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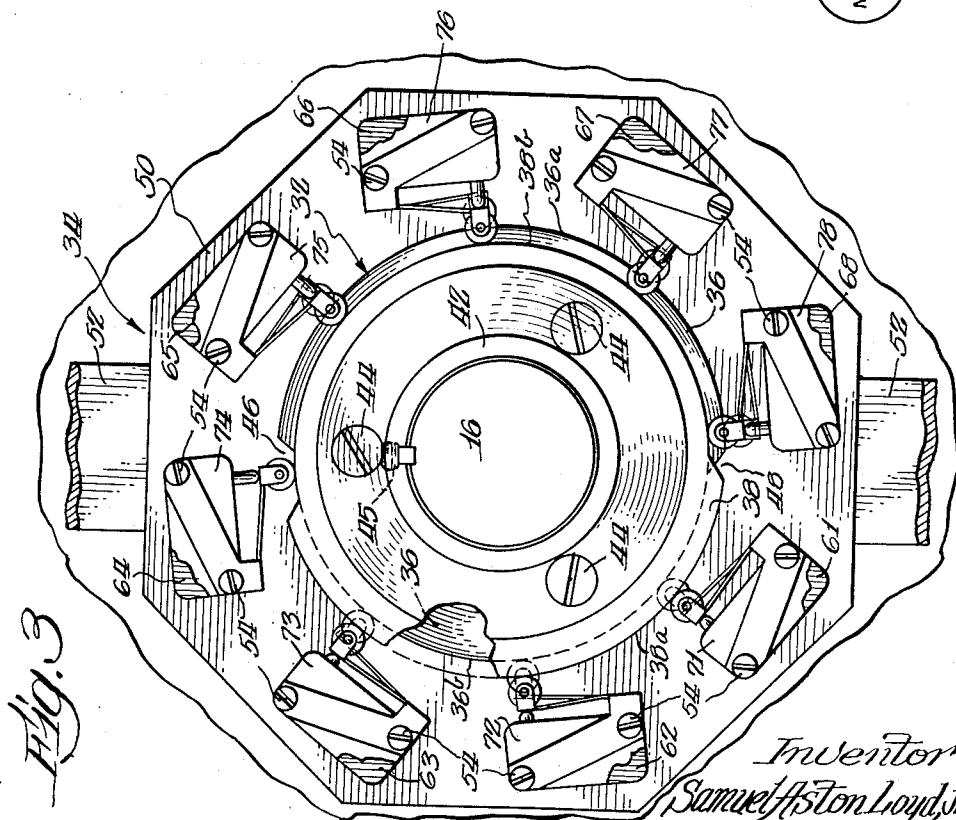
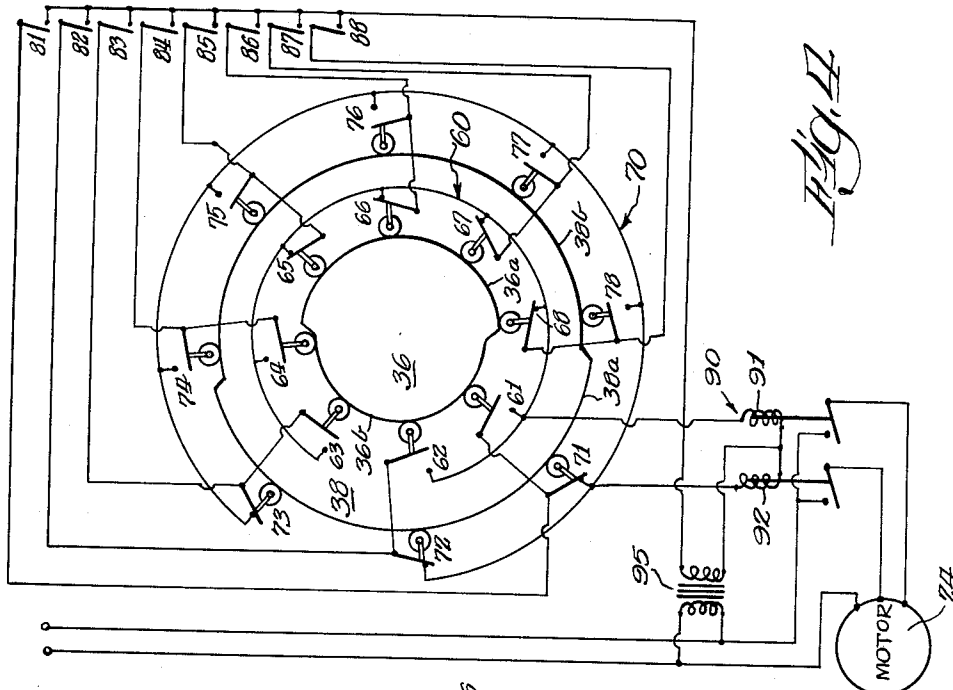
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SELECTIVE POSITION CONTROL

