

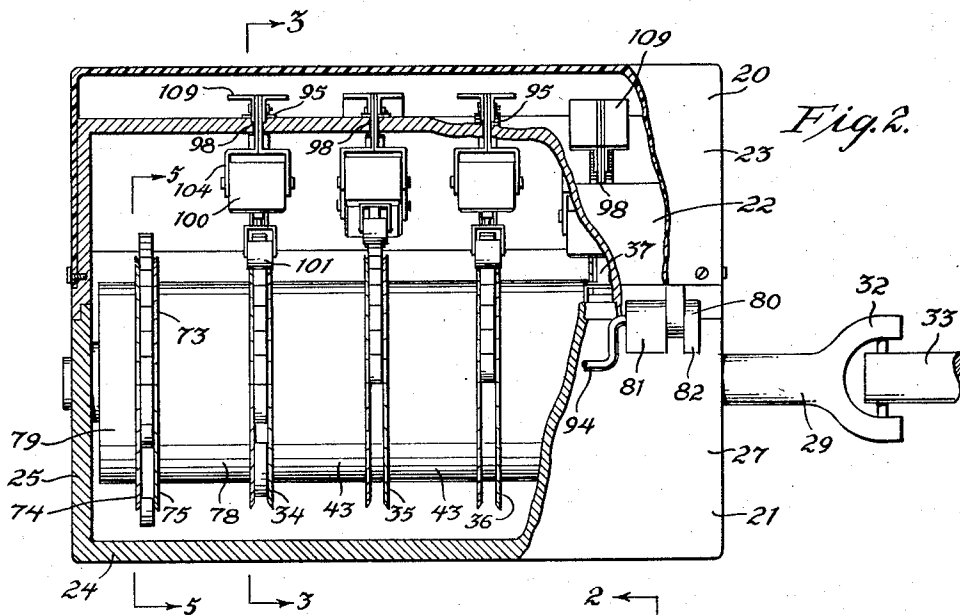
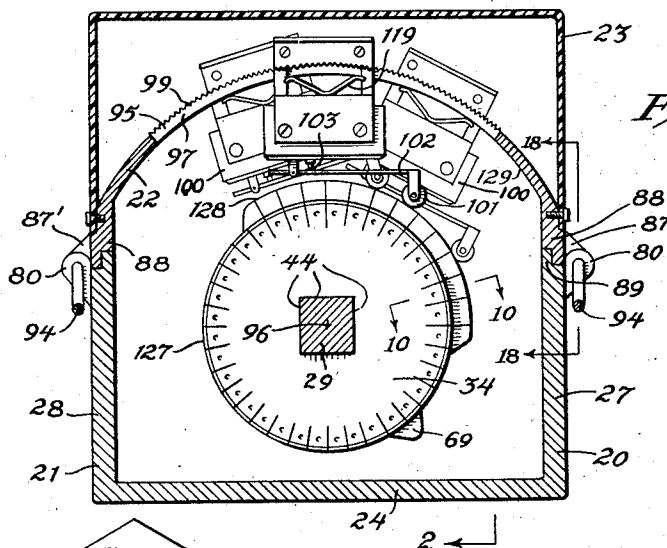
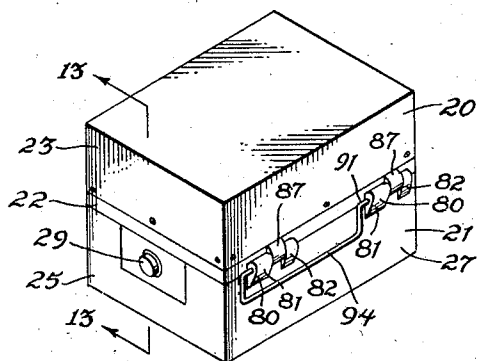
July 22, 1958

P. WITTE
ROTARY CAM SWITCHES

2,844,670

Filed Dec. 30, 1953

3 Sheets-Sheet 1



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July 22, 1958

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ROTARY CAM SWITCHES

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3 Sheets-Sheet 2

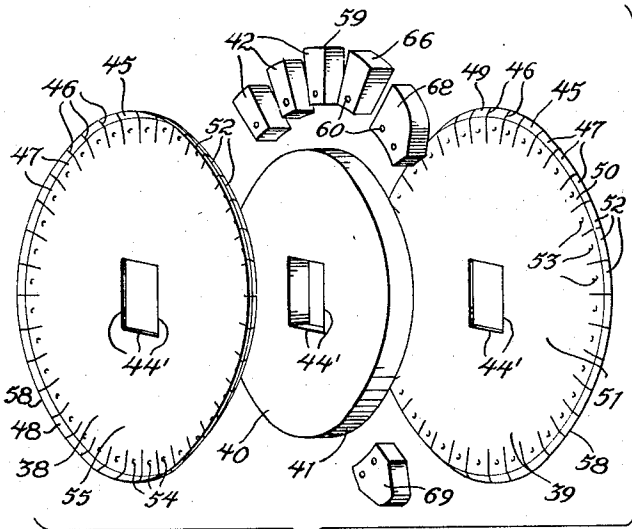


Fig. 4.

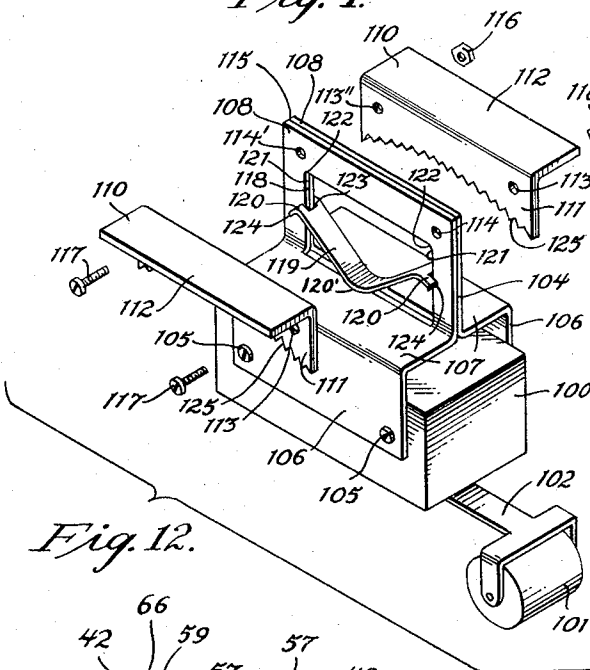


Fig. 12.

