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## Coded electric switch.

This invention relates to an electrical switch, and particularly to an electrical switch capable of selectively providing a connection between an input contact and any one or more of a plurality of output contacts.

Such switches can be arranged to give a binary or other coded output, and find use, for example, as programming devices in electronic equipment.

In U.S. Patent Specification No. 3,281,552 there is disclosed such a switch comprising a circular base of electrically insulating material carrying an input contact and a plurality of output contacts; a bridging contact capable of providing connections between the input contact and any one or more of the output contacts; and an operating member mounted on the base for rotational movement relative thereto between a plurality of relative positions in each of which the bridging contact is caused to provide a connection between the input contact and a respective one or combination of the output contacts, the bridging contact being fixedly mounted on the base in permanent connection with the input contact, and having a plurality of resilient contact arms respectively associated with the output contacts, the operating member being formed with a plurality of cam projections adapted and arranged to engage the contact arms of the bridging contact as the operating member is rotated relative to the base, thereby to urge the contact arms into contact with the associated output contacts.

In this known switch the input contact on which the bridging contact is mounted is positioned at the centre of the base, and the output contacts are located at positions spaced around the centre of the base and at mutually the same distance therefrom. Because of this arrangement the number of possible combinations of output contacts which can be connected by the bridging contact is limited, particularly if, as is desirable, the cam projections on the operating member are to engage the contact arms of the bridging contact over the associated output contacts. In fact in this known switch the cam projections do not directly engage the contact arms of the bridging contact, but engage a separate actuating member which in turn operates on the contact arms, the cam projections being on only two radii from the centre of the base.

According to this invention such a known switch is characterised in that the output contacts are located at positions spaced around the centre of the base and at mutually different distances from the centre of the base, the bridging contact being mounted on the input contact which is offset from the centre of the base such that the distances between the input contact and the output contacts are substantially equal whereby the contact arms of the bridging con-

tact are all substantially equal in effective length, each contact arm of the bridging contact being engaged by the associated cam projection or projections over the associated output contact.

The switch of this invention has the advantages that due to the arrangement of the output contacts relative to the axis of rotation of the operating member, that is to the centre of the base, each output contact can have a cam projection radius individually assigned to it, this considerably increasing the number of possible combinations of output contact which can be interconnected by the bridging contact, while the contact arms are maintained at substantially equal effective length and are engaged by the associated cam projections over the associated output contacts.

This invention will now be described by way of example with reference to the drawings, in which:—

Figure 1 is a top plan view with part broken away of a first electrical switch according to this invention;

Figure 2 is a vertical sectional view of the switch of Figure 1; and

Figure 3 is an underneath plan view of the operating member of the switch of Figures 1 and 2.

The switch shown in Figures 1 to 3 comprises a circular base 1 moulded from electrically insulating plastics material, and carrying an input contact 2 and four output contacts 3. The contacts 2 and 3 are in-moulded in the base 1, and each has an outwardly projecting pin portion for receipt in a hole in a substrate (not shown) thereby to connect the contact 2 or 3 to a conductor on the substrate which may be a printed circuit board. The outer face of the base 1 from which the pin portions of the contacts 2 and 3 project is formed with two diametrically opposed circular bosses 4 which in use of the switch are received in holes in the substrate to locate the switch on the substrate. The inner ends of the output contacts 3 project above the adjacent surface of the base 1 to constitute contact points while the inner end of the input contact 2 has a flat head on which is welded a substantially planar bridging contact 5 having four contact arms 6 associated with the four output contacts 3 respectively.

As clearly shown in Figure 1, the output contacts 3 are located at positions spaced at about 90° around the centre of the base 1 and at mutually different distances, that is radii, from the centre of the base 1, and the input contact 2 is offset from the centre of the base 1 such that it is substantially equi-spaced from each of the output contacts 3. Thus, the effective lengths of the four contact arms 6 of the bridging contact 5 are also equal.

The base 1 is formed with an upstanding

peripheral flange 7 within which is received a circular operating member 8 which completes the switch. The flange 7 has an inwardly directed lip 9 which engages over an annular shoulder 10 on the operating member 8 to mount the operating member 8 on the base 1.

The inner surface of the operating member 8 is formed with a plurality of arcuate cam projections 11 having mutually different radii measured from the centre of the operating member 8, that is from the axis of rotation thereof, which axis passes through the centre of the base 1.

There is at least one cam projection 11 having a radius of curvature equal to the distance of each of the output contacts 3 from the centre of the base 1. Each cam projection has end surfaces 12 which slope from the surface of the operating member 8 up to a level middle surface 13 which is parallel to the surface of the operating member 8.

