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Bienwald et al.

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[54] TEASE-PROOF ELECTRIC SWITCH

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[52] **U.S. Cl.** .....**200/70,** 200/67 G, 200/157

[51] **Int. Cl.**.....**H01h 13/36,** H01h 13/08

[58] **Field of Search**.....200/70, 68, 154, 157, 67 G, 200/153 LA

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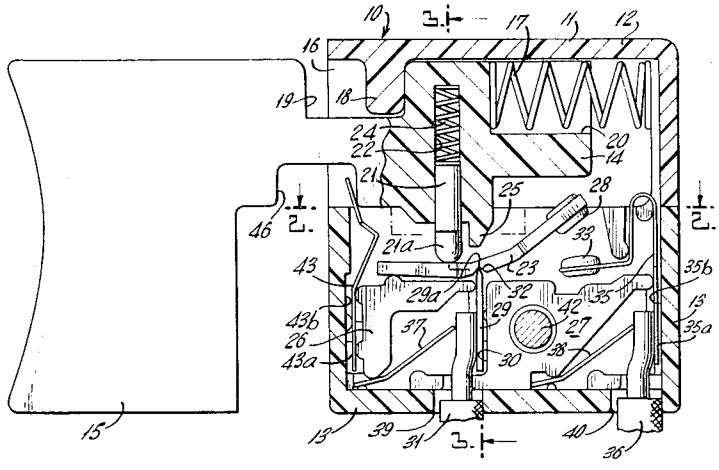
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[57] **ABSTRACT**

The invention relates to a tease-proof electric switch in which the switch contacts cannot be partially opened or closed by manipulation of the mechanism. The switch employs a contact-carrying rocker which moves positively between open and closed positions of the switch under the influence of forces exerted thereon by an operating member.

Movement of the rocker between open and closed positions of the switch is restrained by a releasable latch. Opening and closing of the switch contacts takes place upon release of the latch from engagement with the rocker as the result of forces exerted on the rocker by the operating member. Opening and closing of the switch contacts also takes place positively and quickly with arcing being held to a minimum.

9 Claims, 10 Drawing Figures



2 Sheets-Sheet 1

Fig. 1.

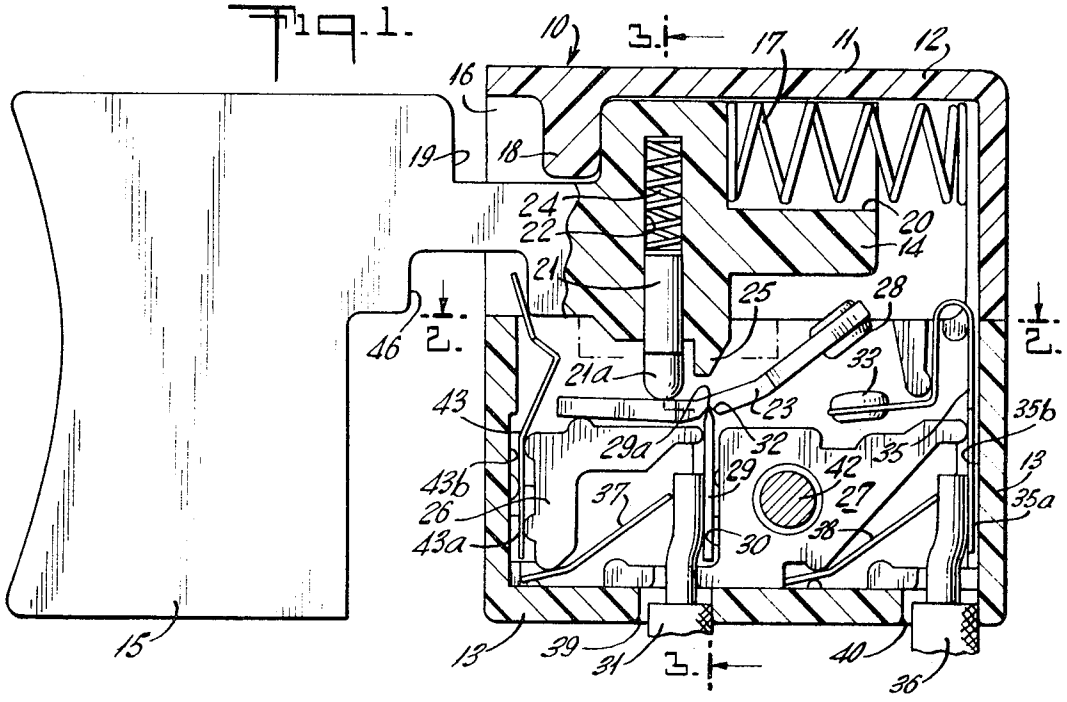


Fig. 2.