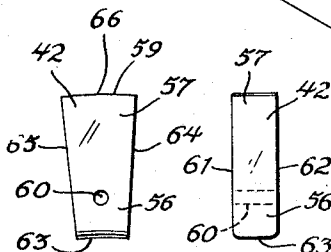


Fig. 6. Fig. 7.

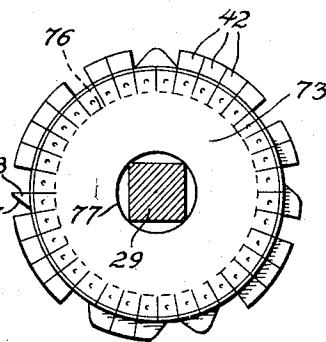


Fig. 5.

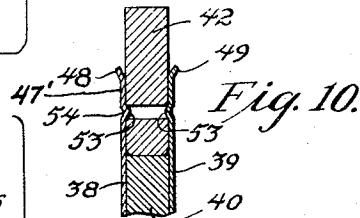


Fig. 10.

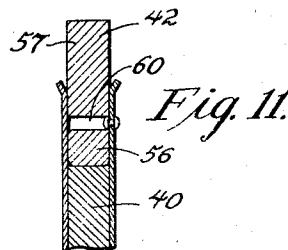


Fig. 11.

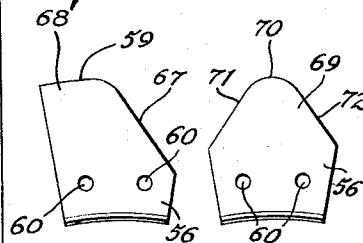


Fig. 8. Fig. 9.

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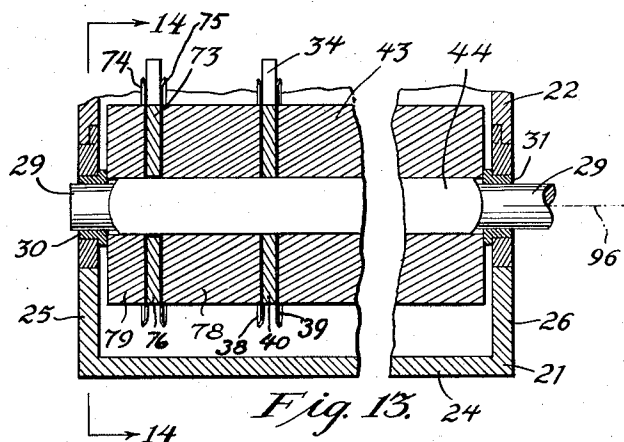
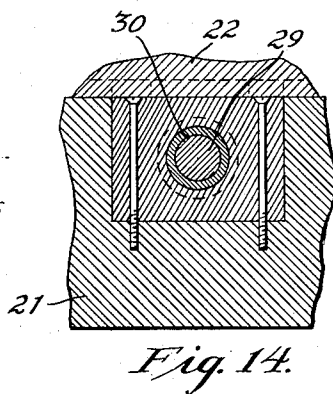
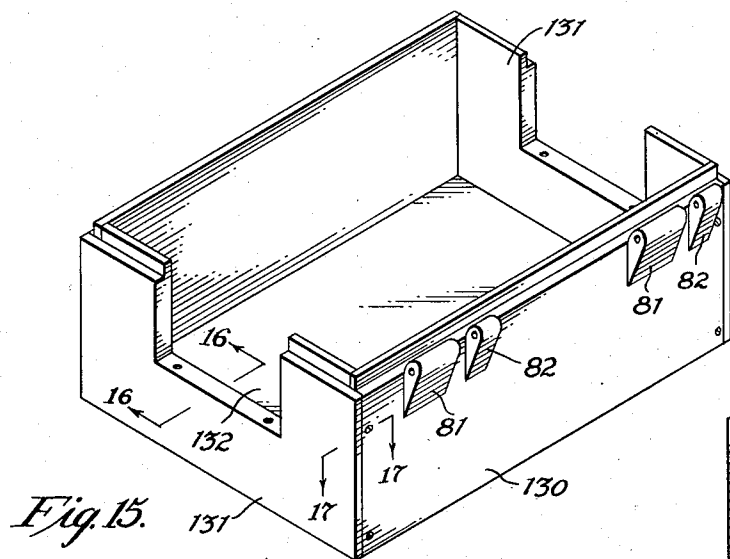
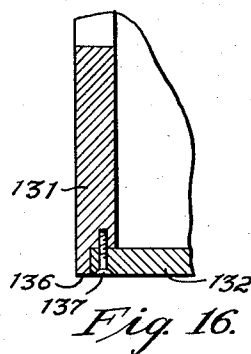
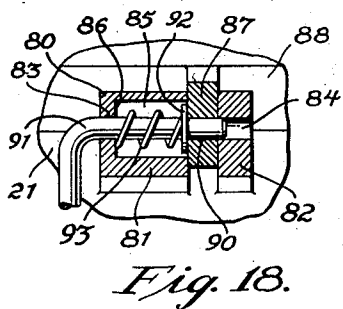
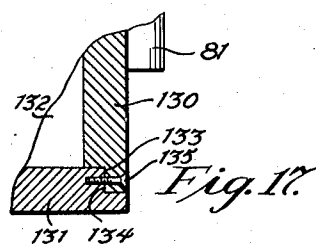
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ROTARY CAM SWITCHES

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3 Sheets-Sheet 3



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2,844,670

ROTARY CAM SWITCHES

Paul Witte, Philadelphia, Pa., assignor of forty percent to
Morris Michael Marks

Application December 30, 1953, Serial No. 401,121

14 Claims. (Cl. 200—27)

My invention relates to rotary cam switches, and it relates more particularly to switches which may from time to time require variations in the timing or in the relationship of one cam with another.