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2 Sheets-Sheet 2



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1

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SELECTIVE POSITION CONTROL

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The present invention relates to control means for selectively positionable devices, and particularly, to means for moving the device through the shortest distance to a selected position and for automatically stopping the device in that position.

The invention is especially adapted to rotary card filing cabinets having an operator's table or station and a rotatable assembly including a plurality of pendulous card holding trays which pass adjacent the station; the control means comprising reversible drive means for the assembly, a manual selector for directing disposition of any selected one of the trays adjacent the station, and an automatically operable control assembly for causing the drive means to rotate the trays through the shortest arc to bring the selected tray to the station and to stop the drive means and the tray when the selected tray is in predetermined position adjacent the table.

It is in particular an object of the invention to provide improved control means of the character above described including reversible drive means for the trays, a rotor rotated conjointly with the trays, a plurality of switch means corresponding in number to the trays, said switch means being associated with said rotor and each having two contact means one or the other of which is closed in various respective positions of the rotor except for one position in which both contact means are open, said switch means each being correlated to a respective one of the trays to be disposed in said one position when the respective tray is adjacent the station, the two contact means of each switch means being coupled to said reversible drive means to cause rotation of the elements in the direction of the shortest distance between the existing position of the switch means and said one position thereof, and means for rendering said switch means selectively operable.

Another object of the invention is to provide improved control means as above defined wherein the switch means comprises two sets of switches disposed in pairs comprised of one switch of each set, the pairs of switches corresponding in number and relative spacing to the trays, one set of switches being connected to rotate the trays in one direction and the other set of switches being connected to rotate the trays in the other direction; and wherein the switches are selectively actuated by cam means comprised of two cam surfaces operatively associated with respective sets of switches for actuating the switches of the respective set, the cam surfaces being of a length correlated to approximately respective halves of the path of movement of the trays, being arranged generally in end-to-end relation and at one set of ends conjointly defining corresponding cam surface portions for simultaneously actuating the two switches of any one pair.

An additional object of the invention is to provide in control means as above defined a control assembly wherein the cam means comprises a pair of cams connected to the trays for rotation therewith and each having approximately a semi-circular cam surface, the cams being mounted with their cam surfaces generally diametrically opposed and with the cam surfaces in substantially end-to-end relation at one set of ends and in circumferentially spaced relation at their other ends, and wherein the two sets of switches circumscribe the cams and are comprised of normally open switches so that the cam surfaces

2

act to close one or the other of the switches of each pair except for a single pair of switches aligned with the circumferential spacing between the surfaces.

A further object is the provision of control means as described wherein the manual selector comprises normally open switches of a number corresponding to the trays and connected in series with a source of power and respective pairs of the pairs of switches for rendering the same selectively operable.

A still further object is the provision of improved control means of the character described that is of compact and economical, yet highly practical and durable construction, and which may conveniently be embodied within rotary filing cabinets.

