Sept. 3, 1968 L. H. McROSKEY 3,400,236

ELECTRIC SWITCH WITH COIL SPRING CONTACT

Filed Sept. 26, 1966 2 Sheets-Sheet 1

Fig. 1.

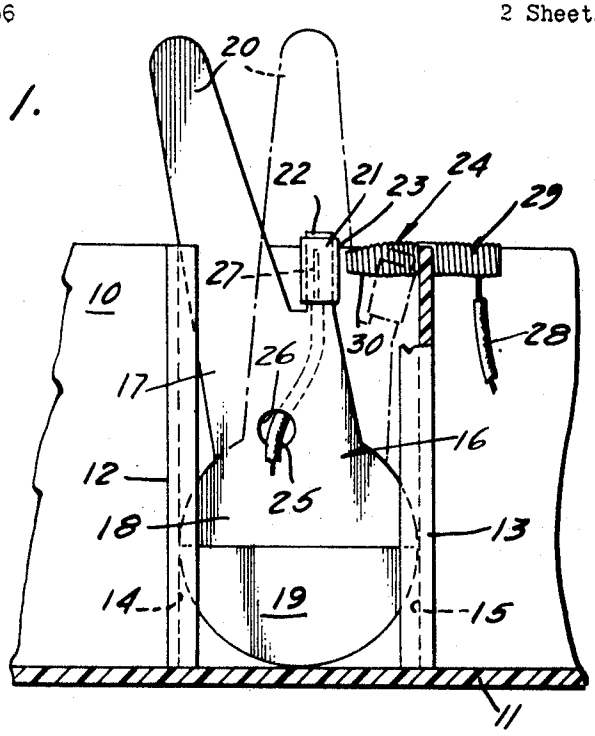
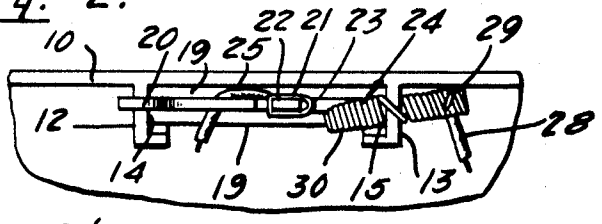
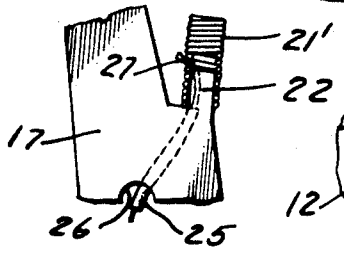


Fig. 2.





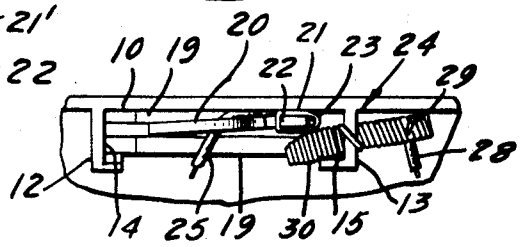


Fig. 4. Fig. 3.

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ELECTRIC SWITCH WITH COIL SPRING CONTACT

Filed Sept. 26, 1966 2 Sheets-Sheet 2

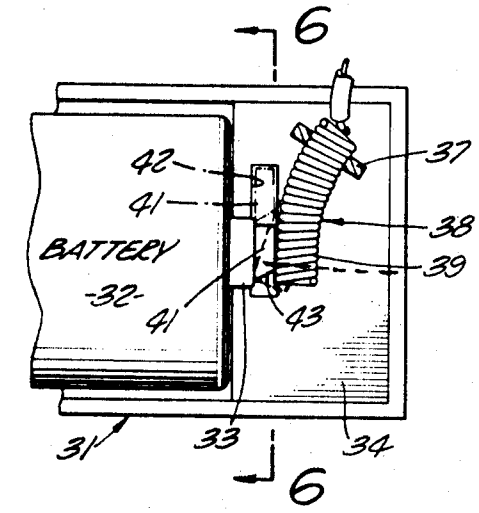


Fig. 5.