Rotary cam switches are particularly adaptable for use in controlling the sequences of operations and the relationships of various groups of operations with respect to each other, in various devices such for instance as presses, packaging machines, servo-mechanisms and the like. By their nature, they must be dependable in operation. However, serious problems have arisen in cases requiring a change of sequences or of relation of one sequence with another. Not only has it been difficult in rotary cam switches hitherto known, to make such a change; but the time required for bringing such a change about has necessitated the shutting down of mass production operations for such a length of time as to render the loss of production extremely costly. Not only so, but such shut-downs and the costliness thereof have been multiplied by the necessity for making additional changes and adjustments, with attendant shut-downs in the course of desired test runs and pilot runs prior to the return to full production schedule on the new sequence or relation. Thus, in rotary cam switches hitherto known, it has been necessary to disassemble whole cams from the switch, and to reassemble them according to the new sequence or new relation. This is frequently done in a generally inaccessible and out-of-the-way place in or about the device being operated, and thus renders it more difficult and time-consuming for the change to be made. Thus, in the case of large presses, it frequently occurs that such a switch is required to be mounted near the top of such a press, necessitating the use of a long ladder to reach it. As a result, ease in changing the sequences or relationships becomes of substantial importance.

Moreover, on occasion, a cam plate will break thereby requiring a complete shut-down of production until a new plate can be ordered, shipped to the plant, and mounted in the switch box. These plates, being made to order, are expensive. Yet, when a given sequence is no longer to be used, the plate must be discarded.

One object of my invention therefore is to provide a rotary cam switch which does not have to be dismounted or substantially disassembled when a change of sequence or relation of sequences is to be made.

Another object of my invention is to provide a rotary cam switch which is so constructed as to have variable cam paths which are easily changed as desired, but which will remain fixed until thus changed.

A further object of my invention is to provide a rotary cam switch having readily changed relationships of sequences as desired, but which relationships are fixed until thus changed.

Another object of my invention is to provide a rotary cam switch in which the sequences and relationships of sequences may be changed from time to time with-

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out replacing one cam plate with another or requiring the making of special cam plates.

A further object of my invention is to provide a rotary cam switch which is easy and inexpensive to make and maintain, and in which the sequences and relations of sequences may be readily changed and in a minimum of time, while being certain in operation.

Another object of my invention is to provide a rotary cam switch which is self-contained and which requires no additional or substitute parts for changing sequences or relationships of sequences.

A further object of my invention is to provide a rotary cam switch which is substantially universal in its application, and which may readily be serviced or its sequence or relationships changed, with little effect from inaccessibility of the switch box.

With the above and other objects in view, my invention consists of a rotary cam switch comprising a mounting unit having a substantially longitudinal axis, a shaft disposed along said axis, a plurality of cam assemblies mounted on said shaft and substantially non-rotatable with respect thereto, a displaceable staging carried by said mounting device and comprising tracks each of which is formed along an arc which is co-axial with said axis but whose path defines a plane which is substantially perpendicular to said axis; each of said tracks having mounted thereon a switch device, a cam follower extending from said switch device operably to actuate the same; each of said cam assemblies comprising a base member, sheaves disposed on either side of said base member, and cam segments; each of said segments comprising a base portion and a path portion; means for releasably interlocking said base portion with said sheaves in substantially fixed position with respect to the peripheries of said sheaves; said peripheries and said cam path portion of each of said segments when in said fixed position, being disposed within the path of said follower; and means for transmitting motion to said shaft.

My invention also consists of the parts, and combinations of parts, as will appear from the more detailed description which follows hereinafter.

For the purpose of illustrating my invention, I have shown in the accompanying drawings forms thereof which are at present preferred by me, since the same have been found in practice to give satisfactory and reliable results, although it is to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized and that my invention is not limited to the precise arrangements and organizations of the instrumentalities as herein shown and described.

Referring now to the drawings in which like reference characters indicate like parts:

Figure 1 represents a perspective view of a rotary cam switch embodying my invention.

Figure 2 represents a vertical sectional view, partly broken away, of a rotary cam switch embodying my invention.

Figure 3 represents a vertical sectional view taken generally along the lines 3—3 of Figure 2.

Figure 4 represents an extended perspective view illustrating component parts of a cam assembly comprised in a rotary cam switch and embodying my invention.

Figure 5 represents an elevational view of a cam segment storage assembly which may be comprised in a rotary cam switch embodying my invention.

Figure 6 represents a side elevational view of a cam segment comprised in a rotary cam switch embodying my invention.

Figure 7 represents an end elevational view of the cam segment illustrated in Figure 6.

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Figure 8 represents a side elevational view of a cam segment adapted to be used for a "rise" or "fall" of a cam path in a rotary cam switch embodying my invention.

Figure 9 represents a side elevational view of a cam segment adapted to impart momentary switch actuation in a rotary cam switch embodying my invention.

Figure 10 represents a vertical sectional view of a cam segment mounting assembly in a rotary cam switch embodying my invention.

Figure 11 represents a vertical sectional view of a cam segment mounting assembly of modified construction which may be used in a rotary cam switch embodying my invention.

Figure 12 represents an extended perspective view of a switch mounting assembly portion comprised in a rotary cam switch embodying my invention.

Figure 13 represents a vertical sectional view taken generally along the lines 13—13 of Figure 1.

Figure 14 represents a sectional view taken generally along the lines 14—14 of Figure 13.

Figure 15 represents a perspective view of a mounting unit of modified construction, embodying my invention.