Other objects and advantages of the invention will become apparent in the following detailed description.

Now, in order to acquaint those skilled in the art with the manner of making and using my improved control means, I shall describe, in connection with the accompanying drawings, a preferred embodiment of the control means and the preferred manner of making and using the same.

In the drawings:

FIGURE 1 is an end view, with the end cover removed, of a rotary filing cabinet equipped with the control means of the invention, portions of the interior partitions of the cabinet being broken away to reveal the mounting of the trays;

FIGURE 2 is a vertical longitudinal section, on a greatly enlarged scale, of a preferred embodiment of my automatic control assembly, the view being taken substantially on line 2-2 of FIGURE 1;

FIGURE 3 is an end elevation of the control assembly; and

FIGURE 4 is a schematic diagram of the electric circuit and switch actuating cams of my improved control means.

Referring now to FIGURE 1, I have shown my invention applied to a generally conventional rotary file which includes a cabinet 10 having a telescopic top wall portion 12 and a pivotally movable upper front wall section 13 for defining an operator's station or table when the cabinet is opened, as shown. Within the cabinet, vertical partitions or wall means 14 are provided which carry bearings 15 for rotatably supporting the central shaft 16 of a rotary tray assembly 18, the assembly 18 including circular end plates 20 secured to the shaft 16 and a plurality of circumferentially spaced pendulous trays 22 which extend axially or longitudinally between the plates 20 and are pivotally secured thereto. The assembly 18 is thus adapted for rotary movement with the shaft selectively to dispose the trays 22 adjacent the table 13.

For rotating the tray assembly, an electric motor 24 is mounted within the cabinet; the connection of the motor to the tray preferably being effected through a speed reducer 26 and a speed reducing belt drive 28, the latter including a relatively large diameter pulley 30 secured to the shaft 16 immediately outward of one of the bearings 15. In the described embodiment of the present invention, the motor 24 is reversible. It will of course be appreciated that reverse drive could be effected by shiftable elements in the reducer 26 and/or by other known means.

With reference particularly to FIGURES 2 and 3, a preferred embodiment of the automatic control assembly of my invention is shown as comprised essentially of two components, namely, cam means 32 and switch means 34. The cam means 32 is comprised of two generally annular axially spaced cam plates 36 and 38, the same suitably being spaced apart by a washer 40, and a flanged hub 42, the plates, washer and hub preferably being united in predetermined relation by fasteners 44 or the like. This

assembly in turn is secured to the outer end of the shaft 16 by a set screw 45 passing through the hub 42.

In general, the two cam plates are similar and are each provided at the periphery with a radially outward cam surface 36a and 38a, respectively, the arcuate extent of which is approximately a semi-circle. While the plates 36 and 38 could simply be of approximately semi-circular form, I prefer to make the same annular and to provide the same over the remaining portion of their respective peripheries with a radially inward or reduced arcuate surface 36b and 38b, respectively. The two plates are then assembled in opposed relation, i.e., with their cam surfaces 36a and 38a generally diametrically opposed and with said cam surfaces in generally end-to-end or axially aligned relation at one set of ends and circumferentially spaced at their other set of ends, thereby to define an arcuate gap 46 in the cam assembly as shown in FIGURE 3.

In the preferred embodiment of the invention, the cam surface 36a of the axially inward cam 36 has an arcuate extent of 155 degrees to accommodate definition of the gap 46 without requiring overlap of the cam surfaces at the opposite or aligned ends of those surfaces. In addition, the cam surface 38a of the axially outward cam 38 defines an arc 176 degrees so that the indentation 48 in the cam assembly at the cross-over point of the two cam surfaces is not diametrically opposite the gap 46, for a reason to be explained. Also, the two cams are of the same size to facilitate a compact assembly of the switch means 34.