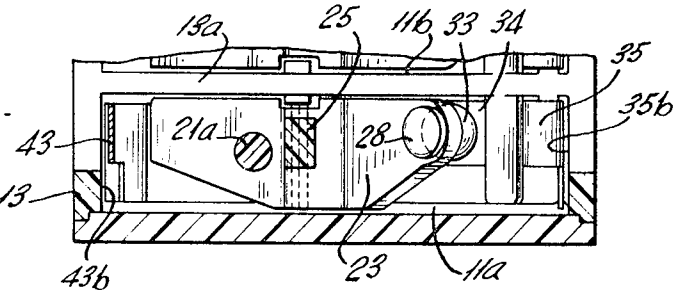


Fig. 3.

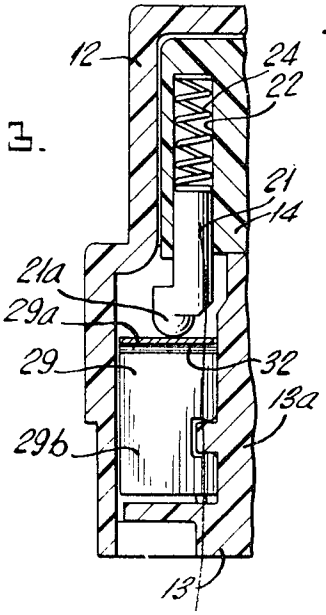


Fig. 4.

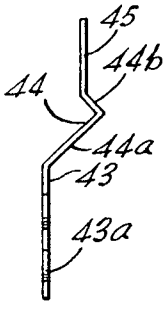
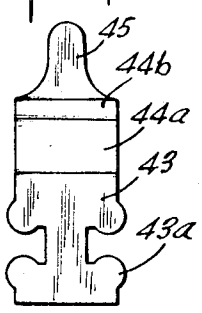


Fig. 5.



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Fig. 6.

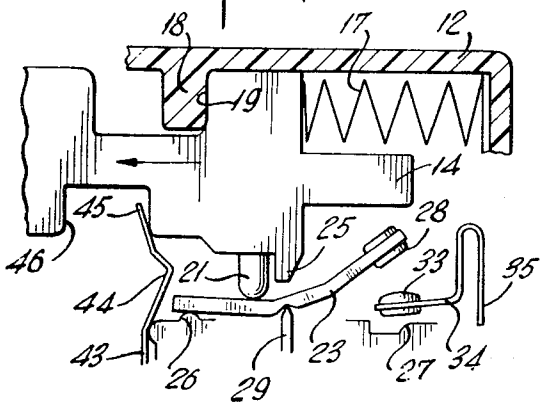


Fig. 7.

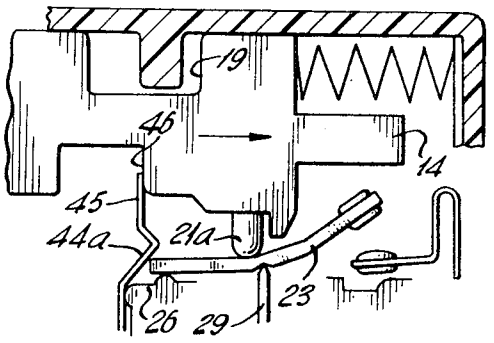


Fig. 8.