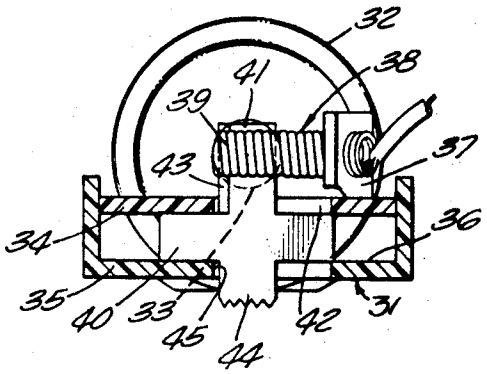


Fig. 6.

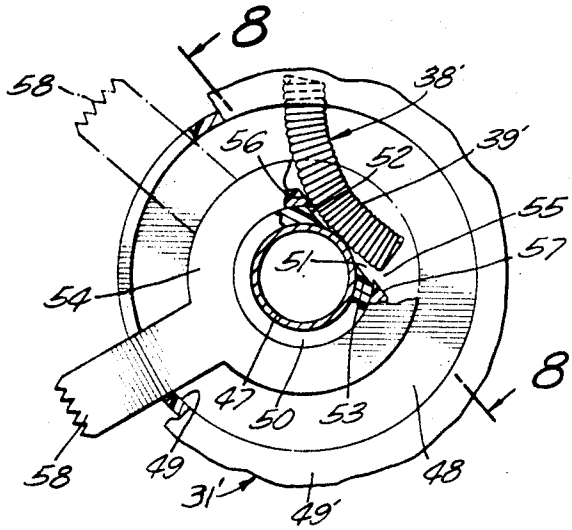


Fig. 7.

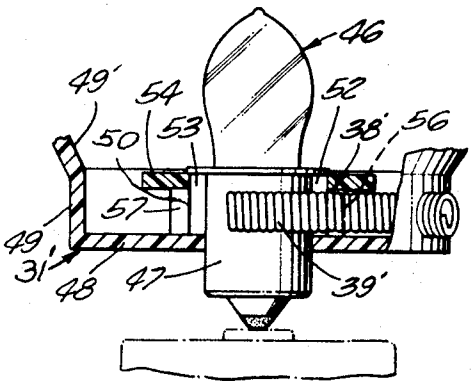


Fig. 8.

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United States Patent Office 3,400,236 Patented Sept. 3, 1968

3,400,236

ELECTRIC SWITCH WITH COIL SPRING CONTACT

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Continuation-in-part of application Ser. No. 488,431, Sept. 20, 1965. This application Sept. 26, 1966, Ser. No. 582,103

5 Claims. (Cl. 200—153)

ABSTRACT OF THE DISCLOSURE

An electric switch, especially for controlling circuits in toy devices, having a pair of contacts in which one of the contacts has a freely deflectable portion normally spring urged into a closed position of engagement with a fixed contact which may comprise a terminal of an electrical device, and a camming barrier of nonconducting material selectively movable into and out of a position between and separating the contacts, movement of the barrier being operable on the deflectable portion and acting to move it with respect to the fixed contact.

This is a continuation-in-part of application Ser. No. 488,431, filed Sept. 20, 1965, now Patent No. 3,288,948.

The present invention relates generally to electric circuit controlling mechanisms, and is more particularly concerned with improvements in an electric switch which is especially suited for the control of motor and other electric circuits in connection with toy devices.

Heretofore, in the case of switch mechanisms of the type utilized for the control of motor energizing circuits and other circuits as embodied particularly in various toy devices, the trend has in the main been to construct the switches of small size and simple construction in order to reduce their cost. As a result of such efforts, the switches have become unreliable, due to failure of parts, failure to function properly as well as for other causes which have in general made the currently available switches undesirable.

With the foregoing in mind, the present invention has for one object a switch of improved construction requiring a minimum of parts and assembly operations, which is susceptible of a long operating life, which will be free of failures, and which may be quickly assembled and connected with the circuit conductors of a control circuit without the use of tools.

A further object is to provide in switches of the herein described character, unique contact members in the form of one or more coiled springs, advantage being taken of the spring coils to provide the mounting for the contact, connections for circuit conductors, and a contact portion which is of flexible character.

