

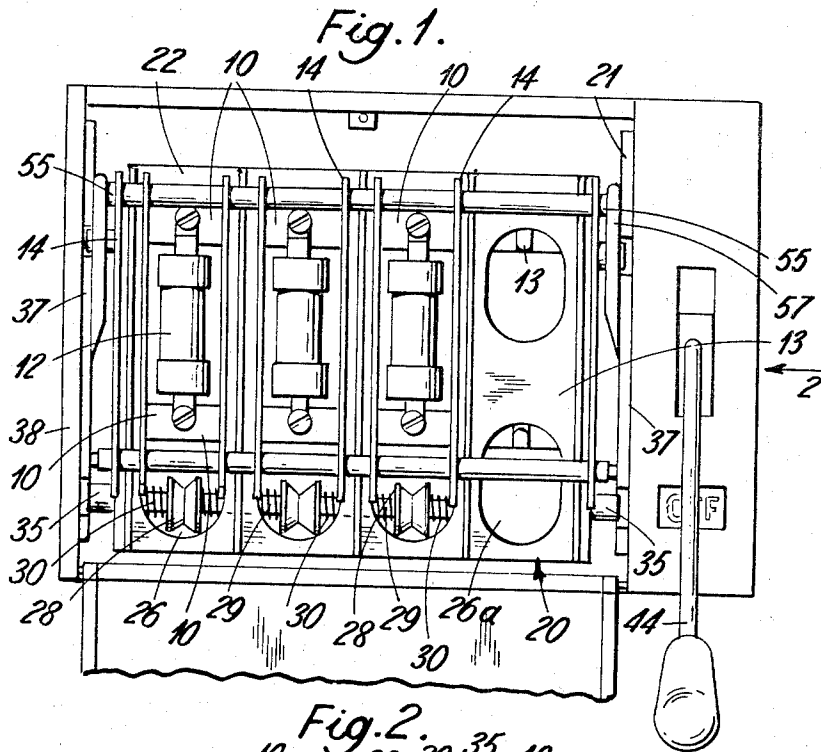
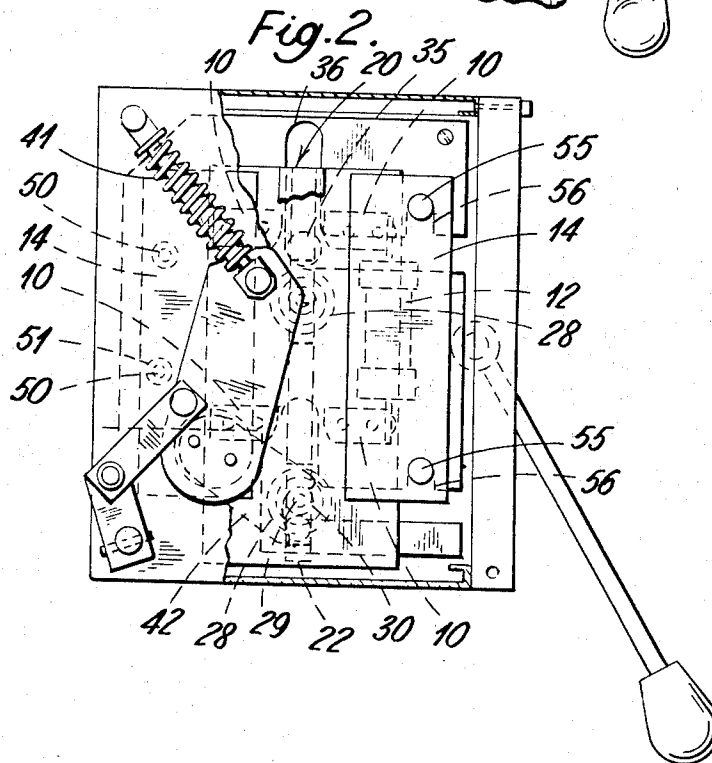
Nov. 12, 1968

D. W. C. SMITH
ELECTRIC SWITCH UTILIZING MOVABLE ROLLER CONTACTS COACTING
WITH FIXED ELONGATED BAR CONTACTS

3,411,037

Filed Jan. 18, 1967

4 Sheets-Sheet 1



*Dennis William Jungst
Bj. Cushman, Darby Cushman
Attorneys*

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D. W. C. SMITH

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Fig. 3.