Figure 16 represents an enlarged sectional view taken generally along the lines 16—16 of Figure 15.

Figure 17 represents an enlarged sectional view taken generally along the lines 17—17 of Figure 15.

Figure 18 represents a sectional view taken generally along the lines 18—18 of Figure 3.

According to my invention I provide a rotary cam switch device 20 comprising a mounting unit or device 21, staging assembly portion 22 and a cover portion 23. The mounting unit 21 may comprise a bottom wall 24, end walls 25 and 26, front wall 27 and rear wall 28. A shaft 29 may be journaled preferably in the mounting unit 21 as at 30 and 31 disposed respectively in the opposed end walls 25 and 26 thereof. The shaft 29 is preferably provided with a suitable coupling means such for instance as the coupling 32 for flexible connection with a shaft 33 adapted to transmit continuous motion to the shaft 29 from the machine (not shown) whose operation is to be controlled by the device 20. In a modified application of my invention, the shaft 33 may derive its motion from an auxiliary source (not shown) or from a prime mover (not shown) whose motion also drives said machine. Any suitable flexible coupling or flexible shafting may be used to transmit such motion.

At suitable intervals along said shaft, I provide cam assemblies such as the assemblies 34, 35, 36 and 37. These assemblies may each consist of two sheaves 38 and 39, a spacer or base member 40 having a preferably circular periphery 41, and one or more cam segments 42 adapted to be inserted between the sheaves 38, 39, held in place thereby, and removed therefrom, as desired. Suitable spacer members 43 may be disposed between adjacent cam assemblies 34, 35, 36, 37. The sheaves 38, 39 and the base member 40 are preferably all keyed in any suitable manner to the shaft 29. As illustrated, this key may consist of flattened surfaces 44 of the shaft 29 bearing against corresponding flattened bearing edges 44' on the sheaves and base member. The spacer members 43 may if desired be similarly keyed to the shaft 29.

The outer edge portion 45 of each of the sheaves 38, 39 is radially cut as at 46 preferably at regular intervals throughout the periphery of the sheave operably to divide the outer edge portion into a series of spring-like lips 47. The rims of the sheaves 38 and 39 are preferably outwardly flared away from each other as at 48 and 49 respectively. Thus, each spring-like lip 47 may comprise a face portion 50 which may be substantially co-planar with the inner area 51 of the sheave, and an outer flange portion 52 which is inclined away from the base member 40. A suitable projection 53 is formed on the face portion 50 of each lip 47 and extends toward the opposing sheave. These projections 53 may be formed of the re-

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verse faces of suitable dimples 54 stamped on the outer face 55 of each sheave 38, 39.

The radius of the periphery 41 of the base member 40 is preferably substantially similar to the radius of the arc formed by the inner ends of the cut portions or slits 46. The sheaves 38 and 39 are held in base member embracing relation by any suitable means, such for instance as the spacer members 43 disposing the cam assemblies along the shaft 29 and between the bearings 30, 31 with the component portions of each cam assembly bearing against each other. In a preferred form the lips 47 of one sheave 38 are disposed substantially in registry with the lips 47 of the other sheave 39, thereby substantially providing a series of spring clips 47' each having two opposed spring lips 47, and adapted to embrace a cam segment 42 in gripping and interlocking relation thereto.

The cam segments 42 each comprises a lower base portion 56 and an upper, cam path portion 57. The base portion 56 has a thickness substantially equal to the thickness of the base member 40, and a height substantially equal to the radial distance along the inner face of the sheave, between that portion immediately adjacent the periphery 41 of the base member 40 and the outer edge 58 of the outwardly flared flange 52. The cam path portion 57 is preferably integral with the base portion 56 and extends outwardly therefrom, terminating in an outer edge 59 forming a segment of the cam path. A recess is preferably formed in each of the side faces 61, 62 of each segment 42, and may consist of an orifice extending laterally through the base portion 56. The longitudinal axis of the orifice 60 is preferably spaced from the bottom 63 of the segment a distance equal to the distance between the projection 53 and the arc of the periphery 41. The forward wall 64 and rearward wall 65 of each segment 42 is preferably disposed along planes inclined at an angle substantially identical to the angles between adjacent radial slits 46; and said walls 64, 65 are spaced at said bottom 63 a distance substantially equal to the distance between the inner ends of the radial slits 46. The recesses or orifice 60 are preferably disposed along the side walls 61, 62 in a manner to register with the projections 53.

The segments 42 may include "high" segments 66 whose outer edges 59 are formed about an arc whose center is disposed on the longitudinal axis of the shaft 29 when the bottom 63 is resting on the periphery 41 and the side faces 61, 62 are abutting the sheaves 38, 39. In this condition, the surface 59 is adapted to form an integral part of the "high" portion of a cam path. Another segment 68 may comprise an inclined surface 67 extending from the base portion 56 to the level of the upper edge 59. If desired, the segment 68' having the inclined surface 67 may also have a "high" surface portion 59 adjacent the inclined surface 67; and in such event, the base portion 56 may if desired be of double the width of the base portion 56 of the segment 66 whose outer edge 59 consists of an arcuate surface 59 alone, and the double width base portion 56 of the segment 68' may comprise two orifices 60, each of which is adapted to register with a projection 53 on a spring-like lip 47. Other segments 69 may be provided, having a "high" portion 70 and an inclined surface 71 and 72 on either side of said "high" portion, leading from the base portion 56 to said "high" portion. The inclined surface 71 and 72 may thus consist of a "rise" and a "fall" respectively. The segments 68 and 68' are each adapted to be disposed at the beginning of a cam path "high" portion, in which event the surface 67 serves as a "rise"; or when reversed in position, at the end of a cam path "high" portion in which event it is adapted to serve as a "fall."

