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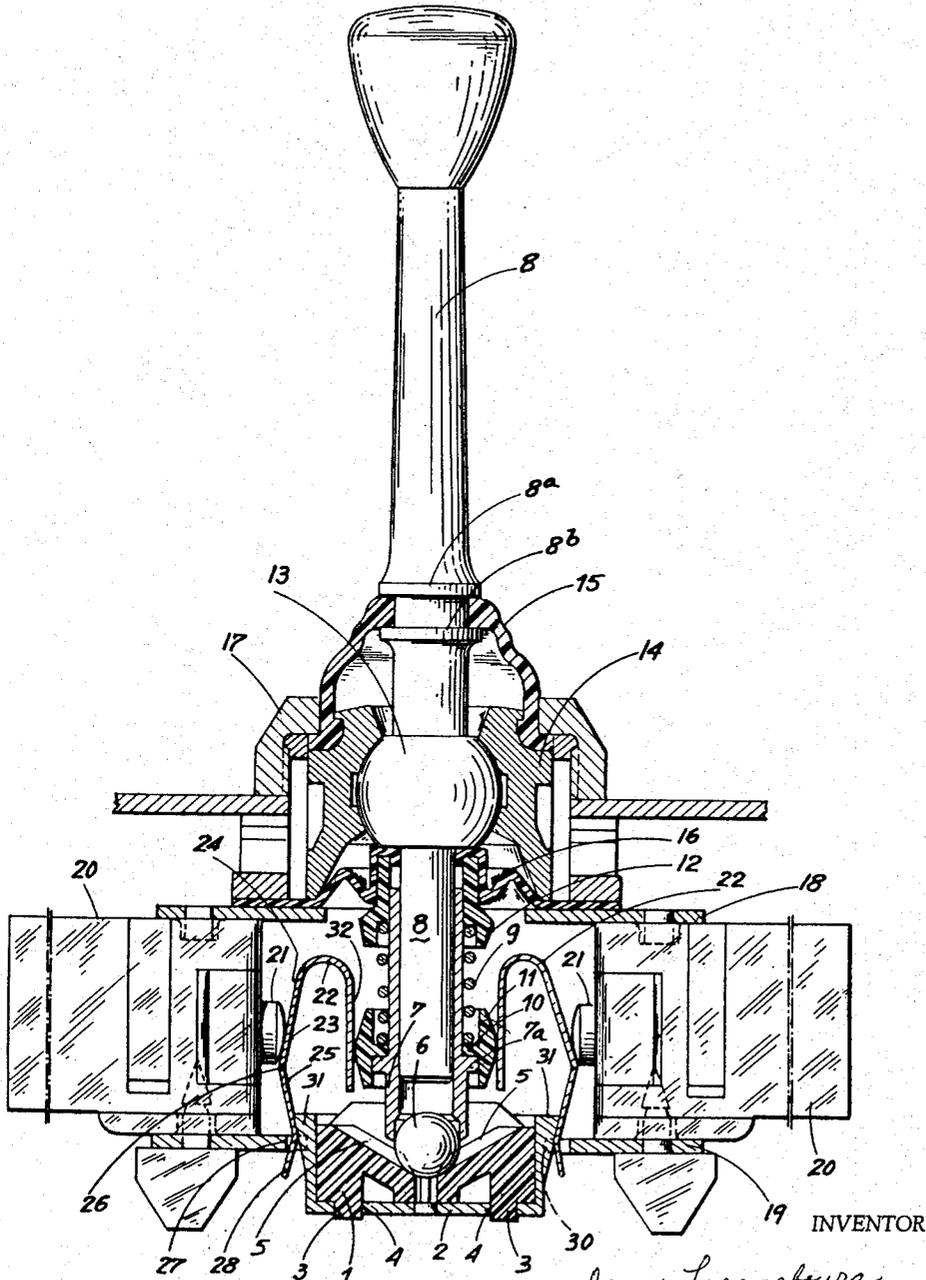
J. LESCOUBOURA
HAND LEVER SWITCH

3,115,555

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2 Sheets-Sheet 1

Fig. 1.



