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R. B. IMMEL

2,969,693

ADJUSTABLE-CONTOUR CAM

Original Filed June 24, 1957

2 Sheets-Sheet 1

Fig. 1.

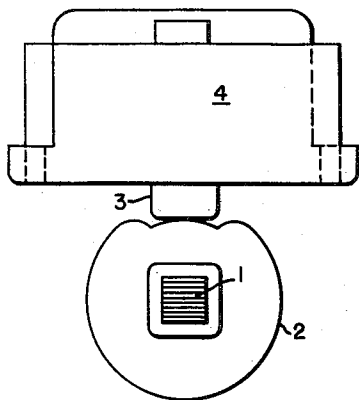


Fig. 2.

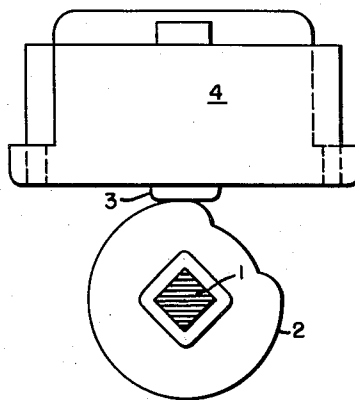


Fig. 3.

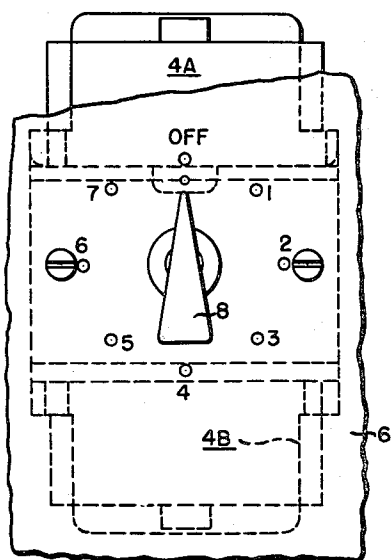
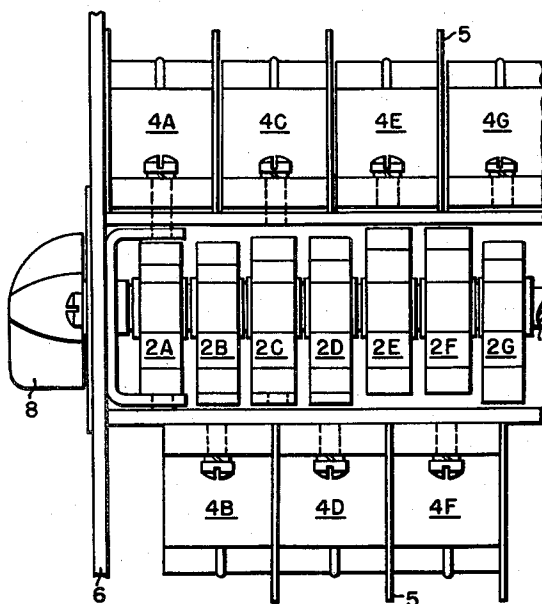


Fig. 4.



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Fig. 7.

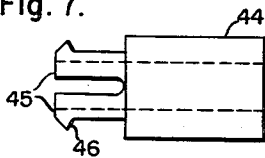


Fig. 8.

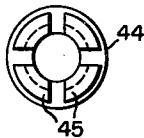


Fig. 5.

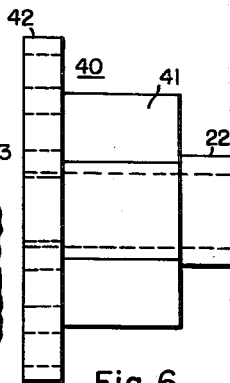
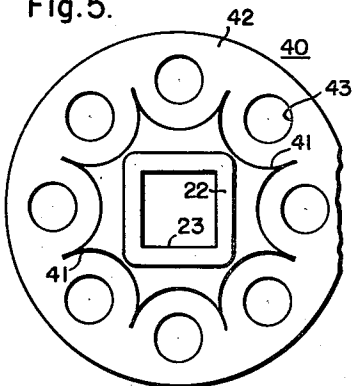
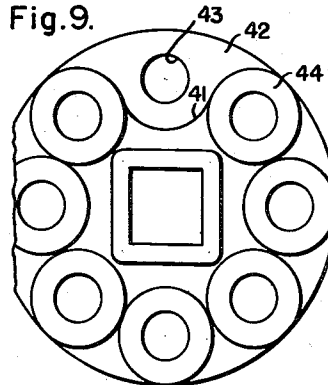


Fig. 9.