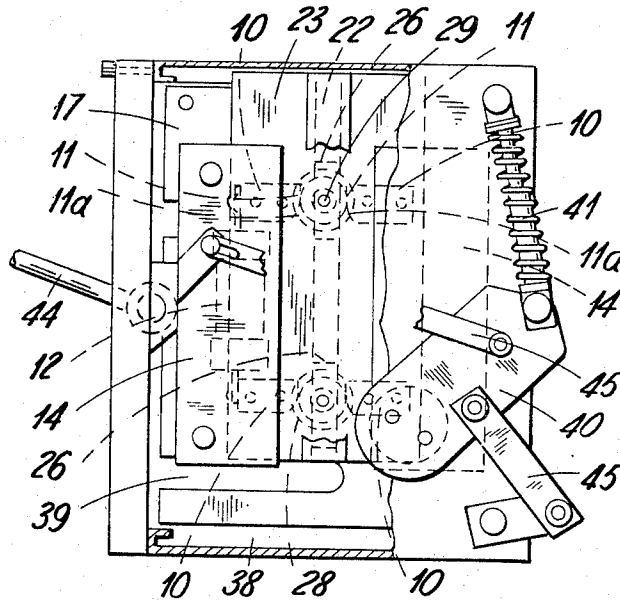
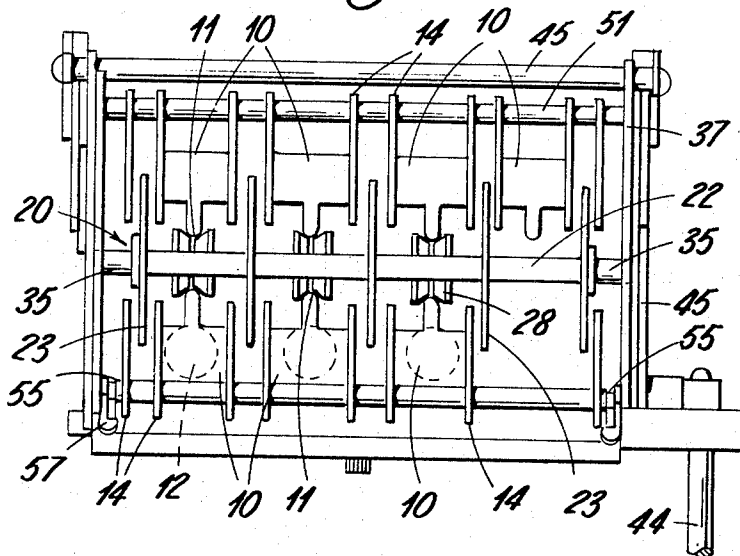


Fig. 4.



Inventor
Dennis William Chesler Smith
By Cushman, Darby & Cushman
Attorneys

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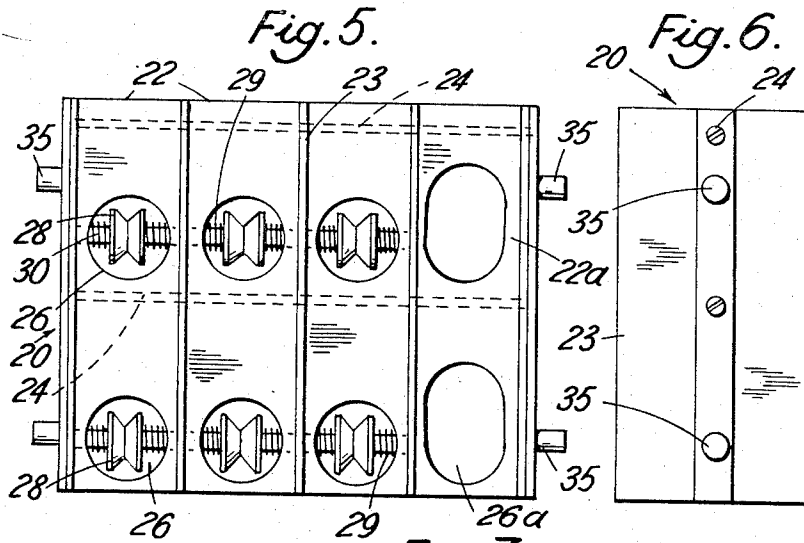
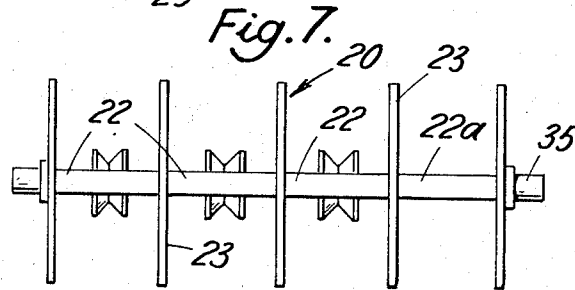
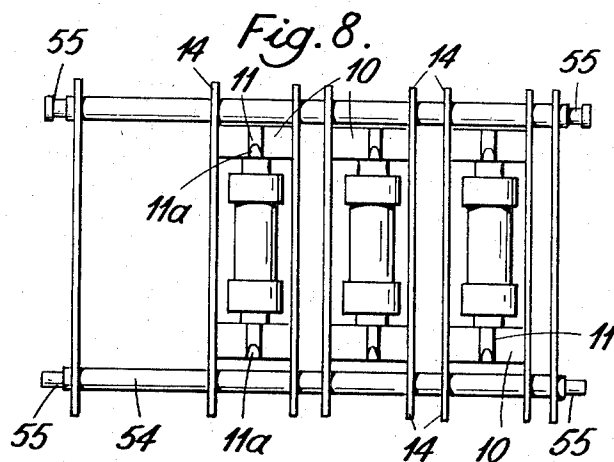
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Inventor
Dennis William Charles Smith
Cushman, Darby & Cushman
Attorneys