The switch means 34 of the illustrated embodiment of the invention is comprised of a generally annular switch mounting plate 50 (herein shown as having an octagonal periphery), a mounting strap or bracket 52 secured to the plate, and a plurality of switches on the plate. The mounting strap or bracket 52 is of generally U-shape to bridge over the pulley 30 and is secured at its ends to the cabinet partition 14 in such manner as to dispose the plate 50 immediately outwardly of the pulley and inwardly of the cam assembly 32 in concentric relation to the shaft and the cams. The switches are mounted on the outer surface of the plate 50 radially outwardly of the cams and in circumscribing relation thereto. The switches are comprised of two sets or circular arrays 60 and 70 (FIGURE 4) of micro switches or the like, each set including a plurality of switches corresponding in number to the trays 22; in this instance eight, namely, switches 61 to 68 and 71 to 78. The switches are mounted on the plate 50 in stacked pairs comprised of one switch from each set or array, and the pairs of switches are disposed at equal circumferential spacings corresponding or correlated to the spacing of the trays. The pairs of switches are preferably secured to one another and the plate 50 by removable fasteners 54 to facilitate replacement of switches as and when necessary. Each switch includes an actuator button, a button actuating cam follower comprising a roller riding on the peripheral surface of a respective cam, and a cantilever spring supporting the roller and normally urging it away from the switch button whereby the switches have a normal circuit condition; in this embodiment normally open. Because of their stacked pairing, the switches of the inner set 60 are aligned and cooperate with the inner cam 36, and the switches of the outer set 70 are aligned and cooperate with the outer cam 38.

Due to the arrangement of the two cams and the relative disposition of the pairs of switches, the cam surface 36a will at any given time close the switches of set 60 in approximately half of the pairs of switches and the cam surface 38a will close the switches of set 70 in approximately the other half of the pairs of switches, with the exception that as the cams rotate the followers of the respective pairs of switches will sequentially be aligned with the gap 46 in the cam surfaces, at which time both switches of the respective pair will be open. For ex-

ample, in the position shown in FIGURE 3, the cam 38 has closed switches 71, 72 and 73 by virtue of its surface 38a and has permitted, by virtue of its surface 38b, the switches 74 to 78 to be open; the cam 36 has closed switches 65, 66, 67 and 68 (which are located behind switches 75, 76, 77 and 78) and has opened switches 61, 62, 63 and 64; and the switches 64 and 74 are the only pair having both switches open. In assembly, the pairs of switches are correlated respectively with the trays 22 and the cam assembly is so mounted that the gap 46 therein is aligned with a respective pair of switches when the corresponding or correlated respective tray is in a predetermined position adjacent the table 13. With the gap 46 aligned with any given pair of switches, it is desirable that none of the switches be located at the cross-over point 48 of the two cams, thereby to eliminate the possibility of a switch pair other than said given pair being at a dead point on the cam surfaces. For this reason, I offset the cross-over point from all switch positions when the gap 46 is aligned with a pair of switches. In the illustrated embodiment, wherein the pairs of switches are of even number and disposed in diametric opposition, the result is accomplished as previously described by offsetting the cross-over 48 a few degrees from diametric opposition to the gap 46.