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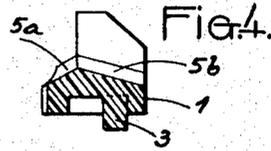
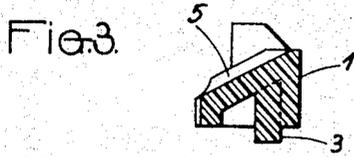


Fig. 3a.

Fig. 4a.

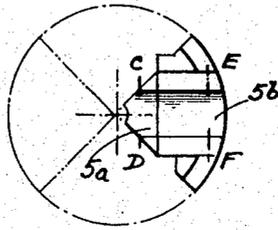
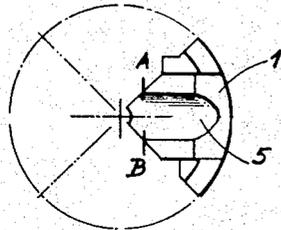
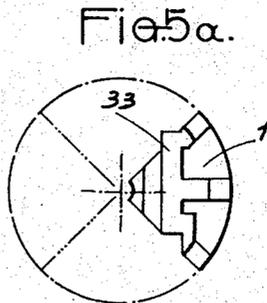
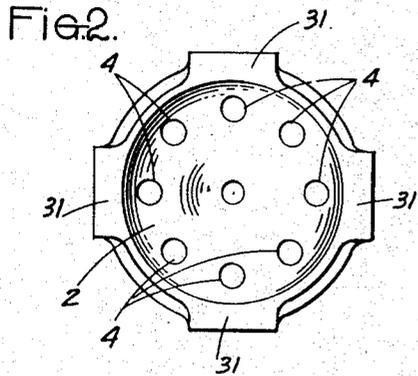
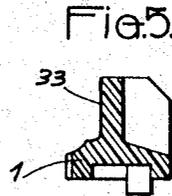
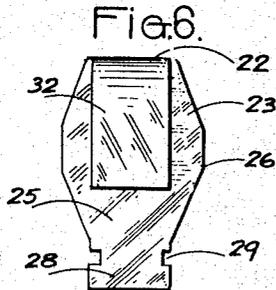
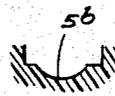
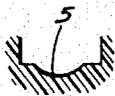


Fig. 3b.

Fig. 4b.

Fig. 4c.



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HAND LEVER SWITCH

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5 Claims. (Cl. 200-5)

The present invention has for its object a lever switch operated manually in four directions perpendicular to each other, from a central neutral position.

This switch is of the combination type, that is to say it can be employed, by means of a very simple conversion of standardised parts, for different switching programmes with respect to the various possible positions of the lever.

A switch has already been proposed which has a lever pivoted about a shaft and having its stable positions determined by teeth on this lever which can engage on a cam surface forming sloping faces and stopping notches. This cam surface is constituted by two complementary parts juxtaposed so as to form an oblong opening for the movements of the lever, extending over an equal distance on each side of the plane of juxtaposition of the two complementary parts. Each stopping notch, whether it is formed in one or the other of the said complementary parts, passes so to speak through the said oblong opening and is continued symmetrically on each side of the said opening. It is possible to associate two cam members taken from a set of different cam members, in order to vary the combinations.

However, this device only permits movement of the lever along a straight line on each side of its pivotal point.

A switch has also been proposed having a swivel-joint lever, with a hemispherical head provided with a centrally-projecting stud. This central stud can be guided in grooves formed in a bowl, and the general plan substantially resembles a wheel with eight spokes, the central hub and the connection of the spokes to the rim corresponding to dish-shaped members in which the hemispherical head can be supported and to as many stopping positions of the said head.

However, the path which can be followed by the head of the lever is invariable.

With this device, a curved disc, through the centre of which the lever passes and is rigidly fixed thereto, actuates directly the knobs of four switches.

The present invention relates to a lever switch with combinations, in which the lever can move along four directions perpendicular to each other, starting from a central neutral position, the cam contour of each direction being formed on an independent changeable member dice in the form of a sector of a truncated cylinder, permitting combinations to be effected between sectors.

The switch is provided with contacts of the micro-switch type in single interchangeable units.