Nov. 12, 1968

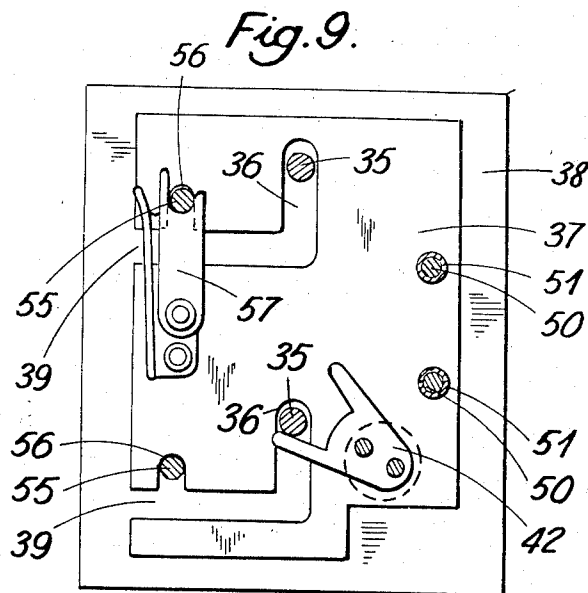
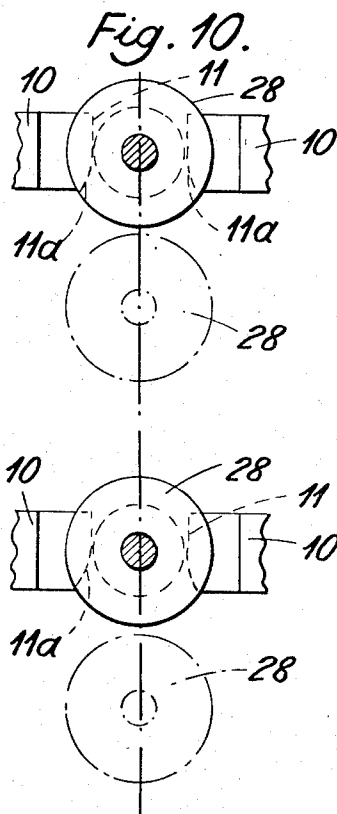
D. W. C. SMITH

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4 Sheets-Sheet 4



Inventor
Dennis William Charles Smith
By *Cushman, Darby & Cushman*
Attorneys

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3,411,037

ELECTRIC SWITCH UTILIZING MOVABLE ROLLER CONTACTS COACTING WITH FIXED ELONGATED BAR CONTACTS

Dennis William Charles Smith, London, England, assignor to Westwood Switchgear Limited, London, England, a British company

Filed Jan. 18, 1967, Ser. No. 610,178

Claims priority, application Great Britain, Jan. 20, 1966, 2,722/66

5 Claims. (Cl. 200-166)

ABSTRACT OF THE DISCLOSURE

An electric switch has a roller contact movable along a bar contact, the electrical connection being broken when the roller moves off the end of the bar. The roller has a peripheral groove which engages the bar with line or point contacts. The two sides of the groove are on separate parts of the roller urged together to make pressure contact with the bar.