Referring now to FIGURE 4, I have shown diagrammatically a preferred control circuit for the motor 24 including the cam and switch assembly just described, a plurality of normally open manually operable push button switches 81 to 88 corresponding in number to the trays and the pairs of switches 60—70, and a reversing circuit or means 90 comprised of parallel solenoid actuated switches or relays 91 and 92. The switches 81 to 88 are correlated by suitable indicia to the respective trays 22 and are connected in series with respective pairs of switches 61—71, 62—72, etc. that are correlated with the respective trays as previously described. The switches 81 to 88 are suitably mounted in conventional manner in a panel (not shown) adjacent the operator's table or station 13 so that the operator may selectively close the switches as she desires to have the trays brought selectively to her station. Preferably, the switches are isolated from line power and fed at a relatively low voltage via a transformer 95, the primary of which is connected across the power supply lines and the secondary of which has one side connected to the switches 81 to 88 and its other side connected to one side of the two coils of the solenoid switches or relays 91 and 92. Corresponding contacts of each pair of switches 61—71, 62—72, etc. are disposed in parallel with one another and in series with the respective switch 81 to 88, which latter switches are disposed in parallel with one another. The other contacts of one set of switches are commonly connected in series with one of the relays 91 and 92, and the other contacts of the other set of switches are commonly connected to the other relay, i.e., as shown in FIGURE 4, the stationary contacts of switches 61 to 68 are connected to the coil of the relay or solenoid 91 and the stationary contacts of switches 71 to 78 are commonly connected to the coil of relay or solenoid 92. These coils in turn actuate respective switches coupled in a parallel line circuit for causing the reversible motor 24 to operate in a selected direction. Specifically, actuation of the relay 91 would energize the motor 24 for operation to rotate the tray assembly and the cams 36 and 38 clockwise as shown in FIGURE 3, and actuation of the relay 92 would energize the motor 24 for operation to rotate the trays and the cams counterclockwise.

Assuming that the tray correlated to switches 64—74—84 is at the operator's station (as depicted in FIGURES 3 and 4) and that she desires to examine the tray corresponding to switches 68—78—88, she would simply depress the button of switch 88. By use of maintained contact switches, this action closes a circuit from the transformer through switches 88 and 68 to the coil of relay 91,

whereupon the relay would be actuated to energize the motor for clockwise rotation of the cams, whereupon the cams and the tray assembly would be rotated clockwise through 180 degrees until the gap 46 were alined with the switches 68—78. Thereupon both switches would be opened and the motor circuit would be broken to stop the tray assembly with the selected tray at the operator's station. If the operator had pushed the button of any of switches 85, 86, or 87, the result would be the same except that the tray assembly would have been rotated clockwise only 45 degrees, 90 degrees, or 135 degrees, respectively. On the other hand, if the operator had depressed the button of switch 81, a circuit would have been closed via switches 81 and 71 to the coil of relay 92, whereupon the tray assembly would have been rotated counterclockwise through an arc of 135 degrees to bring the selected tray to the operator's station. If the operator had closed either of the switches 82 or 83, the latter cycle of operation would likewise have occurred except that the tray assembly would have been rotated clockwise only 90 degrees or 45 degrees, respectively.

Thus, the described circuitry and control assembly assure that the tray assembly will always be rotated through the smallest possible angle, and therefore at the greatest possible speed, to bring a selected tray to the operator's station and to stop the tray assembly with that tray in predetermined position relative to the table 13. From the foregoing description, it is believed clear that all of the objects and advantages of the invention have been shown herein to be obtained in a convenient, economical and practical manner.

While I have shown and described what I regard to be the preferred embodiment of my invention, it is to be appreciated that various changes, rearrangements and modifications may be made therein without departing from the scope of the invention, as defined by the appended claims.

I claim:

1. A control system for plural element rotary files and the like wherein the elements are conjointly rotatable relative to a station for selective positioning adjacent the station, comprising reversible drive means for rotating the elements in opposite directions, a rotor operatively connected to the elements for conjoint rotation therewith, a plurality of switch means corresponding in number to the elements, said switch means being associated with said rotor and each having two contact means one or the other of which is closed in various respective positions of the rotor except for one position in which both contact means are open, said switch means each being correlated to a respective one of the elements to be disposed in said one position when the respective element is adjacent the station, the two contact means of each switch means being coupled to said reversible drive means to cause rotation of the elements in the direction of the shortest distance between the existing position of the switch means and said one position thereof, and means for rendering said switch means selectively operable.