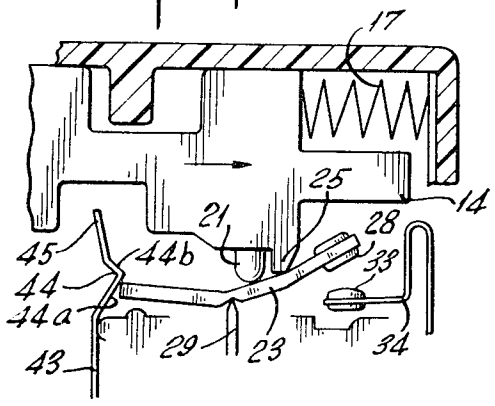
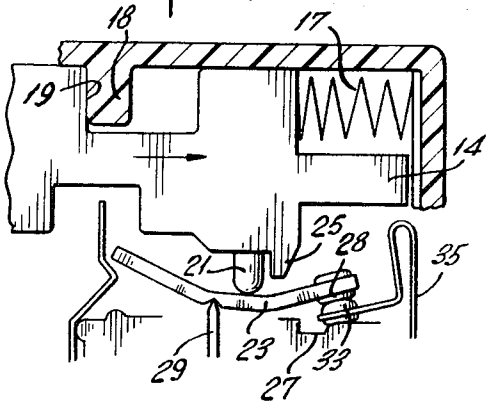


Fig. 9.



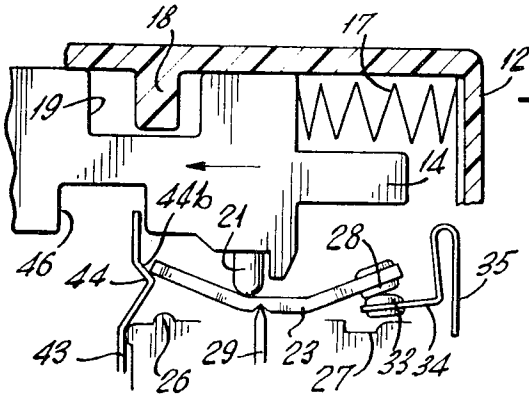


Fig. 10.

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TEASE-PROOF ELECTRIC SWITCH

The present invention relates to a tease-proof electric switch. It relates, more particularly, to an electric switch in which the switch contacts cannot be manipulated into partially open or closed positions.

An object of the present invention is to provide an electric switch in which the switch contacts cannot be brought into close proximity to each other by manipulation of the switch.

Another object of the invention is to provide an electric switch in which movement of the switch contacts between their open and closed positions takes place positively and quickly.

A further object of the invention is to provide an electric switch having a rocker action with movement of the rocker between open and closed positions of the switch contacts being restrained by a releasable latch which prevents partial opening or closing of the switch contacts. Other objects and advantages of the invention will be better understood from the following description and the accompanying drawings in which:

FIG. 1 is a side elevational view in partial vertical section of a trigger-operated electric switch embodying the invention;

FIG. 2 is a fragmentary view in section of a portion of the switch shown in FIG. 1 with the section being taken along the line 2—2 of FIG. 1;

FIG. 3 is a fragmentary view in section of a portion of the switch shown in FIG. 1 with the section being taken along the line 3—3 of FIG. 1;

FIG. 4 is a side view of a latch member employed in the switch shown in FIG. 1;

FIG. 5 is a plan view of the latch member shown in FIG. 4;

FIGS. 6–10 are fragmentary views in vertical section of portions of the switch shown in FIG. 1 and illustrating the parts thereof in different operating positions.

Referring now to the drawings in detail, there is a trigger-operated switch **10** which embodies the invention.

The switch **10** comprises a hollow body or housing **11** having a cover **12** and a base **13** which may be molded from an insulating material. The cover **12** has an opening at the bottom thereof and also has openings in the front and rear end walls thereof. The base **13** fits inside the cover **12** and has upstanding walls at the end thereof which extend into the openings in the end walls of the cover. A partition **13***a* extends upwardly from the base and thus divides the lower part of the housing **11** into two chambers **11***a* and **11***b*, each of which contains a switch mechanism.

A trigger or operating member **14** is slidably supported on top of the partition **13**a with the rear end **15** of the trigger extending through an opening **16** at the rear of the cover **12**. A coil spring **17** interposed between the forward end of the trigger **14** and the front wall of the cover **12** urges the trigger to a rearward or open position of the switch as shown in FIG. 1. In this position, a stop **18** carried by the cover **12** extends into a recess **19** formed in the upper surface of the trigger **14** and thus, limits the rearward or outward movement of the trigger **14**. One end of the coil spring **17** is seated in a recess **20** formed in the front or forward end of the trigger **14**.