The invention relates to electric switches and is particularly, but not exclusively, concerned with switches for moderately high currents.

The invention provides an electric switch having as co-operating switch contacts a roller member and a linear or elongated member along which the roller member may, relatively, roll or slide in substantially point or line contact engagement therewith until it runs off one end of the elongated member to break contact, in which the members interfit with an edge on one of the members engaging in a groove in the other member and in which one of the members is in two parts resiliently urged in the direction of the axis of rotation of the roller member into pressure engagement with the other member.

In one form of the invention the groove is of V-form with substantially straight sides and the member engaging therein has a nose of rounded form running in the groove and making point contacts with the sides thereof.

Preferably the groove is in the periphery of the roller member, this member is in two parts as aforesaid and the two sides of the groove are provided by the two parts.

The invention includes the converse arrangement in which the roller edge runs in a groove in the elongated member. For instance the roller may have a rounded edge, the groove in the elongated member be of V-shape and the sides of the groove be on separate parts spring-urged together. Alternatively the roller may have a V or rounded edge and be in two parts urged away from one another against the sides of the groove. In another alternative the groove is in the roller and the nose of the elongated member is in two parts urged away from one another against the sides of the grooves.

Preferably the elongated member is substantially straight and the relative movement is substantially parallel thereto. The end of the member may be provided with a short run-off or ramp to facilitate re-engagement with the roller.

It is further preferred that there are two, parallel, elongated members and the roller runs between them to make electrical connection between the members. It may be arranged to run off both members at substantially the same time.

An optional but desirable feature of the invention is that there is movable with the roller relative to and between the elongated contacts just described a member of insulating material which follows the roller and as the roller runs off the elongated contacts lies between them to cut off or prevent an arc between the contacts.

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There may be two, or more, sets of switch contacts as above connected in series and there may be a fuse or other form of overload safety device between the sets. Also there may be two, or more, sets of switch contacts arranged in parallel, e.g. as control means for two or more poles.

It is to be understood that whereas it is preferred that the elongated contact or contacts remain stationary and the roller is moved, it is within the invention to move the elongated contacts while the roller remains stationary.

A specific embodiment of a four-pole switch according to the invention will now be described, by way of example, with reference to the accompanying drawings in which:

FIGURE 1 is a front view of the switch mechanism, FIGURE 2 is a side view in the direction of the arrow 2,

FIGURE 3 is a side view in the opposite direction, FIGURE 4 is a plan view of the mechanism,

FIGURE 5 is a front view of a movable carriage carrying the roller contacts,

FIGURE 6 is an end view of the carriage,

FIGURE 7 is a plan view of the carriage,

FIGURE 8 is a front view of one of the fixed contact units,

FIGURE 9 is a view of the inside of one of the end walls of a casing for the mechanism, and

FIGURE 10 is a detail view of one set of the contacts.

The switch comprises, for each of three phases, two pairs of opposed fixed contacts 10, one pair being above the other. These contacts are each formed of a block of copper, or other suitable conducting material, and the contact face is provided by an edge 11 of a projection from the block, the edge being rounded and elongated by reason of the depth of the block. The lower end 11a of each contact edge is cut back, still rounded, to form a ramp. The upper and lower pairs of contacts are coupled by over-load devices 12 connected to one contact of each pair. There is also a pair of fixed neutral contacts 13 which can be connected by a removable link, not shown. Otherwise the contacts 10, 13 are all electrically insulated from one another. The pairs of contacts are also separated by screen 14 of insulating material.

Slidable between the pairs of contacts there is a carriage 20 running in guideways, later described, in the switch casing. The carriage comprises four blocks 22, 22a of insulating material interleaved with sheets or screens 23 also of insulating material, the whole being supported and clamped by rods and screws 24. Each of the blocks 22 has two holes 26 and in each hole there is a two-part roller 28 (e.g. of copper or other suitable conducting material), these rollers constituting the movable contacts of the switch. The two parts of the rollers are frusto-conical discs which together provide a peripheral groove of V-form the sides of which, as can be determined from FIGURE 4, make point contacts with the edges 11 of the fixed contacts 10. The roller parts are free on short rods 29 supported in the blocks 22 and separated from one another. The parts of each roller are urged towards one another by coil springs 30 around the rods 29. The angle between the sides of the V-groove and the springs may be varied as necessary or desired to provide a suitable high contact pressure and the angle may, for example, be about 90° or 120°. The block 22a has elongated holes 26a for passage of the link aforesaid.