2. A control system for plural element files and the like wherein the elements are conjointly movable relative to a station for selective positioning adjacent the station, comprising a reversible drive motor for the elements, switch means including two sets of switches disposed in pairs comprised of one switch of each set, the pairs of switches corresponding in number and relative spacing to the elements, one set of switches being coupled to the motor for operating it in one direction and the other set of switches being coupled to the motor for operating it in the other direction, cam means comprised of two cam surfaces operatively associated with respective sets of said switches for actuating the switches of the respective set, said cam surfaces being of a length correlated to approximately respective halves of the path of movement of said elements, being arranged generally

in end-to-end relation and at one set of ends conjointly defining corresponding cam surface portions for simultaneously actuating the two switches of any of said pairs of switches, one of said means being operatively connected to the elements for conjoint movement therewith and the other of said means being fixed in predetermined relation to the station in correlation to the elements and the one means, said cam means being correlated to the elements, the switches and the station for causing said corresponding cam surface portions simultaneously to actuate the switches of a respective pair when the corresponding element is adjacent the station, and selectively operable control switches corresponding in number to the elements and coupled in series with a power source and respective pairs of said pairs of switches for rendering the switches of respective pairs selectively operable.

3. A control system for plural element rotary files and the like wherein the elements are conjointly rotatable relative to a station for selective positioning adjacent the station, comprising a reversible drive motor for the elements, switch means including two circular arrays of switches having the switches disposed in pairs comprised of one switch of each array, the pairs of switches corresponding in number and relative spacing to the elements, one array of switches being coupled to the motor for operating it in one direction and the other array of switches being coupled to the motor for operating it in the other direction, generally circular cam means comprised of two arcuate cam surfaces operatively associated with respective arrays of said switches for actuating the switches of the respective array, the arc of said cam surfaces being correlated to approximately respective halves of the circle of movement of said elements, being arranged generally in end-to-end relation and at one set of ends conjointly defining corresponding cam surface portions for simultaneously actuating the two switches of any of said pairs of switches, one of said means being operatively connected to the elements for conjoint rotation therewith and the other of said means being fixed in predetermined relation to the station in correlation to the elements and the one means, said cam means being correlated to the elements, the switches and the station for causing said corresponding cam surface portions simultaneously to actuate the switches of a respective pair when the corresponding element is adjacent the station, and selectively operable control switches corresponding in number to the elements and coupled in series with a power source and respective pairs of said pairs of switches for rendering the switches of respective pairs selectively operable.

4. A control system for plural element files and the like wherein the elements are conjointly movable relative to a station for selective positioning adjacent the station, comprising drive means for the elements, switch means including two sets of switches disposed in pairs comprised of one switch of each set, the pairs of switches corresponding in number and relative spacing to the elements, reversing means operatively associated with said drive means for causing the elements to be moved in opposite directions, one set of switches being coupled to said reversing means for causing movement in one direction and the other set of switches being coupled to said reversing means for causing movement in the opposite direction, cam means comprised of two cam surfaces operatively associated with respective sets of said switches for actuating the switches of the respective set, said cam surfaces being of a length correlated to approximately respective halves of the path of movement of said elements, being arranged generally in end-to-end relation and at one set of ends conjointly defining corresponding cam surface portions for simultaneously actuating the two switches of any of said pairs of switches, one of said means being operatively connected to the elements for conjoint movement therewith

and the other of said means being fixed in predetermined relation to the station in correlation to the elements and the one means, said cam means being correlated to the elements, the switches and the station for causing said corresponding cam surface portions simultaneously to actuate the switches of a respective pair when the corresponding element is adjacent the station, and selectively operable control switches corresponding in number to the elements and coupled in series with a power source and respective pairs of said switches for rendering the switches of respective pairs selectively operable.