The operating member 8 is formed with an outwardly directed bar 14 which can be gripped by a user's fingers to rotate the operating member 8 relative to the base 1. The flange 7 on the base 1 is divided into a plurality of circumferentially spaced segments 15 by ten slots 16, and the operating member is formed with a projection 17 on its peripheral edge, which projection 17 is engageable in the slots 16 to provide an indexing action on rotation of the operating member relative to the base 1, the slots 16 and projection 17 thus together defining ten rotary positions of the operating member 8 relative to the base 1.

As clearly shown in Figure 1, each contact arm 6 of the bridging contact 5 comprises a single limb 18 extending from the input contact 2 and carrying at its outer end a three-legged arrangement comprising three outwardly extending substantially equal length legs 19 lying in a common plane. The free end of the centre leg 19 constitutes a contact portion for engagement with the associated output contact 3 positioned beneath the centre leg 19, and the two outer legs 19 are joined by an arcuate linking member 20 which extends towards the operating member 8 for engagement by the cam projection or projections 11 associated therewith.

The arrangement is such that when the linking member 20 of a contact arm 6 is not engaged with an associated cam projection 11 on the operating member 8, the centre leg 19 of that contact arm 6 is out of engagement with the associated output contact 3, as shown in Figure 2, but when the operating member 8 is rotated relative to the base 1 to a position in which the linking member 20 is engaged by an associated projection 11, then the centre leg 19 is held in engagement with the associated output contact 3 whereby the bridging contact 5 provides a connection between the input contact 2 and that output contact 3.

As can be ascertained from Figure 3, the cam

projections 11 are arranged such that for each of the ten rotational positions of the operating member 8 relative to the base 1 a unique combination of connections between the input contact 2 and the output contacts 3 is established by the bridging contact 5, these connections enabling a binary coded decimal output to be obtained from the output contacts 3 from a voltage applied to the input contact 2.

The three-legged form of each of the contact arms 6 of the bridging contact 5 is advantageous in that it gives a two stage closing of the centre leg 19 onto the associated output contact 3, this ensuring ease of operation of the switch with a final high contact force between the centre leg 19 and the output contact 3. When the sloping surface 12 of a cam projection 11 first engages the linking member 20 of a contact arm 6, the whole contact arm 6 including the limb 18 is deflected about the connection of the contact arm 6 to the input contact 2 until the centre leg 19 of the contact arm 6 engages the associated output contact 3. Thereafter only the two outer legs 19 are deflected relative to the centre leg 19 thereby increasing the contact force between the centre leg 19 and the output contact 3 until the linking member 20 is engaged with the planar surface 13 of the cam projection 11. Further, since all three legs 19 are of substantially equal length whereby the linking member 20 engages the cam projection 11 over the associated output contact 3 a maximum contact force is obtained for a minimum applied force, and thus the switch is easy to operate.

A particular advantage of the switch described above is that simply by changing the operating member to one with a different arrangement of cam projections, the coding of the switch can be changed. Further, since there is substantially no sliding contact between the output contacts and the contact arms of the bridging contact, it is possible to have high contact forces with only little wear of the contact surfaces. The only slight sliding contact which takes place is however sufficient to provide cleaning of the contact surfaces. It is thus possible to use tin-plated members for the contacts rather than the often used more expensive gold-plated contacts.

### Claims

1. An electrical switch comprising a circular base (1) of electrically insulating material carrying an input contact (2) and a plurality of output contacts (3); a bridging contact (5) capable of providing connections between the input contact (2) and any one or more of the output contacts (3); and an operating member (8) mounted on the base (1) for rotational movement thereto between a plurality of relative positions in each of which the bridging contact (5) is caused to provide a connection between the input contact (2)

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and a respective one or combination of the output contacts (3), the bridging contact (5) being fixedly mounted on the base (1) in permanent connection with the input contact (2), and having a plurality of resilient contact arms (6) respectively associated with the output contacts (3), the operating member (8) being formed with a plurality of cam projections (11) adapted and arranged to engage the contact arms (6) of the bridging contact (5) as the operating member (8) is rotated relative to the base (1), thereby to urge the contact arms (6) into contact with the associated output contacts (3) characterised in that the output contacts (3) are located at positions spaced around the centre of the base (1) and at mutually different distances from the centre of the base (1), the bridging contact (5) being mounted on the input contact (2) which is offset from the centre of the base (1) such that the distances between the input contact (2) and the output contacts (3) are substantially equal whereby the contact arms (6) of the bridging contact (5) are all substantially equal in effective length, each contact arm (6) of the bridging contact (5) being engaged by the associated cam projection or projections (11) over the associated output contact (3).

