May 13, 1947. S. H. KAST 2,420,485

ELECTRICAL SWITCH WITH KINETIC ENERGY DISSIPATING MEANS

Filed Aug. 5, 1942 2 Sheets-Sheet 1

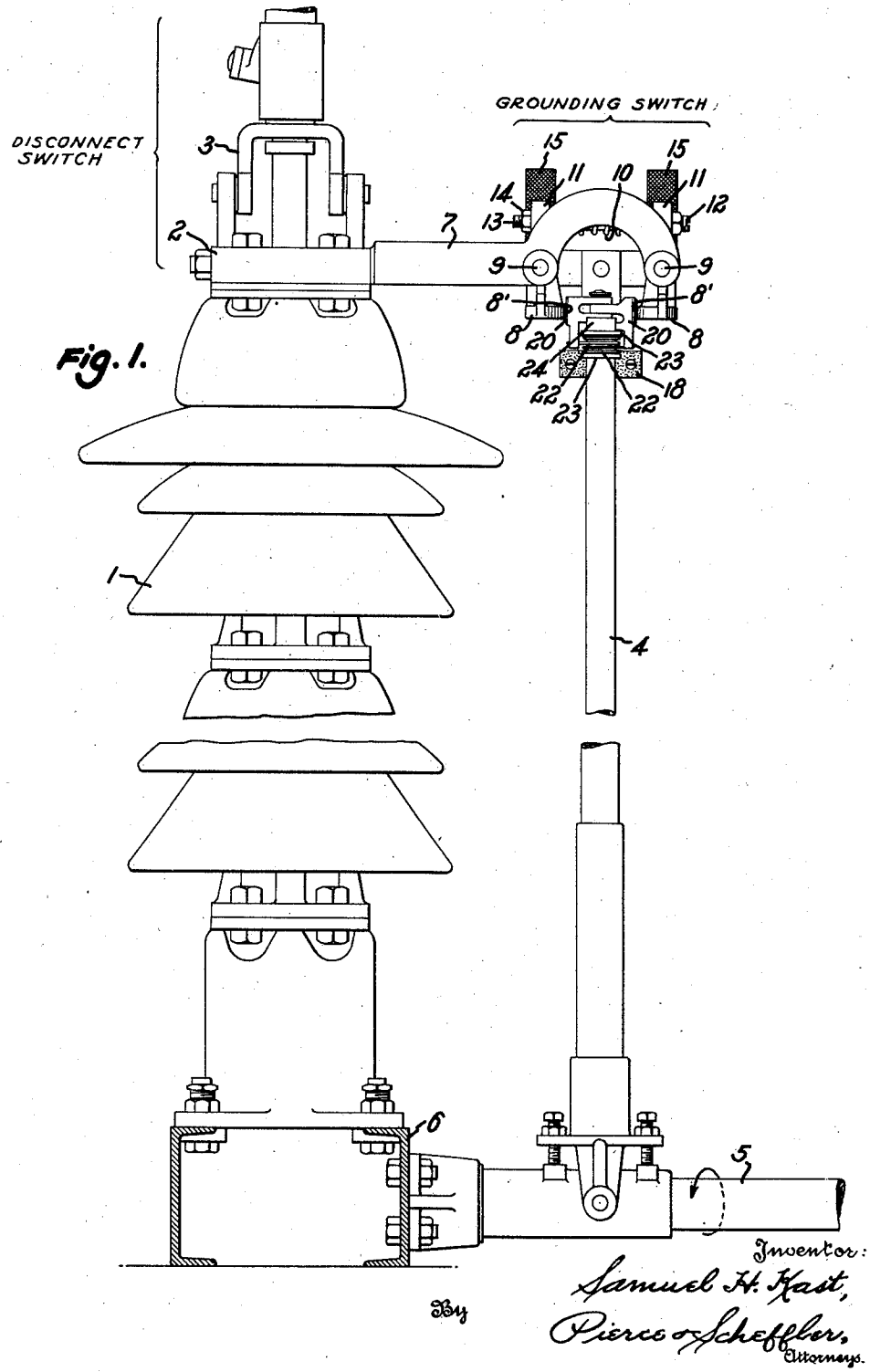

Fig. 1.

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Fig. 2.

