, second and third rigid post elements fixedly supported in spaced relation to a surface of said plate when in said neutral position and selectively abutable with said surface upon predetermined plate pivotal movement.
8. The apparatus claimed in claim 7 wherein said plate is three-sided and comprised of magnetically
permeable material and said controllers each comprise an electromagnetic coil having a field of influence embracing one of said plate corners.

9. A time-sharing system comprising the apparatus claimed in claim 1 and further including:
   a. first circuit means connected to each of said switch means;
   b. a plurality of second circuit means, each connected to a distinct one of said switch means; and
   c. a plurality of third circuit means, each connected to a one of said controllers and operable for said energization thereof, said first circuit means being selectively connected through said switch means with said second circuit means in accordance with the time sequence of said operation of said third circuit means.