5. A control system for plural element rotary files and the like wherein the elements are conjointly rotatable relative to a station for selective positioning adjacent the station, comprising drive means for the elements, two circular arrays of switches having the switches disposed in pairs comprised of one switch of each array, the pairs of switches corresponding in number and relative spacing to the elements and being mounted in fixed relation to one another and the station, reversing means operatively associated with said drive means for causing the elements to be rotated in opposite directions, one array of switches being coupled to said reversing means for causing rotation in one direction and the other array of switches being coupled to said reversing means for causing rotation in the opposite direction, generally circular cam means concentric with said circular arrays of switches and operatively connected to and conjointly rotatable with the elements, said cam means comprising two arcuate cam surfaces operatively associated with respective arrays of said switches for actuating the switches of the respective array, the arc of said cam surfaces being correlated to approximately respective halves of the circle of movement of said elements, being arranged generally in end-to-end relation and at one set of ends conjointly defining corresponding cam surface portions for simultaneously actuating the two switches of any of said pair of switches, said cam means being correlated to the elements, the switches and the station for causing said corresponding cam surface portions simultaneously to actuate the switches of a respective pair when the corresponding element is adjacent the station, and selectively operable control switches corresponding in number to the elements and coupled in series with a power source and respective pairs of said switches for rendering the switches of respective pairs selectively operable.

6. A control system for motor driven plural element rotary files and the like wherein the elements are conjointly rotatable relative to a station for selective positioning adjacent the station, comprising a pair of cams connected to the elements for rotation therewith and each having approximately a semi-circular cam surface, said cams being mounted with their cam surfaces generally diametrically opposed and with said cam surfaces in substantially end-to-end relation at one set of ends and in circumferentially spaced relation at their other ends, two arrays of normally open switches operatively associated respectively with said cams and mounted in fixed relation to one another and the station, said switches being disposed in pairs comprised of one switch of each array, the pairs of switches corresponding in number and relative spacing to the elements, the respective arrays of

switches being operatively coupled for causing the motor to drive the elements in opposite directions, said cam surfaces closing one or the other of the switches of each pair except for a single pair of switches aligned with the circumferential spacing between said surfaces, and normally open selectively operable control switches corresponding in number to the elements and connected in series with a source of power and respective pairs of said switches for rendering the same selectively operable.

7. A control system as set forth in claim 6 wherein said motor comprises a reversible electric drive motor and wherein the respective arrays of switches are coupled with the motor for operating it in opposite directions.

8. A control system as set forth in claim 6 including reversing means operatively associated with the motor for causing the same to rotate the elements in opposite directions, the respective arrays of switches being operatively coupled with said reversing means for causing rotation of the elements in opposite directions.

9. In a control system for a selectively positionable device, a selector control assembly comprising a rotor having a pair of axially spaced cam surfaces thereon, said surfaces each comprising approximately a semi-circle, being generally diametrically opposed, having one set of ends substantially aligned and having their other set of ends circumferentially spaced, and two arrays of switches circumscribing said rotor and aligned radially with respective ones of said surfaces, the switches being disposed in pairs comprised of one switch from each array, each switch having a follower engageable with the respective cam surface whereby said surfaces actuate one or the other of the switches of each pair except for a single pair of switches having their followers aligned with the circumferential spacing between said surfaces.

10. In a control system for a selectively positionable device, a selector control assembly comprising a rotor including a pair of cams, one of said cams having an arcuate cam surface slightly less than 180 degrees in extent and the other having a cam surface somewhat less in arcuate extent, said cams being mounted with their cam surfaces generally diametrically opposed, one set of ends substantially aligned and the other set of ends circumferentially spaced, and two arrays of switches circumscribing said motor and aligned radially with respective ones of said surfaces, the switches being disposed in pairs comprised of one switch from each array, each switch having a follower engageable with the respective cam surface, the followers of each pair being diametrically aligned with the followers of another pair, the arcuate extents of said cam surfaces serving to offset the generally aligned ends of the cam surfaces from diametric opposition to said circumferential spacing, whereby said surfaces actuate one or the other of the switches of each pair except for a single pair of switches having their followers aligned with the circumferential spacing between said surfaces.

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