A still further object is to provide switch contacts embodying a coiled spring in which the coils operate to effect self cleaning of the contacts.

Another object is to provide in such switches, a contact embodying the use of a coiled spring which serves to provide through its construction and flexibility a frictional contact pressure.

It is also an object to utilize a contact having the structure of a coiled spring, in which the individual coils will serve as locking or dwell means for retaining an associated slide contact in its circuit closed position against inadvertent displacement.

Still another object of the invention is to provide unique switching means, wherein a connection contact of an associated device such as a battery, electric lamp and the like may be utilized as one of the contacts for the switching means.

Further objects of the invention will be brought out in the following part of the specification, wherein detailed description is for the purpose of fully disclosing the invention without placing limitations thereon.

Referring to the accompanying drawings, which are for illustrative purposes only:

FIG. 1 is an enlarged elevational view, partly in section, of an electric switch embodying the features of the present invention;

FIG. 2 is a fragmentary plan view of the same, showing the switch contacts in opened position;

FIG. 3 is a fragmentary plan view, showing the contacts in closed position;

FIG. 4 is a fragmentary detail view showing an alternate construction for the movable contact of the switch;

FIG. 5 is a fragmentary plan view of a modified form of the invention;

FIG. 6 is a transverse section of the same, taken substantially on line **6**—**6** of FIG. 5;

FIG. 7 is a fragmentary plan view of another modified form of the invention; and

FIG. 8 is a transverse section taken substantially on line **8**—**8** of FIG. 7.

Referring now more specifically to the drawings, for illustrative purposes, the switch of the present invention is disclosed in FIG. 1 as being incorporated in connection with a wall forming member **10** which may constitute a side wall, partition or the like of a compartment or container having a bottom closure wall **11**. While the switch parts are shown as being thus associated, it is within the broad concepts of the present invention to utilize other forms of construction for the housing and mounting of the switch parts into cooperative relationship.

As shown in the disclosed embodiment, the wall **10** is provided with integrally formed spaced apart guide rails **12** and **13** which project from the adjacent surface of the wall **10** and provide confronting channels **14** and **15** which are utilized for removably supporting and positioning the cooperatively associated switching instrumentalities in a manner which will now be explained.

A movable switch body, as indicated by the numeral **16**, is provided, this body comprising an elongate member which is constructed of a suitable plastic or other suitable material preferably having insulating properties and of flat uniform thickness. One end of the member **17** is enlarged to form a head portion **18** of generally circular perimeter, and of a size to extend into the channels **14** and **15** on its opposite side edges. The member **17** is of less thickness than the width of the channels, and in order to center the member in the channels, the head portion may be provided with an overlying semicircular disc **19** on its opposite sides to serve as a spacer.

The opposite end of the member **17** is extended beyond the wall member **10** and tapered to provide a handle portion **20** by means of which the member **17** may be rocked or swung about its head portion **18** for manipulating the switch contacts into and out of engagement.

A movable contact **21** is carried by the member **17**, and comprises in the embodiment shown in FIG. 1 a tubular sleeve of conducting material such as copper, aluminum and the like which is supported upon a projecting portion or finger **22** that is integrally formed on the movable switch body. As best shown in FIG. 2 the sleeve is provided with opposite sides which converge to provide in effect a knife edge **23** to facilitate movement of the movable contact **21** into engagement with an operably associated contact as generally indicated at **24**. In utilizing a contact sleeve structure as just described, a circuit conductor such as the conductor **25** may be connected to the contact by leading an end portion of the conductor from one side of the member **17** to the other through an

opening **26** which will anchor the conductor and permit the insertion of an end of the conductor from which the insulation has been stripped, as indicated at **27** between the contact sleeve and the projecting portion **22**.

The contact **24** is in the form of a relatively tightly coiled spring formed of electrically conducting spring wire. As thus constructed, the contact may be mounted upon one of the guide rails or other projection simply by spreading adjacent intermediate coil turns and pushing the coil spring over the edge of the projection or rail portion, in the manner shown in FIG. 1. As thus mounted, the adjacent coil turns frictionally grip the support and retain the contact in a mounted position with end portions extending on opposite sides thereof.