A cam segment storage assembly 73 may be provided on the shaft and may comprise sheaves 74 and 75 and a base member 76 respectively substantially similar to the sheaves 38 and 39 and base member 40. If desired,

the sheaves 74 and 75 and base member 76 may each comprise a bearing edge 77 which is not keyed to the shaft 29. The storage assembly 73 may be spaced from the next adjacent cam assembly 34 by a suitable spacer 78 and may also be spaced from the end wall construction 25 by a suitable spacer 79.

The staging portion 22 is preferably secured to the mounting unit 21 by means of one or more hinge devices 80. In a preferred form, these hinge devices 80 are disposed on opposed walls such for instance as the front wall 27 and rear wall 28 of the mounting unit 21, and are so constructed as to be adapted to release the staging portion 22 when desired.

Thus, the hinge 80 may comprise bearing members 81 and 82 projecting outwardly from the wall 27 or 28 and comprising respective aligned bearings 83 and 84. The bearing member 81 may also comprise a chamber 85 disposed intermediate the bearing 83 and the bearing member 82, said chamber 85 having an inner wall 86. A lug 87 may project from one edge portion 88 of the staging 22 in a manner to be disposed between the bearing members 81 and 82 when said edge portion 88 is juxtaposed to the upper edge portion 89 of the wall 27. In similar manner, a lug 87' may project from the opposed edge portion 88 of the staging 22. Channels 90 may extend through each of the lugs 87, 87' and in alignment with the bearings 83 and 84 when said lug 87 or 87' is thus disposed between the bearing members 81 and 82.

A pintle 91 may be slideably disposed within the bearings 83, 84 and through the channel 90. A suitable stop 92 may be fixedly mounted on the pintle 91 and within the chamber 85. A suitable spring 93 may be mounted within the chamber 85 and between the inner wall 86 thereof and the stop 92 operably to urge the pintle 91 toward the bearing member 82. A suitable handle member 94 may extend from the pintle 91 operably to aid in the withdrawal of the pintle 91 from the bearing 84 and the channel 90 against the pressure of the spring 93. If desired, a plurality of hinges 80 may be disposed substantially in alignment along the juncture of either or both edges 88 with the corresponding wall or walls 27, 28, and in such event, the handle member 94 may extend from one end of the pintle 91 of one of said hinge assemblies 80 to the similar end of the aligned pintle 91 of the other substantially aligned hinge assembly 80.

It is thus rendered possible to release one edge portion 88 of the staging 22 from locking engagement with a wall 27, 28 while retaining the opposed edge 88 of said staging 22 in hinged relation to one of said walls 27, 28; or indeed, if desired, to release both edges 88 of said staging portion 22 and thereby permit the complete withdrawal of said staging from the mounting unit 21.

The staging 22 preferably comprises one or more tracks 95 which are formed about an arc whose center is disposed on the longitudinal axis 96 of the shaft 29, an effective edge 97 of said track 95 being disposed along a plane which is perpendicular to said axis 96.

In one construction I may dispose slots 98 in said staging portion 22, with each of said effective edge portions 97 forming a longitudinal side surface edge of one of said slots 98. Each of the slots 98 is preferably disposed in registry with one of the cam assemblies 34, 35, 36, 37. In a preferred form, the upper surface of the tracks 95, adjacent the slots 98, is knurled or serrated as at 99.

A suitable switch device, such for instance as the micro-switch 100 is provided, with a suitable cam follower such for instance as the roller 101 secured to the switch 100 in a manner to operate the switch device 100 as by means of the lever 102 bearing against the plunger 103 which in turn actuates the make and break mechanism of the switch device 100. The roller 101 is preferably of greater width than the width between the sheaves 38 and 39.

A yoke 104 embraces the upper and side portions of the switch device 100 and is secured thereto by any suitable means such as the bolts 105. As illustrated in Figures

2, 3 and 12, the yoke 104 may comprise two substantially similar Z-shaped brackets, each of which comprises a vertical wall member 106, a cross-wall member 107, and a vertical wall member 108. The vertical wall members 108 are disposed in abutting relation, with the wall members 106 spaced a distance substantially equal to the width of the switch device 100. A handle member 109 is provided, and may comprise two similar angle members 110, each having a vertical wall portion 111 and a lateral wall portion 112 at substantially right angles thereto. Registering orifices 113, 114 and 113' may respectively be disposed at one end portion of the wall 111 of one angle 110, abutting walls 118, and the wall 111 of the other angle member 110, when said walls are disposed in apposition to each other. Similar orifices 113'' and 114' may be disposed at the other end portions of said walls. The handle member 109 may thus be assembled by disposing each wall 111 in abutting relation to an outside face of a wall 108, with the lateral walls 112 disposed in proximity to the upper edges 115 of the abutting walls 108, and with the orifices 113, 114 and 113' in registry, and the similar orifices 113'' and 114' in registry; and passing a suitable retaining member through each group of said registering orifices, and locking said retaining member in place. For this purpose, a suitable nut 116 and bolt 117 may be used for each group of registering orifices.

The thus combined walls 108 are preferably of a thickness substantially equal to, or slightly less than, the width of the slot 98, and may be channeled as at 118 to receive a suitable spring device 119 which may be splined as at 120 about the interior edges of the channel 118 while resting a portion of said spring 119 against a portion of the cross wall 107. In a preferred form, the spring device 119 may be substantially V-shaped with its vertex 120' curved and resting upon the cross walls 107, and the ends each reversely curved and channeled to receive and ride upon the interior edges 121 of the channel 118, said interior edges 121 being substantially perpendicular to the cross walls 107, and said reversely curved ends being disposed intermediate said cross walls 107 and the upper ends 122 of the edges 121. The channels 123 formed through the ends of the spring device 119 are preferably of a length sufficient to enable the spring device to be flattened a substantial degree without interference from the interior ends of the channels 123. Thus, when the spring device 119 is in free condition, the interior ends of the channels 123 are spaced a distance substantially less than the distance between the opposed edges 121 of the channels 118, while the outer end portion 124 of the spring device 119 embraces the abutting walls 108 adjacent said channel 118.