The switch mechanisms located in the two chambers **11***a* and **11***b* are similar and hence, only one of the switch mechanisms need be described here. At a point between its ends, the trigger **14** carries rocker-engaging plunger **21** which projects downwardly from the trigger **14** and has a rounded lower end **21***a*. The plunger **21** extends into a cavity **22** in the trigger and has a rounded lower end which is urged into engagement with a contact-carrying rocker **23** by a coil spring **24**. A rocker-engaging finger **25** is also carried by and extends downwardly from the trigger **14** ahead of the plunger **21**. The finger **25** engages with and acts on the upwardly curved forward end of the rocker as the trigger is advanced.

When the switch is in open position, as shown in FIG. 1, the plunger **21** engages with and holds the rear end of the rocker **23** against an upwardly facing surface of a shoulder or projection **26** formed on and extending outwardly from one side of the partition **13***a* adjacent the rear thereof. A second shoulder **27** is formed on and extends outwardly from the side of the partition **13***a* adjacent the front thereof.

The rocker **23** is formed from a rigid piece of electrically conductive material and curves upwardly at its outer or forward end with a contact button **28** being attached to said outer end. The rocker **23** is pivotally supported intermediate its ends on a knifelike upper edge **29***a* of a support or cradle member **29**. The support member **29** has a lower end **29***b* which extends into a slot or cavity **30** formed between opposing ends of the front and rear shoulders **26** and **27** on the partition. As will be described, the lower end **29***b* of the cradle **29** serves as a terminal for connection of a conductor wire **31** to the cradle and thus, to the rocker **23** resting thereon.

The rocker **23** has a transverse groove **32** formed therein in which the pointed or knifelike edge **29***a* of the support or pivot member **29** is seated. Electrical connection between the rocker **23** and the support or cradle member **29** is maintained by the pressure exerted on the rocker by the spring-biased plunger **21**.

A second switch contact in the form of a contact button **32** is yieldably supported in opposing relation to the contact button **28** on the rocker **23** by a spring arm **34** forming part of a contact element **35**. The spring arm **34** extends inwardly above the projection **27** at the forward end of the partition **13***a*. The lower end **35***a* of the contact element **35** extends into a slot **35***b* formed between the front of the projection **27** and the end wall at the front of the base **13**. The lower end **35***a* of the contact element **35** serves as a terminal for connection of a second conductor wire **36** to the switch.

The terminals, as illustrated, are of the pushin type and include wire-engaging spring tongues **37** and **38** which are supported, respectively, in cavities formed in the projections **26** and **27** carried by the partition **13***a*. Each of the wire-engaging tongues **37** and **38** is positioned so that an end thereof extends over a stepped wire-receiving opening **39** or **40** in the base **13**. The wire-receiving openings **39** and **40** are positioned so that a bare end of one of the conductor wires **31** or **36** inserted through the opening will be urged against the terminal **29***b* or **35***a* by the wire-engaging end of the opposing tongue **37** or **38**.

In operation of the switch, a releasable latch member **43** engages with the rear end of the rocker **23** and controls movement of the rocker between open and closed positions of the switch. The latch member **43** is formed of a resilient material such as spring steel and has a lower end **43***a* which extends into a slot **43***b* formed between the rear end wall of the base **13** and the opposing end of the rear projection **26** carried by the partition **13***a*.

The latch member **43** includes a rocker-engaging detent **44** having a lower leg **44***a* which slopes upwardly and outwardly and an upper leg **44***b* which slopes inwardly and connects the detent to a tail or release portion **45**. The tail **45** extends upwardly into a recess **46** formed in the lower face of the trigger **14** and when the trigger **14** is in its rearward position, as shown in FIG. **6**, an end wall at the front of the recess **46** engages with the tail **45** of the latch and holds the latch in a position where the detent **44** will not engage with the rear end of the rocker **23**. Forward movement of the trigger **14**, as shown in FIG. **7**, releases the trigger from engagement with the tail **45** of the latch and thus, permits the lower leg **44***a* of the detent **44** to move into engagement with the rear end of the rocker **23**.