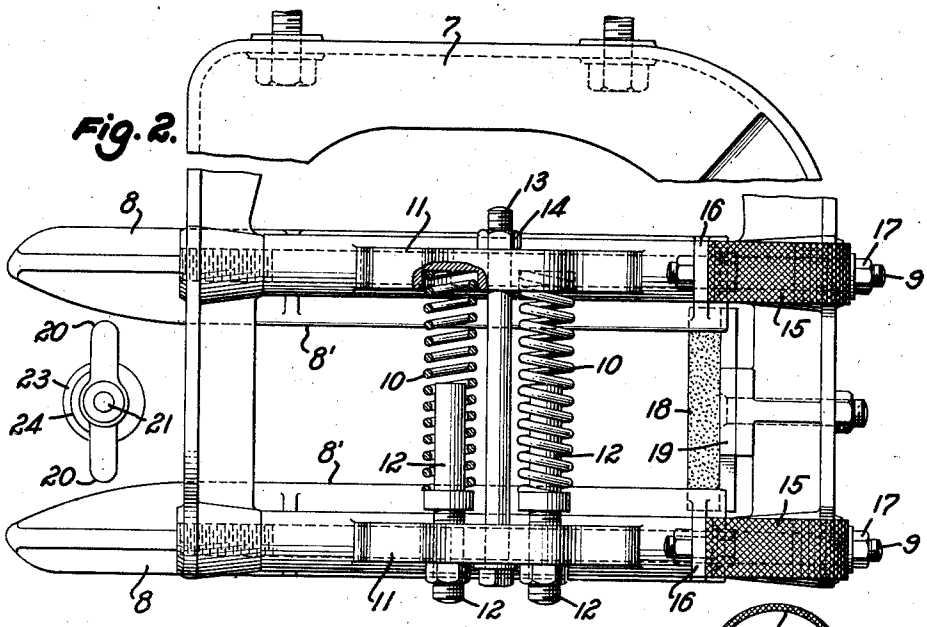


Fig. 3.

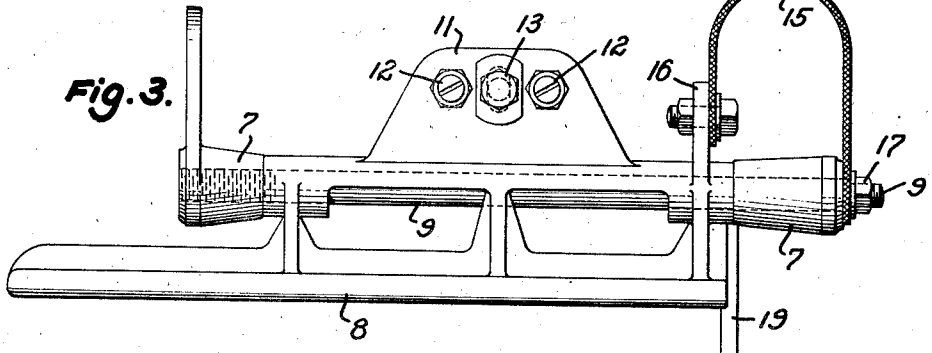


Fig. 4.

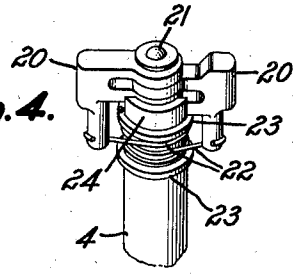


Fig. 5.

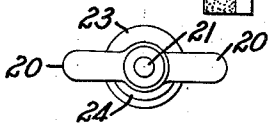
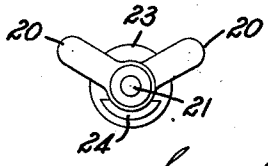


Fig. 6.



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ELECTRICAL SWITCH WITH KINETIC ENERGY DISSIPATING MEANS

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10 Claims. (Cl. 200—162)

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This invention relates to electrical switches and to constructions that are appropriate for use in disconnect switches but that are particularly useful in grounding switches that are closed automatically by heavy springs in a time interval of the order of 8 to 10 cycles on a 60 cycles per second distribution circuit.

The switch blade must be of relatively light weight to permit rapid acceleration when the operating mechanism is tripped, and the kinetic energy of the rapidly moving blade can best be absorbed by contact elements that engage under appreciable pressure to bring the blade to a sliding stop. The opening movement of the blade must overcome the friction of the blade on the jaw element but it is possible to reduce this frictional resistance of the contact members during the opening of the blade.

An object of this invention is to provide an electrical switch in which the blade contact has a relatively long travel within a resilient jaw contact whose opposed contact elements establish a substantial pressure upon the blade contact, thereby dissipating the kinetic energy of the moving blade and establishing a contact engagement of low resistance, the blade contact being of such design that it collapses upon an opening movement of the switch blade to reduce or eliminate the pressure exerted on the movable contact by the jaw contact. An object is to provide a switch including a blade contact of two sections pivotally connected to form a toggle that is spread during a closing movement of the switch blade to establish a high pressure engagement with the opposed contact elements of a jaw contact, and is collapsed upon an opening movement of the blade to relieve the contact pressure and the frictional resistance to movement of the switch blade. Another object is to provide a switch jaw contact including opposed contact elements of relatively great length, as measured along the path of movement of the blade contact, that are pivotally connected and spring pressed towards each other to exert upon a movable blade contact a pressure that is substantially independent of the position of the blade contact within the jaw contact. More specifically, an object is to provide a jaw contact of the type stated in which the elongated contact elements of the jaw contact are pivotally connected for angular movement about an axis or axes substantially parallel to the path of movement of the blade contact as it moves into the jaw contact.