With a right-hand wound spring the inclination of the gripping coils act to support the spring with its axis at such an angle, with respect to the plane of movement of the movable contact, as to desirably assure proper closing of the contacts. The outermost end of the contact provides means by which a conductor **28** may have its stripped end **29** connected to the contact simply by inserting this stripped end between adjacent coil turns in the manner shown in FIG. 1.

The opposite end of the contact member is shown as being tapered as indicated at **30** by reducing the diameter of the coil turns in a direction towards the adjacent end of the contact member. By providing a tapered end, the movement of the contacts into closed position will be further facilitated.

Referring to FIG. 2, it will be observed that the tapered portion of the contact **24** is in the path of movement of the knife edge **23** of the movable contact, and that as the contacts are closed the knife edge will ride up on the tapered end **30** of the contact **24** and in so doing may deflect both the member **17** and the end portion of the spring as indicated in FIG. 3. Pressure frictional engagement is thus formed between the contacts so as to establish a good current flow connection. It will also be appreciated that the spring coils at this end of the contact will have an inherent cleaning effect due to their relative movement during opening and closing of the switch contacts. Moreover, there is a desirable tendency of the coils of the contact **24** to form a locking engagement with the movable contact which will tend to hold the movable contact in its closed position.

Referring to FIG. 4, there is shown an alternate arrangement for the movable contact which differs with that previously described in that instead of utilizing a sleeve for the contact **21**, the contact as indicated at **21'** in this case embodies a coiled spring which functions in the same manner as the previously explained contact. In this arrangement, it will be observed that the coiled springs as used in the moving contact and contact **24** will have their axes disposed at an angle, and the previously explained advantages for the contact **24**, will also be present in the contact **21'**. Thus, the conductor **25** may have its bared end **27** anchored in the contact **21'** by inserting it between the coil turns of the contact. Moreover, the contact **21'** will also be deflected in the closed position of the contacts.

The modified versions of the invention as shown in FIGS. 5 to 8 inclusive differ from the arrangements described above primarily by utilizing a switch contact arrangement wherein it is possible to utilize a connection contact of an associated device, such as a battery, electric lamp and the like as one of the contacts of the switching mechanism. This amounts to a material saving in cost, while at the same time permitting utilization of the unique features of the invention.

As shown more specifically in FIG. 5, this modification embodies a frame structure **31** which is adapted to receive and support an associated electrical device, namely, a battery **32** of the type utilized for flashlights and similar devices. This battery is of conventional construction and has a central electrode contact **33** at one end.

Adjacent the contact **33**, the underlying frame structure is constructed with spaced walls **34** and **35** which define an internal cavity **36**. The frame structure is so arranged that the wall **34** will extend just below the contact **33**. This wall is provided with an integrally formed projection **37** which serves as a support for a resilient contact **38** which is similar to the previously described contact **24** in the form of a relatively tightly coiled spring of electrically conducting spring wire. This contact as mounted on the projection **37** has a free end **39** which is normally laterally deflected so that this end of the contact will be forcibly urged into engagement with the electrode contact **33** of the battery.

For controlling actuation of the switch which is thus formed by the contacts **33** and **38**, there is provided an actuator which comprises a slide member **40** supported in the internal cavity **36** for rectilinear movement. This slide member carries an upper projection **41**, as viewed in FIG. 6, which guidingly extends through an elongate slot **42** in the wall **34**. The projection **41** has a bevelled edge **43** so that the projection will serve as a camming barrier which can be moved into and out of a position as shown in full lines in FIG. 5 between and separating the contacts **33** and **38**. Upon movement of the projection **41** to the dotted line position, FIG. 5, the contact **38** will be forcefully urged into engagement with contact **33**. The projection **41** is of non-conducting material and may be constructed of a plastic or insulation either separately or integrally with the slide member **40**.

The slide member **40** also has a downwardly extending projection **44** which extends through a guide slot **45** in the wall **35**. The projection **44** provides a digitally engageable handle for manually shifting the slide member during operation of the switch.