As the trigger **14** continues to advance, the rocker-engaging plunger **21** slides along the rocker **23** toward the curved or forward end thereof and the force exerted on the rocker increases as a result of the upward curvature. However, the engagement of the latch detent **44** with the rear end of the rocker prevents downward or contact closing movement of the rocker until the pressure or downward force exerted on the rocker is sufficient to force the latch **43** rearwardly with the detent **44** being moved out of engagement with the rear end of the rocker **23**. The rear end of the rocker **23** then moves upwardly along the sloping leg **44a** of the detent and the contacts close with a quick positive action under the influence of the plunger **21** and the rocker-engaging finger **25**

carried by the trigger 14. However, such movement of the rocker does not take place until after the plunger 21 and the finger 25 carried by the trigger 14 have moved to a position in advance of the support or cradle 29 on which the rocker is pivoted and thus, the contacts cannot be teased into close proximity to each other and when the rear end of the rocker 23 is released from the latch, the rocker moves to a closed position, as shown in FIG. 9, and the contacts are closed with a quick and positive action.

When the trigger 14 is released and is retracted or moved rearwardly, as shown in FIG. 10, the upper leg 44*b* of the latch detent 44 is located beneath the rear end of the rocker and prevents the contact buttons 28 and 33 from separating. During initial rearward movement of the trigger, the spring arm 34 of the contact 35 maintains the contact button 33 in engagement with the opposing contact button 28 on the rocker 23. This continues until the end wall at the front of the recess 46 in the trigger 14 engages the tail 45 of the latch 43 and then further rearward movement of the trigger releases the latch detent 44 from engagement with the rear end of the rocker 23. The plunger 21 will then force the rear end of the rocker downward separating the contact buttons 28 and 33 with a quick and positive action.

When the trigger 14 returns to its fully retracted position, as shown in FIG. 1, the front wall of the recess 46 in the trigger engages with the tail of the latch and holds the latch out of rocker-engaging position with the contacts being open.

In the case of a double-pole switch, corresponding switch mechanisms may be installed in the two chambers 11*a* and 11*b* and may be operated simultaneously. This will provide for the opening and closing of two connections to the switch in both sides of the line if required by the electrical code.

As will be noted, movement of the rocker between open and closed positions of the switch is restricted by means of the latch 43 and such movement cannot take place until the rocker-engaging plunger 21 carried by the trigger 14 has moved past the support or pivot member 29 in an appropriate direction. This insures positive action of the switch and prevents manipulation to position the opposing contact buttons in close proximity relative to each other.

In assembly of the switch, the various parts carried by the base 13 may be installed thereon and the base may then be inserted in the opening in the bottom of the cover 12. When the base 13 and the cover 12 are assembled, a rivet 42 or other suitable fastening means may be employed to secure the base in the cover.

It will be understood that various modifications and changes may be made by those skilled in the art in the embodiment of the switch illustrated and described herein without departing from the principles of operation thereof.

What is claimed is:

1. In a tease-proof electric switch of the rocker type, the combination which comprises:
   a. a contact-carrying rocker formed of a conductive material and having a curved configuration;
   b. a pivot member of conductive material electrically engaging with the curved rocker at a point intermediate its ends;
   c. said pivot member supporting the rocker for rocking movement between an open and a closed position of the switch;
   d. an electric contact located at one end of said rocker and engaging therewith in the closed position of the switch;
   e. a resilient arm of electrically conductive material yieldably supporting said contact and urging said contact toward engagement with said one end of the rocker; and
   f. latch means releasably engaging with a second end of the rocker and holding the rocker against movement toward the closed position;
   g. said latch means comprising a resilient member having a movable end and a latching detent formed thereon;
   h. said latching detent being biased into engagement with the second end of the rocker and being movable rearwardly relative to and out of engagement with said second end of the rocker by a downward force exerted on the curved rocker at a point beyond the pivot member.