The cam sectors or dice can be displaced from each other through an angle, preferably 45°, with respect to two perpendicular movements.

The operation of each micro-switch is effected through the intermediary of an elastic means which converts the amplitude of the travel of the lever to the much smaller travel necessary for the operation of the micro-switch, avoiding shocks caused by an abrupt movement of the lever, permitting an over-travel of the lever after the micro-switch contact has changed over, and lending itself to actuation displaced by 45°.

Other particular features and advantages of the present invention will become evident from the description which follows below with regard to the accompanying drawings, in which:

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FIG. 1 is a view in partial longitudinal section of a switch according to the invention;

FIG. 2 is a view from above of a cup holding the four cam dice or sectors;

FIG. 3 is a view in longitudinal section of one of these sectors;

FIG. 3a is a view from above this same sector;

FIG. 3b is a view in cross-section along the line A—B of FIG. 3a;

FIG. 4 is a view in longitudinal section of a further alternative form of sector;

FIG. 4a is a view of this second form of sector looking from above;

FIGS. 4b and 4c are cross-sections taken along the lines C—D and E—F respectively of FIG. 4a;

FIG. 5 is a view in longitudinal section of another alternative form of sector;

FIG. 5a is a plan view of this sector; and

FIG. 6 is a view in elevation of a spring forming the intermediary between the lever and each micro-switch.

In the form of embodiment shown, the combination switch with four directions perpendicular to each other, starting from a central neutral position, comprises dice or sectors 1, preferably in the form of a sector of a truncated cylinder, each corresponding in an individual and changeable manner, to one of the four directions.

The sectors 1 preferably made of a synthetic material, are held in a dish or cup 2, the material of which is advantageously also a synthetic substance.

The sectors are mounted in the cup by means of a positioning nipple 3 passing into holes 4 formed in the bottom of the cup. This cup is pierced with eight holes spaced angularly apart at 45°, so that there are available two possible mounting positions of the sectors at 45° from each other.

The sectors 1 are provided on their inclined portions with a cam 5 for guiding a ball 6 held at the extremity of a sliding end-member 7.

The end-member 7 slides on the manual operating lever 8 of the switch. It can slide against the action of a spring 9, held between an internal collar 10 of a ring 11, itself retained by a collar 7a on the end-member and a circular abutment 12 preferably made of synthetic material. The depth of this abutment permits the sliding movement of the end-member 7.

By reason of the presence of the spring 9, the ball 6 is pressed against the cams 5 of the sectors 1 held in the cup 2.

The lever 8 is provided with a swivel-joint 13. This swivel-joint pivots inside a solid cylindrical cage 14. Fluid-tight bellows 15 and 16 are clamped at their peripheries: the first bellows between the cage 14 and a fixing nut 17 and two small flanges 8a and 8b on the lever 8; the second between the cage 14 and a plate 18 and between the abutment 12 and the ball-joint 13.

Between the plate 18 and a further plate 19 are clamped micro-switches 20. There is one micro-switch per direction, but two of these micro-switches only have been shown in FIG. 1 for the sake of clearness.

The actuation of the buttons 21 of the micro-switches is effected by means of flat springs 22 in the form of loops.

A portion 23 of one of the branches 24 of each spring bears against the button 21 which corresponds to it. The portion 23 of the branch 24 is followed, after an elbow 26, by a portion 25 of the said branch. The portion 25 is held loosely in an opening 27 formed in the plate 19.

The slightly curved-back extremity 28 of the portion 25 of the branch 24 of the spring 22 is provided with notches 29 (FIG. 6) serving to maintain the spring in the opening 27 of the plate 19.

Each opening 27 gives into a central orifice 30 formed in the plate 19 and intended to receive the cup 2.

As there are as many springs as directions, and as these directions are perpendicular to each other, the openings 27 are formed diametrically facing each other on two diameters at right angles of the central orifice 30.

The cup 2 is made so as to have bearing surfaces 31 inclined at an angle, the inclination corresponding to that of the portion 25 of the springs 22.