The lower edge 125 of each of the walls 111 of the handle member 109 may be substantially curved about an arc substantially identical to that of the upper edge 99 of the track 95, and is preferably similarly knurled or serrated. The cover member 23 may be mounted on the staging portion 22 or the mounting unit 21 in any suitable manner, operably to cover the slots 98, handle members 109 and related track structure from dust or dirt.

In practice, a number of slots 98 may be provided which may be equal to the greatest number of cam assemblies expected to be utilized at one time on the rotary cam switch 20, and each slot 98 may have mounted therethrough and thereabout an assembly carrying a switch device 100. Cam assemblies such as the assemblies 34, 35, 36 and 37 are disposed on the shaft 29, in spaced relation to each other as by the spacer members 43, and with one cam assembly directly under each slot 98 and in substantial alignment therewith. The cam segment storage assembly 73 may be mounted on the shaft 29 in the vicinity of one end of the mounting unit 21, and preferably rotatably disposed with re-

spect to the shaft 29. In this condition, the follower 101 is urged downwardly by virtue of its weight and leverage, and preferably also by virtue of the spring-loaded plunger 103 bearing against the lever 102 on which the follower 101 is mounted. In the downward inclination of the follower 101, it bears against the rims 58 of the sheaves 38, 39, and in the thus extended position of the follower 101 and the lever 102 carried thereby, the spring-loaded plunger 103 is permitted to extend outwardly from the switch box 100 in "off" position, and it will remain thus as long as no cam segments 42 are disposed between the sheaves 38, 39 with their cam path portions 57 projecting outwardly therefrom.

When it is desired to actuate the plunger 103 by virtue of the rotation of the shaft 29, the machinery (not shown) may be operated through its cycle until that point in its operational sequence is reached where the switch 100 should be actuated for the next step of operation. In so doing, the cam shaft 29 is correspondingly rotated and carries with it the sheaves 38, 39 of each cam assembly. One cam assembly is then chosen to operate a switch device 100 to actuate the next step of sequential operation of the machine whose operation is being controlled by the rotary cam switch. A cam segment 42 is then chosen for insertion between the sheaves 38 and 39 of said cam assembly immediately beneath the follower 101 which is raised to permit the insertion of said segment 42. If desired, the segment 42 may consist of a segment such as the one designated as at 68 with a "high" portion 59 and an inclined portion 67, or it may consist of a segment 66 having a "high" portion 59, in which latter case the auxiliary segment 68 of single base construction may be used with its inclined surface 67 serving as a "rise," said last mentioned segment 68 being disposed adjacent the segment 66 and immediately before it in the cam path being established. Additional segments 66 are then disposed with their bases slipped between the spring-like lips 47, their bottoms 63 resting on the periphery 41 and their orifices 60 in interlocking engagement with the projections 53, and the radial wall 64 of one substantially abutting the radial wall 65 of the next adjacent segment until the desired degree of arc is established by the surfaces 59 corresponding to the degree of rotation of shaft 29 which is desired to lapse before the switch device 100 is to be de-actuated. When the last such segment 66 has been thus inserted, a "fall" segment 68 may be inserted adjacent thereto, or the last segment in the series may consist of a segment 68 having both a "high" 59 and a "fall" 67. There is thus established a cam path consisting of an "off" arc 127 wherein the follower 101 rides upon the rims 58 of the sheaves 38, 39, and an "on" arc 128 consisting of the cumulative abutting surfaces 59, with a "rise" intermediate the "off" and "on" arcs, and a "fall" intermediate the "on" and "off" arcs. Where it is desired to actuate the switch 100 momentarily, a cam segment 69 may be used and in the event such momentary actuation is to be of extremely brief duration, the segment 69 may be made of a single-width base (not shown) rather than the double-width base illustrated in the drawings. As many "high" paths 128 and "low" paths 127 as may be desired may thus be established, and of as long or short duration as desired.

Should the sequence thus established be found to be the proper one for the machine whose operation is being controlled, but the incidence of the operation is found to be improperly timed, this may be corrected or adjusted by adjusting the position of the switch device 100 with its attendant follower 101 along the track 95. This may readily be done by lifting the handle member 109 against the action of the spring 119 bearing against the under surface 129 of the staging 22 until the bottom edges 125 are free of contact with the knurled or serrated surface 99, and moving the thus freed handle

member 109 with the yoke 104 secured thereto backward or forward along the slot 98 until the follower 101 is in correct position with regard to the cam path and the incidence of the "high" and "low" thereof. This may readily be done, even while the machine being controlled is in actual operation, thereby simultaneously changing and testing the relationship of the cams, and thus avoiding shut-downs. In this position, the handle member 109 may be released, whereupon the yoke 104 will be urged downwardly by means of its spring 119 bearing against both the cross walls 107 and the under surface 129 of the stage portion 22, until the knurled or serrated edges 125 of the handle member 109 are again interlocked with the knurled or serrated surface 99.

In like manner, each of the remaining cam assemblies such as the assemblies 34, 35, 36 and 37 may have cam sequences established thereon, and the incidence thereof adjusted by movement and adjustment of the switch device 100 with respect thereto.

When it is desired to revise the incidence of the sequences, it is not necessary to adjust the cam assemblies; it being merely required that the cover 23 be removed and the handle members 109 of the desired switches lifted and moved into proper position along their tracks 95. The cover 23 may then be returned into place and the rotary cam switch is ready for its revised operation.

When it is desired to revise the cam sequence, it is merely necessary to unlatch one edge portion 88 of the staging portion 22 and to lift the staging portion about the opposed hinge, thereby exposing the cam assemblies for revision. The operator may then readily slip the undesired cam segments 42 out of their clasped relation to the sheaves 38, 39, and insert desired segments 42 in proper place between the peripheral spring clips comprising opposed spring-like lips 47 all as hereinabove described. To aid in this operation, the operator may utilize the cam segment storage assembly 73 which is freely rotatable on the shaft 29 while the other cam assemblies are fixed with respect to said shaft. When the new sequences are thus established, the staging portion 22 is then returned into fully interlocked condition with the mounting unit 21, and the rotary cam switch is ready for operation in its new sequences. Any revision of incidence of such a sequence may be effected in the manner hereinbefore described.