2. In a tease-proof electric switch of the rocker type, the combination as defined in claim 1 which includes:
   a. a second latching detent formed on the resilient latching member;
   b. said second detent releasably engaging with the second end of the rocker and maintaining the contact carrying end of the rocker in engagement with yieldably supported contact until the second end of the curved rocker is forced downwardly and out of engagement with said second detent.

3. In a tease-proof electric switch of the rocker type, the combination as defined in claim 2 which includes:
   a. an operating member slidably engaging with the rocker member and being movable lengthwise relative thereto;
   b. said operating member engaging with and exerting a downward force on the curved rocker at opposite ends thereof in said sliding movement relative to said rocker.

4. In a tease-proof electric switch of the rocker type, the combination as defined in claim 2 which includes:
   a. an operating member slidably engaging with the rocker member and being movable lengthwise relative thereto;
   b. said operating member engaging with and exerting a downward force on the curved rocker at opposite ends thereof in said sliding movement relative to said rocker; and
   c. means on said operating member for engaging with and moving the latch out of rocker-engaging position in one position of said operating member.

5. In an electric switch, the combination which comprises:
   a. a hollow housing;
   b. said housing comprising a cover and a base;
   c. a curved rocker member of electrically conductive material rockably supported on said base for movement between an open and a closed position of the switch;
   d. a pivot member of conductive material extending upwardly from said base and electrically engaging with the rocker member at a point intermediate its ends;
   e. an operating member slidably mounted in said housing and engaging with the rocker member;
   f. said operating member being slidable lengthwise relative to the rocker member and exerting a downward force on opposite ends of the curved rocker member in said movement;
   g. a resilient contact arm of conductive material supported at one end of the base in opposing relation to a first end of the rocker member;
   h. an end of said resilient arm being yieldably urged toward engagement with said first end of the rocker member; and
   i. a resilient latch member releasably engaging with a second end of the rocker member;
   j. said latch member releasably engaging with the second end of the rocker member and restraining movement of the rocker member into and out of engagement with the resilient contact arm until a downward force is exerted by the operating member on a raised portion of the rocker on one side of the pivot member.

6. In a tease-proof electric switch of the rocker type, the combination as defined in claim 5 which includes:
   a. a latch release formed on said operating member;
   b. said latch release engaging with and moving said resilient latch away from rocker-engaging position in one position of the operating member.

7. In a tease-proof electric switch of the rocker type, the combination as defined in claim 5 wherein:
   a. the resilient latch includes a pair of rocker-engaging detents;
   b. one detent having a rocker-engaging surface sloping upward and outwardly; and
   c. a second detent having a rocker-engaging surface sloping upwardly and inwardly from said first detent;

d. said detents engaging with the second end of the rocker and restraining rocking movement of the rocker in opposite directions.

8. In a tease-proof electric switch of the rocker type, the combination as defined in claim 5 wherein:

a. said base includes a partition extending lengthwise of the base and slidably supporting the operating member;

b. said partition forming two chambers in the cover.

9. In a tease-proof electric switch of the rocker type, the combination comprising:

a. a housing of insulating material;

b. said housing comprising a cover and a base;

c. said cover and base being fitted together and defining at least one chamber;

d. a partition formed on the base and extending lengthwise of said cover;

e. a pivot member of electrically conductive material carried by and extending upwardly from said base at one side of the partition;

f. a curved rocker formed from a conductive material rockably supported intermediate its ends on said pivot member and being in electrical engagement therewith;

g. said rocker being rockable about said pivot member between open and closed positions of the switch;

h. a contact carried by the rocker at one end thereof;

i. a second contact yieldably supported at one end of the base in opposing relation to the contact carried by the rocker;

j. an operating member slidably mounted on the partition;

k. said operating member being movable lengthwise relative to said curved rocker and engaging with the rocker on opposite sides of the pivot member in said movement;

l. a releasable latch formed of a strip of resilient material located at an opposite end of the base;

m. said latch being biased into engagement with a second end of the rocker and restraining rocking movement of said rocker between said open and closed positions of the switch until a downward force is exerted on a raised position of the rocker at a point beyond the pivot member; and

n. latch release means formed on the operating member for engaging with and releasing said latch from engagement with the rocker end in a retracted position of the operating member.

* * * * *