The other branch 32 of each spring bears on the ring 11 slidably mounted on the sliding end-member 7. This ring is of spherical form so as to facilitate the actuation of the springs 22 irrespective of the position of the end-member 7, and therefore of the ball 6 on one or the other of the cams 5 of the sectors 1.

In the form of embodiment shown in FIGS. 1, 3, 3a and 3b, each sector 1 has a cam 5, the slope of which forces the lever 8 and its ball 6 to return to the neutral point when it is released, as shown in FIG. 1.

In the form of construction shown in FIGS. 4, 4a, 4b and 4c, the cam of the sector 1 is hump-backed and thus has two slopes 5a and 5b. Following this hump-backed cam, the lever is controlled in a stable position when it is inclined in the corresponding direction.

In the form of embodiment shown in FIGS. 5 and 5a, the sector 1 is provided with an abutment 33 which prevents the lever from rocking.

The springs 22 convert the amplitude of the travel of the ring 11 to the much shorter travel necessary for the operation of the micro-switches.

They prevent shocks due to any abrupt movement of the lever which, failing them, would be transmitted to the push-buttons 21 of the micro-switches.

They also permit an over-travel of the lever after the micro-switch contact has changed over.

In addition, when the sectors 1 are displaced by 45° in their cup, the remainder of the apparatus is not modified; the ring 11 then applies a coupling on the springs 22 which twist slightly but nevertheless transmit the movement to the buttons 21 because of the very small travel of the latter (2 to 3 mm.).

The three forms of construction of the sectors, without taking into account the simple changes of position by turning the apparatus, permit a great number of combinations to be made which have not been described in detail but which will be evident to a man skilled in the art.

It is possible to construct other special forms of sector, for example a hollow conical sector making it possible to pass from one direction to the other without returning to zero, or alternatively sectors with bosses at the centre, permitting the switch to have two stable end positions with respect to the neutral point.

In a general way, the above description has been given only by way of explanation and without implied limitation, and the invention is capable of receiving many alternative forms compatible with its scope.

I claim:

1. A lever change-over switch with a lever on a swivel joint and a control projection surrounding its rod, for actuating switches in a plurality of directions starting from a central neutral position comprising a cup member, a plurality of switches positioned around said cup member

each having actuating means substantially directed toward said cup member, independent and changeable dice members in the form of sectors of a cylinder with one of said dice members for each of said switches located in said cup member, a cam surface on each of said dice members, and a cam track on each of said cam surfaces.

2. A lever change-over switch with a swivel joint and control projection surrounding its rod, for actuating switches in a plurality of directions starting from a central neutral position comprising a cup member having holes pierced through the bottom and spaced angularly apart by 45°, a plurality of switches positioned around said cup member each having actuating means substantially directed toward said cup member, independent and changeable dice members in the form of sectors of a cylinder with one of said dice members for each of said switches located in said cup member, a positioning nipple on each of said dice members located to pass through the holes in the bottom of said cup member, a cam surface on each of said dice members, and a cam track on each of said cam surfaces.

3. The lever change-over switch in accordance with claim 1, further characterized by a sliding member on said lever and a ball retained at the extremity of said sliding member and guided in said cam tracks.

4. The lever change-over switch in accordance with claim 1 further characterized by a resilient means contacting each of said actuating means on each of said switches converting the amplitude of the travel of the lever to the greatly reduced travel necessary for the operation of the switch, preventing shocks due to an abrupt movement of the lever, permitting an over-travel of the lever after the actuating means of the switch has changed over, and lending itself to actuating displaced by 45°.

5. A lever change-over switch with a swivel joint and control projection surrounding its rod, for actuating switches in a plurality of directions starting from a central neutral position comprising a cup member, a plurality of switches positioned around said cup member each having actuating means substantially directed toward said cup member, independent and changeable dice members in the form of sectors of a cylinder with one of said dice members for each of said switches located in said cup member, a cam surface on each of said dice members, a cam track on each of said cam surfaces, a projecting control member in the form of a spherical ring on the lever, and a loosely retained flat spring in the form of a loop having one branch of said spring acted upon by said projecting control member and another branch acting on one of said actuating means of said switch whereby a twisting movement of said spring is permitted when the actuation is displaced by 45°.

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