In Figures 15, 16 and 17 are illustrated a modified construction of mounting unit embodying my invention. In this construction, the mounting unit comprises a front wall 130, and walls 131 and bottom 132, which are secured to each other in a manner to enable the selected withdrawal of front wall or bottom without disturbing the construction within the mounting unit or carried thereby. In this modification, a rabbeted edge 133 may be formed vertically along the outer edges of the front wall, and corresponding with complementary rabbeted edges 134 formed along the forward edges of the end walls 131, the inner walls of the thus rabbeted edges being lapped together and the thus joined walls being held in place by means of a suitable screw 135. The lower edge 136 of the end walls 131 may also be rabbeted to receive the bottom 132 which may be secured thereto by a suitable screw 137.

I am aware that the invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and I therefore desired the present embodiment to be considered in all respects as illustrative and not restrictive, reference being had to the appended claims rather than to the foregoing description to indicate the scope of the invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A rotary cam switch comprising a mounting device having a substantially longitudinal axis, a rotary shaft disposed along said axis, a cam assembly mounted on said shaft and substantially non-rotatable with respect

thereto, a displaceable staging carried by said mounting device and comprising a track formed along an arc which is substantially coaxial with said axis but whose path defines a plane which is substantially perpendicular to said axis; said track having mounted thereon a micro-switch device, a cam follower extending from said micro-switch device operably to actuate the same; said cam assembly comprising a spacer member, sheaves disposed on either side of said spacer member, and cam segments radially supported by said spacer member; means for releasably interlocking said segments with said sheaves, with said segments in substantially fixed position with respect to the peripheries of said sheaves; said peripheries and said segments when in said fixed position, being disposed within the path of said follower.

2. A rotary cam switch comprising a mounting device having a substantially longitudinal axis, a rotary shaft disposed along said axis, a cam assembly mounted on said shaft and substantially non-rotatable with respect thereto, a displaceable staging carried by said mounting device and comprising a track formed along an arc which is substantially coaxial with said axis but whose path defines a plane which is substantially perpendicular to said axis; said track having mounted thereon a micro-switch device, a cam follower extending from said micro-switch device operably to actuate the same; said cam assembly comprising a spacer member, sheaves disposed on either side of said spacer member, and cam segments radially supported by said spacer member; means for releasably interlocking said segments with said sheaves, with said segments in substantially fixed position with respect to the peripheries of said sheaves; said peripheries and said segments when in said fixed position, being disposed within the path of said follower; a plurality of said segments being juxtaposed one to another, with their outer edges defining a continuous cam path.

3. A rotary cam switch comprising a mounting device having a substantially longitudinal axis, a shaft disposed along said axis, a cam assembly mounted on said shaft and substantially non-rotatable with respect thereto, a switch device assembly carried by said mounting device, said switch device assembly including a cam follower; said cam assembly comprising a base member and cam segments; spring clips disposed about the periphery of said base member; each of said segments comprising a base portion and a path portion; said spring clips being adapted releasably to interlock with said base portion; said peripheries and said cam path portion of each of said segments when in said interlocked position, being disposed within the path of said follower; and means for transmitting motion to said shaft.

4. A rotary cam switch comprising a mounting device having a substantially longitudinal axis, a shaft disposed along said axis, an adjustable cam assembly mounted on said shaft and rotatable about said axis, a displaceable staging assembly carried by said mounting device and comprising a track formed along an arc which is substantially co-axial with said axis; said track having mounted thereon a switch device; a cam follower extending from said switch device operably to actuate the same when said cam follower is in operable relation to said cam assembly; said staging assembly being retained on said mounting device in a manner alternately to be disposed in an operative position wherein said follower is in said operable relation, and in an inoperative position wherein said follower is disposed in an out-of-the-way position in a manner to permit access to said cam assembly for adjustment thereof; and means for transmitting motion to said cam assembly.

5. A rotary cam switch comprising a mounting device having a substantially longitudinal axis, an adjustable cam assembly carried by said mounting device and rotatable about said axis, a staging assembly carried by said mounting device and comprising a track formed along an arc which is substantially co-axial with said axis; a

switch device carried by said staging assembly and in such relation to said track that its movement is limited by said track; a cam follower adapted to actuate said switch device when said follower is in operable relation to said cam assembly; said staging assembly being retained on said mounting device in a manner alternately to be disposed in an operative position wherein said follower is in said operable relation, and in an inoperative position wherein said follower is disposed in an out-of-the-way position in a manner to permit access to said cam assembly for adjustment thereof; and means for transmitting motion to said cam assembly.

6. A rotary cam switch comprising a mounting device having a substantially longitudinal axis, an adjustable cam assembly carried by said mounting device and rotatable about said axis, a staging assembly carried by said mounting device and comprising a track formed along an arc which is substantially co-axial with said axis; a switch device carried by said staging assembly in a manner to have its displacement with respect to said staging assembly limited by said track; a cam follower adapted to actuate said switch device when said follower is in operable relation to said cam assembly; said staging assembly being retained on said mounting device in a manner alternately to be disposed in an operative position wherein said follower is in said operable relation, and in an inoperative position wherein said follower is disposed in an out-of-the-way position in a manner to permit access to said cam assembly for adjustment thereof; said cam assembly comprising a spacer member, sheaves disposed on either side of said spacer member, and a cam segment comprising a base portion and a path portion; spring means for releasably retaining said base portion in place with respect to said sheaves and in radially supported position with respect to said spacer member; peripheral portions of said sheaves, and said path portion of said spring-retained segment, being disposed within the path of said follower when said staging assembly is in operative position; and means for transmitting motion to said cam assembly.