These and other objects and advantages of the invention will be apparent from the following

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specification when taken with the accompanying drawings in which:

Fig. 1 is a fragmentary front elevation of a grounding switch embodying the invention;

Fig. 2 is a fragmentary top plan view of the switch, with the switch blade shown in position approaching, but outside of, the jaw contact;

Fig. 3 is a side elevation of the jaw contact;

Fig. 4 is a fragmentary perspective view of the contact end of the blade; and

Figs. 5 and 6 are end views of the contact blade showing the contact members in spread and in collapsed positions, respectively.

In the drawings, the reference numeral 1 identifies a stationary insulating column that supports the base 2 of the hinge terminal of a disconnect switch 3 that is to be grounded by the switch that embodies the present invention. The jaw contact of the grounding switch is mounted upon the terminal base 2, and the blade 4 of the grounding switch is supported upon an operating shaft 5 that is journalled upon the steel framework 6 on which the insulator column 1 is mounted.

The operating shaft 5 is preferably actuated by a strong spring, not shown, that accelerates the blade 4 rapidly to effect a quick closure of the grounding switch. Whether operated by a strong spring or manually, the blade 4 is moving rapidly as it reaches the contact jaw, and its kinetic energy must be dissipated at a relatively slow rate to avoid excessive stresses in the blade 4. The kinetic energy is dissipated by a relatively long travel of the switch blade within the jaw against a frictional resistance that is substantially constant over the entire range of movement of the blade within the jaw.

The switch jaw comprises a yoke or U-shaped base 7 that is bolted to the disconnect switch base 2, and a pair of opposed contact elements 8, 8 that are pivotally supported upon the base 7 on shafts 9 that are substantially parallel to a tangent to the arcuate path of movement of the contact end of the blade as it enters the switch jaw. The elongated contact surfaces 8' of the contact elements 8 are substantially parallel to each other and to the shafts 9, and are urged toward each other by a pair of springs 10 that are supported on and between flanges 11 of the contact elements. The springs are seated in recesses in one of the flanges 11 and are mounted on shouldered studs 12 that are threaded into the other flange 11 for adjustment to determine the pressure exerted upon the switch blade by the jaw contact elements. A bolt 13 extends through

the flanges 11 and carries a nut 14 that may be turned down upon the bolt to determine the minimum width of the contact jaw when the grounding switch is open. Flexible current-carrying jumpers 15 are connected between lugs 16 on the contact elements 8 and the jaw base 7, the jumpers being preferably fitted over the shafts 9 and clamped to the base 7 by nuts 17 that are threaded upon shafts 9. A rubber stop 18 is supported below the contact surfaces 8' by an inverted T-shaped member 19 that is secured to the base 7 but, in normal operation, the blade 4 will be arrested by frictional resistance before it reaches the stop 18.

The contact means of the switch blade 4 has a normal width somewhat in excess of the spacing of the jaw contact surfaces 8' when the switch is open, and the springs 10 therefore establish a high pressure contact engagement that provides the frictional resistance for arresting the rapidly moving switch blade and affords a high pressure contact engagement of low electrical resistance. The blade contact means comprises a pair of laterally alined contact members 20 that are pivotally mounted on the reduced diameter end 21 of the blade 4 for rocking movement about the axes of the blade. Torsion springs 22 are connected between the contact members 20 and flanges 23 on the blade 4 to urge the contact members in opposite directions to engage the arcuate stop 24 that positions the contact members in diametrical alinement corresponding to a maximum width of the blade contact means.

The frictional resistance to movement of the blade into the resilient contact jaw establishes forces on the contact members 20 that act in the same sense as the springs 22 to hold the contact members in spread or maximum width position. The frictional resistance operates in opposition to the springs 22 upon an opening movement of the switch, and the springs 22 yield to permit a rocking movement of the contact members to reduce the pressure exerted upon the blade contact members by the contact jaw elements, thereby reducing the frictional resistance to an opening movement of the switch.

The switch blade assembly is of relatively light weight and can be closed quickly by a spring mechanism, not shown, and the high speed movement is gradually slowed down by friction between the jaw contact elements 8 and the blade contact members 20. This frictional resistance may be substantially constant over the full range of movement of the blade within the jaw, but it can be increased or decreased with the movement of the blade contacts by appropriate design of the contact surfaces 8' of the jaw contact elements. The frictional resistance is substantially reduced upon an opening movement of the switch by the rocking of the blade contact members in opposition to the forces exerted by the springs 22.