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2,969,693

ADJUSTABLE-CONTOUR CAM

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Original application June 24, 1957, Ser. No. 667,632, now Patent No. 2,887,901, dated May 26, 1959. Divided and this application Mar. 20, 1958, Ser. No. 722,780

1 Claim. (Cl. 74—568)

This invention relates to an adjustable cam designed for an electrical selector-switch, but which is of general utility for use in cam-mechanisms of all kinds, either as a single cam, or on a shaft carrying a plurality of cams which are designed to operate during different portions of the rotation of the shaft, either for effecting a plurality of mechanical operations at predetermined times and in a preselected sequence, or for similarly operating a plurality of cam-switches, or a plurality of snap-action switches, or for engaging a plurality of electrical contacts after the manner of a drum-controller. This case is a division of my United States Letters Patent No. 2,887,901, issued May 26, 1959, and entitled Adjustable-Contour Cam.

The purpose of this invention is to provide a novel, compact, low-cost means for changing or adjusting a cam-contour.

A fundamental feature of this adjustable-contour cam is the combination of a basic cylindrical matrix having a plurality of circularly spaced, axially extending openings therein, and a plurality of cam-segment-forming elements which are removably securable in any selected openings.

Exemplary forms of embodiment of this invention are shown on an enlarged scale in the accompanying drawings, wherein:

Figure 1 is an elevational view showing an assembly of a cam and a snap-switch which could function as one circuit of a multi-circuit selector switch in accordance with this invention;

Fig. 2 is a similar view of the same parts, showing the cam rotated 45° to depress the switch-plunger;

Figs. 3 and 4 are end and side elevational views of a complete selector-switch assembly such as would utilize this invention;

Figs. 5 and 6 are end and side elevational views of a face-plate type of 8-point cam-matrix, having a plurality of circularly spaced, axially extending holes through the face-plate, these holes being adapted to receive the axially removable pronged ends of a plurality of removable cam-rollers, Fig. 5 being a view of the right-hand end of Fig. 6;

Figs. 7 and 8 are side and end views of one of the laterally pronged rollers which are adapted to be used with the matrix of Figs. 5 and 6, Fig. 8 being a view of the left-hand end of Fig. 7; and

Fig. 9 is an end view of an assembled 7-point cam using the matrix of Figs. 5 and 6 and seven of the cam-rollers of Figs. 7 and 8.

It will be understood that while my illustrations show a cam-matrix with eight points, the design is flexible and can be made for more or fewer points, as may be desired.

Figs. 1 and 2 are transverse or end-elevational views showing a cam-shaft 1 carrying a cam 2 for actuating the plunger 3 of any suitable snap-action switch 4, which may be of any suitable type, such, for example, as that

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which is shown in Patent No. 2,773,144, granted December 4, 1956 to Martin Wibell and myself.

Figs. 3 and 4 show a typical selector-switch assembly in which a cam-shaft 1 carries seven cams 2A to 2G, which operate seven snap-switches 4A to 4G, some of which are mounted above the cams, and some below the cams. The snap-switches are illustrated as being separated by insulating barriers 5. The front panel-plate 6 of the assembly is shown as being marked with an off-position and seven on-positions, the latter being numbered from 1 to 7, to show the positions of a pointer-knob 8 which is mounted on the end of the cam-shaft 1.

My present invention relates more particularly to the construction of one of the cams 2 such as are adapted for use in the switch-assemblies of Figs. 1 to 4, or for any other uses to which cams may be put.