7. A rotary cam switch comprising a mounting device having a substantially longitudinal axis, an adjustable cam assembly carried by said mounting device and rotatable about said axis, a displaceable staging assembly carried by said mounting device and comprising a track formed along an arc which is substantially co-axial with said axis; said track having mounted thereon a switch device; a cam follower carried by said switch device and adapted to actuate said switch device when said follower is in operable relation to said cam assembly; said displaceable staging being adapted when in one position, to dispose said follower in operative relation to said cam assembly, and when in another position on said mounting device, to dispose said follower in an out-of-the-way position operably to expose said cam assembly for adjustment thereof; and means for transmitting motion to said cam assembly.

8. A rotary cam switch comprising a mounting device having a substantially longitudinal axis, a plurality of cam assemblies carried by said mounting device and rotatable about said axis, a staging assembly carried by said mounting device and comprising tracks each of which is formed along an arc which is substantially co-axial with said axis; switch devices carried by said staging assembly; said tracks being adapted to limit movement of said switch devices; a cam follower extending from each of said switch devices operably to actuate the same; each of said cam assemblies comprising a base member, a sheave, and cam segments; each of said segments comprising a base portion and a path portion; means for releasably interlocking said base portion with said sheaves, with said base portion in radially supported position with respect to said base member; a peripheral portion of said sheave, and said path portion of each of said segments when in said interlocked position, being

disposed within the path of said follower; and means for transmitting motion to said cam assemblies.

9. A rotary cam switch comprising a mounting device having a substantially longitudinal axis, a cam assembly carried by said mounting device and rotatable about said axis, a staging assembly carried by said mounting device and comprising a track formed along an arc which is substantially co-axial with said axis; a switch device carried by said staging assembly; said track being adapted to limit movement of said switch device; a cam follower extending from said switch device operably to actuate the same; said cam assembly comprising a base member, a sheave, and cam segments; each of said segments comprising a base portion and a path portion; means for releasably interlocking said base portion with said sheaves, with said base portion in radially supported position with respect to said base member; a peripheral portion of said sheave and path portion of each of said segments when in said interlocked position being disposed within the path of said follower; and means for transmitting motion to said cam assembly.

10. A rotary cam switch comprising a mounting device having a substantially longitudinal axis, a cam assembly carried by said mounting device and rotatable about said axis, a staging assembly carried by said mounting device and comprising a track formed along an arc which is substantially co-axial with said axis; a micro-switch carried by said staging assembly; said track being adapted to limit movement of said microswitch; a cam follower extending from said microswitch operably to actuate the same; said cam assembly comprising a spacer member, sheaves disposed on either side of said spacer member, and a cam segment radially supported by said spacer member; means for releasably interlocking said segment with said sheaves, with said segment in substantially fixed position with respect to the peripheries of said sheaves; said peripheries and said segment when in said fixed position, being disposed within the path of said follower; and means for transmitting motion to said cam assembly.

11. A rotary cam switch comprising a mounting unit having a substantially longitudinal axis, a rotary shaft disposed along said axis, a plurality of cam assemblies mounted on said shaft and substantially non-rotatable with respect thereto, a staging carried by said mounting unit and comprising tracks each of which is formed along an arc which is substantially coaxial with said axis when said staging is in operative position with respect to said cam assemblies; each of said tracks having mounted thereon a switch device, a cam follower extending from said switch device operably to actuate the same; each of said cam assemblies comprising a base member, and an adjustable cam segment; said staging being mounted on said mounting unit in a manner alternately to be disposed in an operative position wherein said followers are in the path of said segment, and in an inoperative position wherein said followers are disposed in an out-of-the-way position in a manner to permit access to said cam segment for adjustment thereof.

12. A rotary cam switch comprising a mounting unit having a substantially longitudinal axis, a rotary shaft disposed along said axis, a plurality of cam assemblies mounted on said shaft and substantially non-rotatable

with respect thereto, a staging carried by said mounting unit and comprising tracks each of which is formed along an arc which is substantially coaxial with said axis when said staging is in operative position with respect to said cam assemblies; each of said tracks having mounted thereon a switch device, a cam follower extending from said switch device operably to actuate the same; each of said cam assemblies comprising a base member, and an adjustable cam segment; said staging being mounted on said mounting unit in a manner alternately to be disposed in an operative position wherein said followers are in the path of said segment, and in an inoperative position wherein said followers are disposed in an out-of-the-way position in a manner to permit access to said cam segment for adjustment thereof; a cover member carried by said mounting unit and displaceably disposed above said staging and said switch device.

13. A rotary cam switch comprising a mounting unit having a substantially longitudinal axis, a rotary shaft disposed along said axis, a cam assembly mounted on said shaft and substantially non-rotatable with respect thereto, a displaceable staging carried by said mounting unit and comprising a track formed along an arc which is substantially coaxial with said axis when said staging is in operative position with respect to said cam assembly; said track having mounted thereon a switch device, a cam follower extending from said switch device operably to actuate the same; said cam assembly comprising a base member, and an adjustable cam segment; said staging being mounted on said mounting unit in a manner alternately to be disposed in an operative position wherein said follower is in the path of said segment, and in an inoperative position wherein said follower is disposed in an out-of-the-way position in a manner to permit access to said cam segment for adjustment thereof.

14. A rotary cam switch comprising a mounting device having a substantially longitudinal axis, a rotary shaft disposed along said axis, a cam assembly mounted on said shaft and substantially non-rotatable with respect thereto, a switch device assembly carried by said mounting device, said switch device assembly including a cam follower; said cam assembly comprising a base member, a sheave, and a cam segment comprising a base portion and a path portion; spring means for releasably retaining said base portion in place with respect to said sheave and in radially supported position with respect to said base member; a peripheral portion of said sheave, and said path portion of said spring-retained segment, being disposed within the path of said follower.

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