2. A switch as claimed in Claim 1, characterised in that each contact arm (6) of the bridging contact (5) comprises a single limb (18) extending from the input contact (2) and carrying at its outer end a three-legged arrangement comprising three outwardly extending substantially equal length legs (19) lying in a common plane, the free end of the centre leg constituting a contact portion for engagement with the associated output contact (3), and the two outer legs (19) being joined by a linking member (20) which extends towards the operating member (8) for engagement by the cam projection (11) or projections (11) associated therewith.

## Revendications

1. Interrupteur électrique comprenant une base circulaire (1) en matière électriquement isolante, portant un contact (2) d'entrée et plusieurs contacts (3) de sortie; un contact (5) de pontage capable de réaliser des connexions entre le contact (2) d'entrée et au moins l'un quelconque des contacts (3) de sortie; et un élément (8) de commande monté sur la base (1) afin de pouvoir tourner par rapport à elle entre plusieurs positions relatives dans chacune desquelles le contact (5) de pontage est actionné de manière à réaliser une connexion entre le contact (2) d'entrée et l'un, correspondant, ou une combinaison correspondante des contacts (3) de sortie, le contact (5) de pontage étant monté fixement sur la base (1), en liaison permanente avec le contact (2) d'entrée, et comportant plusieurs bras flexibles (6) de contact associés respectivement aux contacts (3) de sortie, l'élément (8) de commande comportant

plusieurs cames (11) en saillie conçues et disposées pour porter contre les bras (6) de contact du contact (5) de pontage lorsque l'élément (8) de commande est tourné par rapport à la base (1), afin de faire porter les bras (6) de contact contre les contacts associés (3) de sortie, caractérisé en ce que les contacts (3) de sortie sont placés dans des positions espacées autour du centre de la base (1) et situées à des distances différentes les unes des autres du centre de la base (1), le contact (5) de pontage étant monté sur le contact (2) d'entrée qui est décalé du centre de la base (1) de manière que les distances comprises entre le contact (2) d'entrée et les contacts (3) de sortie soient sensiblement égales afin que les bras (6) de contact du contact (5) de pontage aient pratiquement tous la même longueur utile, chaque bras (6) de contact du contact (5) de pontage étant engagé par la ou les cames associées (11) en saillie, au-dessus du contact associé (3) de sortie.

2. Interrupteur selon la revendication 1, caractérisé en ce que chaque bras (6) contact du contact (5) de pontage comprend une branche unique (18) qui fait saillie du contact (2) d'entrée et qui porte à son extrémité extérieure un ensemble à trois pattes comprenant trois pattes (19) situées dans un plan commun, s'étendant vers l'extérieur et sensiblement de même longueur, l'extrémité libre de la patte centrale constituant une partie de contact destinée à porter contre le contact associé (3) de sortie, et les deux pattes extérieures (19) étant reliées par un élément (20) de liaison qui s'étend vers l'élément (8) de commande afin d'être engagé par la ou les cames (11) en saillie qui lui sont associées.

## Patentansprüche

1. Elektrischer Schalter mit einem kreisförmigen Hauptteil (1) aus elektrisch isolierendem Material, der einen Eingangskontakt (2) und eine Vielzahl von Ausgangskontakten (3) trägt, mit einem Brückenkontakt (5), der in der Lage ist, Verbindungen zwischen dem Eingangskontakt (2) und irgendeinem oder mehreren der Ausgangskontakte (3) herzustellen, und mit einem Betätigungsglied (8), das auf dem Hauptteil (1) für eine Drehbewegung zwischen einer Vielzahl von Relativstellungen diesem gegenüber gelagert ist, in deren jeder der Brückenkontakt (5) veranlasst ist, eine Verbindung zwischen dem Eingangskontakt (2) und jeweils einem oder einer Kombination der Ausgangskontakte (3) herzustellen, wobei der Brückenkontakt (5) fest auf dem Hauptteil (1) in dauerhafter Verbindung mit dem Eingangskontakt (2) angeordnet ist und eine Vielzahl von nachgiebigen Kontaktarmen (6) hat, die jeweils den Ausgangskontakten (3) zugeordnet sind, wobei das Betätigungsglied (8) mit einer Vielzahl von Nockenvorsprüngen (11) ausgebildet ist, die geeignet