Figs. 5 to 9 show an embodiment of an "add-a-roller" cam-assembly. This assembly requires a lateral space, rather than a radial space, for the insertion and removal of the rollers, as will be apparent as the description thereof proceeds.

Thus, Figs. 5 and 6 show a basic matrix 40 having a hub-portion 22 at its right end, a cylindrical hub-member 41 to the left of the hub-portion 22 and having a considerably larger transverse dimension than the hub-portion 22, and a cylindrical face-plate 42 of a larger diameter than the transverse dimension of said hub-member 41, at the left end of said hub-member 41. The cylindrical face-plate 42 of the basic matrix 40 of Figs. 5 and 6 has eight, or any other desired number of circularly spaced, axially extending holes 43 therethrough.

The word "cylindrical" as used herein means a surface generated by a line moving parallel to itself. The hub-portion 22 and the hub-member 41 have outer surface contours generated by a line moving parallel to the axis of the basic matrix 40.

Figs. 7 and 8 show one of a plurality of cam-segment-forming rollers 44, which are adapted for use with matrix 40 of Figs. 5 and 6. As illustrated, each roller 44 has, at one end, a plurality of resilient, laterally extending prongs 45, which are adapted to extend through, and to removably engage, one of the holes 43 in the cylindrical matrix 42 of Figs. 5 and 6. The engagement of the prongs 45 within the holes 43 is of such a gripping nature as to removably retain the roller 44 in place, with its pronged end abutting against the side of the face-plate 42 of the matrix. This gripping engagement of the plungers in the holes may be of any suitable nature, such as a simple frictional engagement, or a more positive barb-ended engagement, such as can be provided by the barbed ends 46 of the prongs 45, as shown in Fig. 7. In this manner, the rollers 44, such as are shown in Figs. 7 and 8, are removably securable in any selected holes 43 of the matrix 40—42 of Figs. 5 and 6.

In the matrix-design, which is shown in Figs. 5 and 9, the cylindrical hub-member 41 has an outer peripheral contour that forms saddle-like seats for the cylindrical portions of the rollers 44. These saddle-like seats thus provide a backing for the rollers 44 so that the radially inwardly directed pressure on the rollers, during operation of the cam, will not subject the prongs to a radial pressure which might tend to pull the resilient prongs 45 out of the holes 43.

In the preferred form of construction of this invention, all of the separate parts of the adjustable-contour cam are preferably molded from nylon, including the matrix 40, and the plurality of cam-segment-forming elements 44. Nylon is preferable because of its low cost, its resilient nature, its low coefficient of friction, and the facility with which it can be injection-molded. When the cam-assembly is used as a part of an electrical switching-assembly, the insulating property of nylon is also an ad-

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vantage. However, this invention is not limited to nylon, or to any other plastic material, or to an insulating material. It is quite conceivable that the segment-forming members 44 could be made of a conducting material, and could complete an electric circuit by making connection with one or more stationary brushes or contact-members. The matrix also could conceivably be fabricated from a metallic spring-material.

In general, while one preferred construction is illustrated and described, it is to be understood that this invention, in its more basic principles, is not limited to these details.

I claim as my invention.

An adjustable-contour cam, comprising, a basic matrix having an axis and having a cylindrical hub-member and a cylindrical face plate of larger diametric dimension than said hub-member at one end of said hub-member, both having their outer peripheral surfaces symmetrically disposed with respect to said axis, said cylindrical face-plate having a plurality of circularly spaced, axially extending holes therethrough, and a plurality of cam-segment-forming elements each made of a somewhat elastic material, such as solid nylon, each cam-segment-

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forming element having a cylindrical portion and a plurality of resilient, laterally extending circularly and radially spaced prongs, each prong being provided with a radially projecting ridge at its end, said prongs being adapted to extend through said holes with the ridges holding the prongs against axial movement in the holes, whereby said plurality of cam-segment-forming elements are each removably securable in any selected hole, the outer peripheral surface of said hub-member being shaped to form saddle-like seats for the cylindrical portion of each of said cam-segment-forming elements to thus receive the radial thrust on said cam-segment-forming elements during operation.

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