Referring now to FIG. 7, there is shown a modification which works on the same principles as that shown in FIG. 5, except that instead of the camming barrier being movable rectilinearly, it is movable in an arcuate path. More specifically, the arrangement shown in FIG. 7 is adapted to a combination which utilizes, for example, a light bulb device as generally indicated at **46** of conventional construction and having a conducting cylindrical base **47**.

In this arrangement, the embodiment includes a frame structure **31'** having an annular bottom wall **48**, a surrounding side wall **49** at its periphery, this side wall at its upper edge being extended to provide an upwardly flared wall portion **49'**. Centrally, the bottom wall is provided with an upstanding tubular sleeve **50** which serves as a receiving socket for the base contact **47**, this sleeve at one side having a cut out opening or notch **51** therein which extends between notch forming edges **52** and **53**. As thus arranged, the surface of the base contact **47** is exposed in the notch. Similarly, as described above, a coil contact **38'** is in this case supported in the circular peripheral wall **49** with a free end portion **39'** extending across the notch and being deflectingly resiliently urged into engagement with the surface of the cylindrical base contact **47** therein.

For controlling the switch contacts, which are thus formed by the base contact **47** and the contact **38'**, there is provided in this case an outer sleeve member **54** which is mounted in concentric surrounding relation to the sleeve **50**. The outer sleeve member **54** is likewise provided with a notch **55** which extends between bevelled notch forming edges **56** and **57** which are shown as being bevelled so as to form camming edges. The notch **55** is substantially in registration with the notch **51**. The sleeve **54** is rotatable by means of a radially extending handle **58**.

With the handle **58** in the position shown in full lines, FIG. 7, the contact **38'** will be in circuit engagement with the base contact **47**. However, upon moving the handle **58** to the dotted line position, the notch edge **56** will be moved with camming action between the contacts **38'** and **47** to form a separating barrier and hold the contacts in open position.

From the foregoing description and drawings, it will be clearly evident that the delineated objects of the invention will be accomplished.

Various modifications may suggest themselves to those skilled in the art without departing from the spirit of my invention, and, hence, I do not wish to be restricted to the specific form shown or uses mentioned, except to the extent indicated in the appended claims.

I claim:

1. An electric switch, comprising:
   (a) a pair of cooperable associated contacts having engaged and disengaged positions, one of said contacts being fixed and one of said contacts being a supported member having a freely deflectable portion forcibly urged into engagement with the fixed contact in response to a pre-stressing deflection of said portion laterally away from its normal axis position; and
   (b) manually movable means including a camming member for actuating said contacts to a disengaged position, said member having a path or movement passing between said contacts and in one direction of movement into engagement with said deflectable portion and acting to move said portion out of engagement with the fixed contact.

2. An electric switch according to claim 1, in which the supported member is an elongate coiled spring having coils in an end portion urged into engagement with the other contact.

3. An electric switch according to claim 1, wherein the manually movable means includes a camming member supported for movement along an arcuate path into and out of a position for separating the contacts.

4. Electric switching means comprising in combination:
   (a) a battery mounted in a fixed position and having an electrode contact at one end;
   (b) a coiled spring contact member fixedly supported and having a free laterally deflected end portion with coil turns thereof resiliently urged into electrical conducting contact engagement with said electrode contact; and
   (c) a camming barrier of nonconducting material supported for movement into and out of a position between and separating said contacts, the barrier movement into said position acting to engage and move the coiled spring in a direction to disengage said coil turns from said electrode contact.

5. Electric switching means comprising in combination:
   (a) a support including a tubular inner sleeve of insulating material having a wall opening on one side;
   (b) an electrically energizable device having a cylindrical part coaxially supported in said sleeve and providing a connection contact member for the device;
   (c) a coiled spring contact member fixedly supported and having a free laterally deflected end portion extending across said wall opening and being resiliently urged into electrical conducting engagement with said connection contact member; and
   (d) concentric outer sleeve means rotatable on said inner sleeve, said outer sleeve means including an arcuate camming barrier of nonconducting material movable into and out of a position between and separating said contact members.

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