und so angeordnet sind, dass sie in Eingriff mit den Kontaktarmen (6) des Brückenkontakts (5) gelangen, wenn das Betätigungsglied (8) in bezug auf den Hauptteil (1) verdreht wird, wodurch die Kontaktarme (6) in Kontakt mit den zugehörigen Ausgangskontakten (3) gebracht werden, dadurch gekennzeichnet, dass die Ausgangskontakte (3) in Stellungen angeordnet sind, die um die Mitte des Hauptteils (1) herum mit Abständen und unter gegenseitig verschiedenen Entfernungen gegenüber der Mitte des Hauptteils (1) angeordnet sind, wobei der Brückenkontakt (5) auf dem Eingangskontakt (2) gelagert ist, der gegenüber der Mitte des Hauptteils (1) derart versetzt ist, dass die Abstände zwischen dem Eingangskontakt (2) und den Ausgangskontakten (3) im wesentlichen gleich sind, wodurch die Kontaktarme (6) des Brückenkontakts (5) alle im wesentlichen die gleiche effektive Länge haben, und wobei jeder Kontaktarm (6) des Brückenkontakts (5) über

dem zugehörigen Ausgangskontakt (3) durch den zugehörigen Nockenvorsprung oder die zugehörigen Nockenvorsprünge (11) beaufschlagt wird.

5 2. Schalter nach Anspruch 1, dadurch gekennzeichnet, dass jeder Kontaktarm (6) des Brückenkontakts (5) einen einzigen Steg (18) aufweist, der sich von dem Eingangskontakt (2) her erstreckt und an seinem äusseren Ende eine dreifingerige Anordnung trägt, die drei sich nach aussen erstreckende, im wesentlichen gleich lange Finger (19) aufweist, die in einer gemeinsamen Ebene liegen, wobei das freie Ende des mittleren Fingers einen Kontaktteil zum Eingriff mit dem zugehörigen Ausgangskontakt (3) bildet, und wobei die beiden äusseren Finger (19) durch ein Verbindungsglied (20) verbunden sind, das sich zum Eingriff durch den zugehörigen Nockenvorsprung (11) oder die zugehörigen Nockenvorsprünge (11) des Betätigungsgliedes (8) auf dieses zu erstreckt.

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FIG.1.

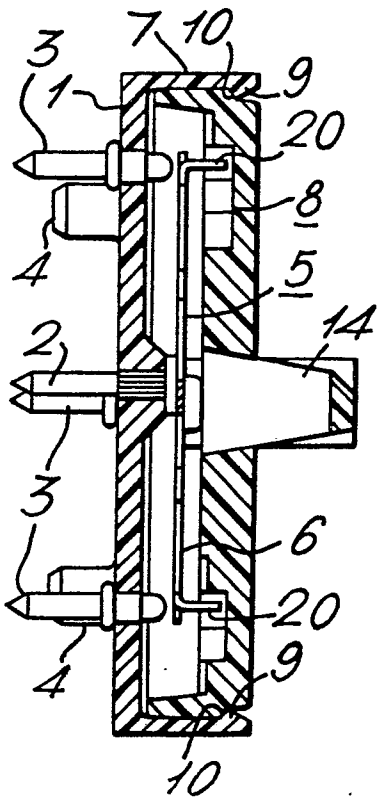
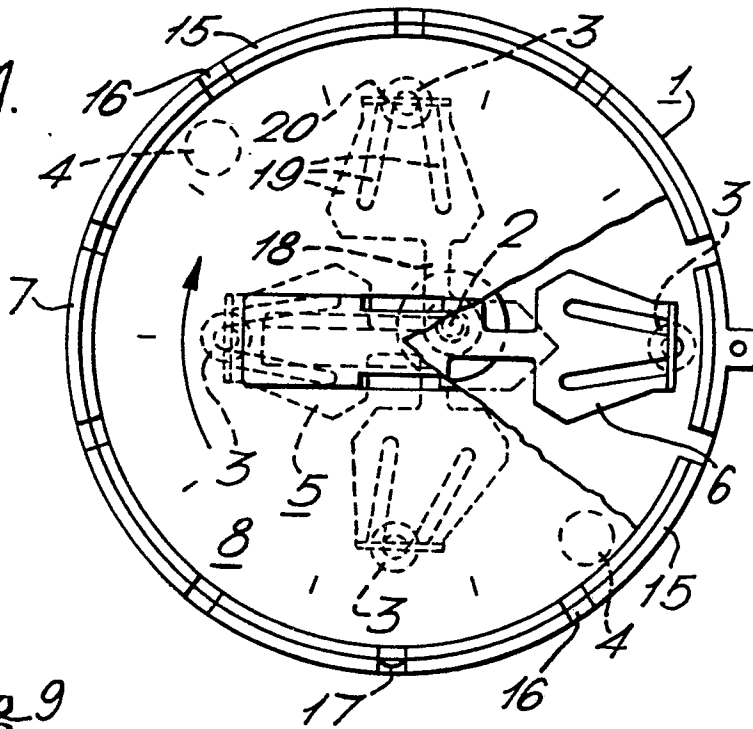


FIG.2.

FIG.3.