The carriage 20 has, at each end, two bosses 35 which are received within and guided for up and down vertical movement by, two slots 36 in end plates 37 secured inside the end walls 38 of the switch casing. The slots 36 have lateral open-ended extensions 39 to permit insertion and removal of the bosses.

There is a snap-action toggle mechanism for moving

the carriage up and down between the position seen in FIGURES 3 and 4 in which the rollers are between and gripping the fixed contacts and the position seen in FIGURES 1 and 2 in which the rollers are clear of the fixed contacts and the blocks 22 are between these contacts (see also FIGURE 10). It is to be appreciated that during the first part of the movement from the first to the second position (i.e. in opening the switch) the rollers run on the fixed contacts with constant pressure. This largely corresponds to the acceleration period of the toggle mechanism and the actual break, when the rollers run off the fixed contacts, occurs after they have reached, or nearly reached, full speed. Furthermore, almost immediately after the rollers have left the fixed contacts the insulating blocks move between them. These features tend to limit arcing. The screens 14 and 23 isolate the individual poles.

In view of the fact that opposite sides of the rollers engage the fixed contacts they will normally slide rather than roll on the fixed contacts. However it is found that, in practice, there is some rotation of the rollers (e.g. due to rough spots caused by arcing) and that the combined sliding and rolling action provides a self-wiping action and a change of contact surface.

The toggle mechanism comprises on the outside of each end of the casing a lever 40 with an over-centre toggle spring 41. These levers are each coupled to a fork 42 on the inner face of the casing end, the forks embracing the lower bosses 35 whereby rocking movement of the forks moves the carriage up and down. The levers 40 are rocked by manual operation of a bell-crank lever 44 having a coupling link 45 to one of the levers 40. The two levers 40 are interconnected by a rod and lever system 45.

The rear set of fixed contacts 10 (i.e. the upper set as seen in FIGURE 4) are secured between the insulating plates 14 by screws and the plates are held on fixed bars 50 surrounded by sleeves 51 serving as distance pieces. These rear contacts are provided with cable connections, not shown.

The front set of fixed contacts 10 are carried on removable unit (FIGURE 8). The contacts, like those at the rear, are secured to the insulating plates 14 which in turn are held on bars and separated by distance pieces 54 surrounding the bars. There are bosses 55 on the ends of the bars which bosses are received in notches 56 in plates 37 and held by releasable latches 57.

The invention is not, of course, restricted to the details of the above example. For instance, if a two-pole switch is required, the contacts described may be interconnected in pairs, in parallel. The shape of the fixed contacts may be varied. The body parts of the contacts may be of square section and the contact surfaces provided on tongues projecting from one end of the body parts (e.g. of the full depth but one-third of the width of the body

parts). Means may be provided for adjusting the contact pressure, e.g. by varying the spring loading or by means of interchangeable rollers of different angles or diameters.

I claim:

1. An electric switch having as co-operating switch contacts a roller member and an elongated member along which, on opening the switch from a switch closed position, the roller member moves, by relative movement between the members, in contact engagement therewith, until it runs off one end of the elongated member to break contact and having means for effecting such relative movement, in which switch the members interfit when in the switch closed position with a rounded edge of one of the members engaging in a groove of V-form with substantially straight sides in the other member, the edge making point contacts with said sides and one of the members is in two parts resiliently urged in the direction of the axis of rotation of the roller member into pressure engagement with the other member.

2. A switch as claimed in claim 1 in which the groove is in the periphery of the roller member, the roller member is in two parts as aforesaid and the two sides of the groove are provided by the two parts.

3. A switch as claimed in claim 1 in which the elongated member is substantially straight and the relative movement is substantially parallel thereto.

4. A switch as claimed in claim 1 in which there are two parallel, elongated members, the roller member runs between them to make electrical connection between the members, and the members are arranged so that the roller member runs off both elongated members at substantially the same time.

5. A switch as claimed in claim 1 in which there are two parallel elongated members, the roller member runs between them to make electrical connection between the members and there is movable with the roller member relative to and between the two elongated members a member of insulating material which follows the roller member and as the roller member runs off the elongated members enters between them to prevent an arc between the elongated members.

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ROBERT K. SCHAEFER, *Primary Examiner.*

H. BURKS, *Assistant Examiner.*