A preferred embodiment of the invention has been illustrated and described but it is to be understood that the invention is not limited to automatic grounding switches and that various changes may be made within the spirit of my invention as set forth in the following claims.

I claim:

1. In an electrical switch, a blade pivotally supported for angular movement in opposite directions for switch closing and switch opening movements respectively, contact means at the outer end of the blade, a jaw contact for engagement by said blade contact means and including opposed relatively movable contact elements having

elongated contact surfaces substantially parallel to each other and to a line parallel to the arcuate path of the blade contact means as it enters the jaw contact, elongated pivot means supporting at least one of said contact elements for rocking movement about an axis parallel to said contact surfaces, spring means urging said contact elements towards each other to exert a substantial pressure upon the blade contact means as it moves into and along the jaw contact, and means limiting the relative rocking movement of said contact elements to determine the minimum spacing of said contact surfaces upon movement of blade contact means out of the jaw contact.

2. In an electrical switch, the invention as claimed in claim 1, wherein said jaw contact includes a base member and said elongated pivot means supports each of said contact elements on said base member for rocking movement about spaced axes each parallel to said contact surfaces.

3. In an electrical switch, the invention as claimed in claim 1, wherein said jaw contact includes a base member and said elongated pivot means supports each of said contact elements on said base member for rocking movement about spaced axes each parallel to said contact surfaces, and said spring means is supported on and between said contact elements to exert pressure thereon to urge the blade-engaging contact surfaces of said contact elements towards each other.

4. In an electrical switch, the invention as recited in claim 1, wherein said blade contact means include contact members supported on said blade for relative movement, under the frictional drag exerted on said contact members by the spring-pressed contact elements during a switch opening movement of said blade, to decrease the effective width of the blade contact means, thereby automatically to reduce the frictional resistance to movement of the blade contact means out of said jaw contact to a value substantially lower than that of the frictional resistance to movement of the blade contact means into and along the jaw contact.

5. In an electrical switch, a jaw contact including opposed and relatively elongated contact elements resiliently pressed towards each other, a switch blade and means supporting the same for angular movement in opposite directions to carry the contact end thereof into and out of said jaw contact, and contact means on said blade for engagement with said contact jaws; said contact means including a contact member pivoted upon said blade for angular movement about the axis thereof and movable to vary the effective width of the contact means, and spring means urging said contact member into position to present a maximum width of said contact means for wedging engagement with said contact jaw.

6. In an electrical switch, the invention as recited in claim 5, wherein said spring means exerts a force on said contact member less than that arising from the frictional resistance to movement of the contact means out of said contact jaw upon an opening movement of the switch blade, whereby said contact is automatically rocked to reduce the frictional resistance to movement upon switch opening movement of the switch blade.

7. In an electrical switch, the invention as recited in claim 5, wherein said contact means comprises two contact members alined transversely of the switch blade and pivoted thereon

for rocking movement about the axis of the blade, and said spring means exerts forces upon said contact members in the same sense as that of the forces developed upon said contact members by the frictional resistance to movement of said contact members into said contact jaw.

8. A switch jaw for cooperation with a pivotally mounted switch blade and comprising a base, a pair of contact elements, each contact element having an elongated contact surface substantially parallel to a tangent to the arcuate path of movement of a switch blade as it enters the switch jaw, elongated shafts pivotally mounting said contact elements upon said base for rocking movement about axes substantially parallel to the associated contact surface, and spring means urging said contact surfaces towards each other.

9. A switch jaw as recited in claim 8, wherein said contact elements each includes a flange extending to the side of their respective supporting shafts opposite their elongated contact surfaces, and said spring means comprises compression springs supported between said flanges of the contact elements.

10. A switch jaw as recited in claim 8, wherein said contact elements each includes a flange extending to the side of their respective supporting shafts opposite their elongated contact surfaces, and said spring means comprises compression

springs supported between said flanges of the contact elements, in combination with a bolt extending through said flanges to limit the minimum spacing of said elongated contact surfaces.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,095,554	Maseng	Oct. 12, 1937
888,760	Smythe	May 26, 1908
1,935,597	Koppitz	Nov. 14, 1933
792,860	Sundh	June 20, 1905
856,737	Sill	June 11, 1907
2,254,914	Rugg	Sept. 2, 1941
638,036	White	Nov. 28, 1899
615,665	Guett	Dec. 6, 1898
2,309,909	Koppitz	Feb. 2, 1943
2,306,117	Dunlap	Dec. 22, 1942
964,037	Lux	July 12, 1910
981,452	McNally	Jan. 10, 1911

FOREIGN PATENTS

Number	Country	Date
603,820	Germany	Oct. 9, 1934
378,567	Great Britain	1932