

Nov. 12, 1968

E. E. KUSSMAUL

3,410,974

PRESSURE SWITCH MECHANISM

Filed Jan. 30, 1967

2 Sheets-Sheet 1

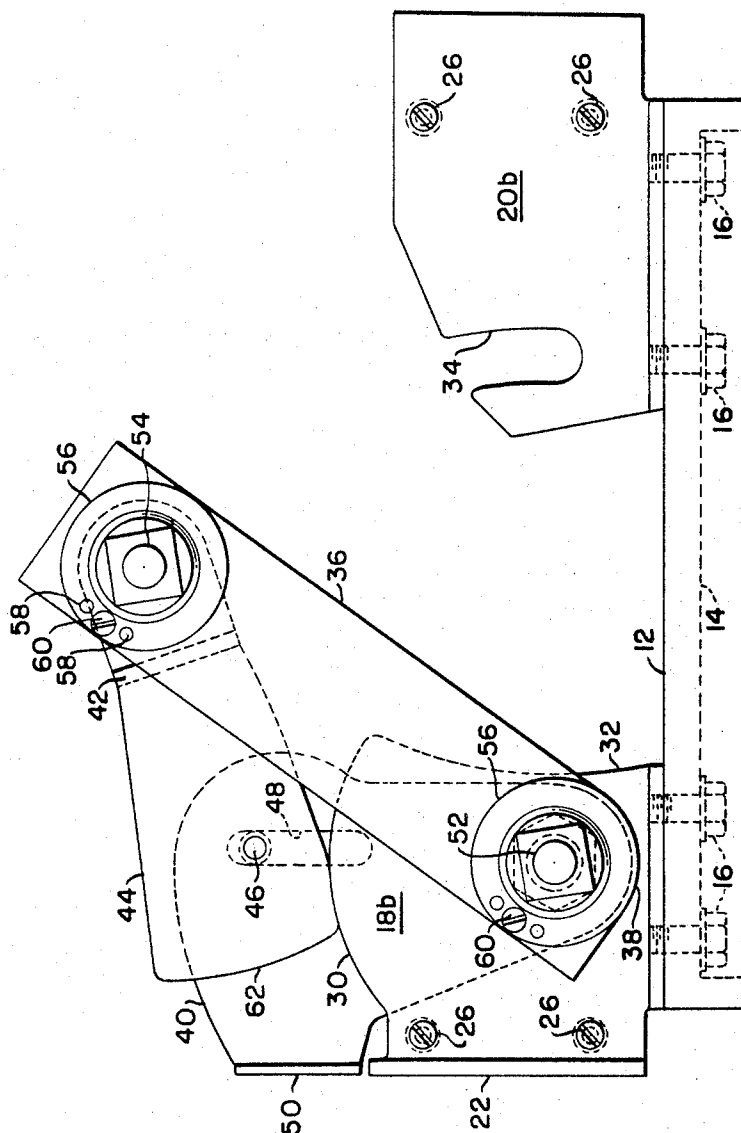


FIG. 1

INVENTOR

EDWIN E. KUSSMAUL

BY Kenway, Jenney &
Hildreth

ATTORNEYS

Nov. 12, 1968

E. E. KUSSMAUL

3,410,974

PRESSURE SWITCH MECHANISM

Filed Jan. 30, 1967

2 Sheets-Sheet 2

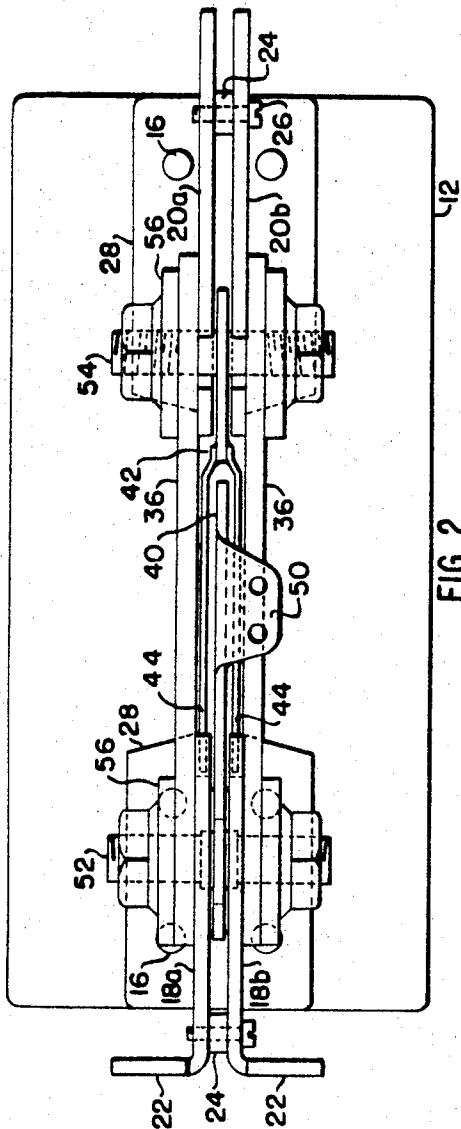


FIG. 2

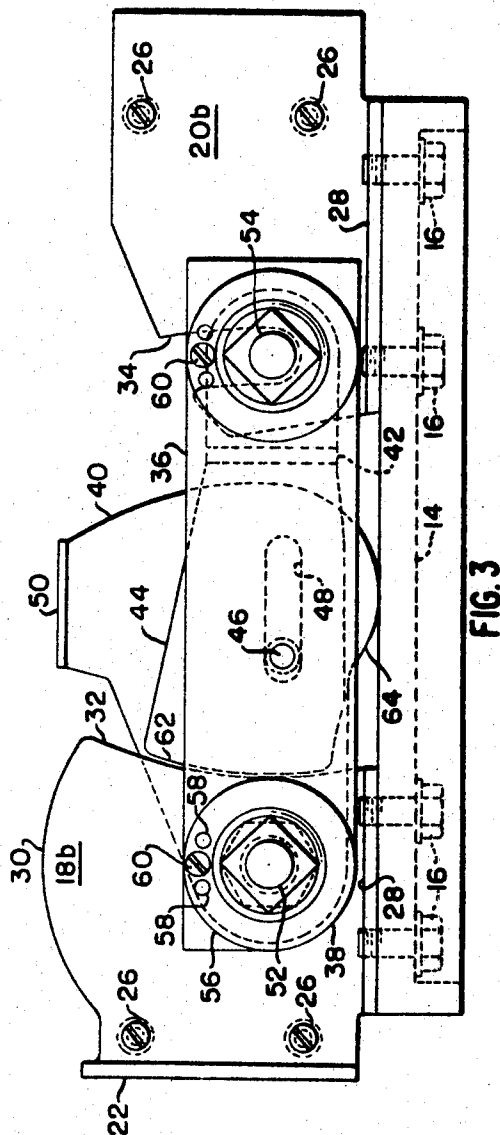


FIG. 3

INVENTOR

EDWIN E. KUSSMAUL

BY *Kerway, Jancy & Heduth*

ATTORNEYS

1

3,410,974

PRESSURE SWITCH MECHANISM

Edwin E. Kussmaul, Westwood, Mass., assignor to
Kelek Company, Norwood, Mass., a corporation of
Massachusetts

Filed Jan. 30, 1967, Ser. No. 612,592

4 Claims. (Cl. 200-162)

ABSTRACT OF THE DISCLOSURE

A pressure contact switch has spaced mirror image sheet metal terminal parts readily adapted to receive lugs on busses, fuses or other connections. These current carrying terminal parts also serve as cams cooperable with a yoke, such yoke forming a collapsible triangle with an operating handle and the switch blades. This arrangement is combined with blade clamping bolts operable by angular displacement between the blades and the yoke and handle to apply pressure to the contacts in the closed switch position.

Background of the invention

The field of this invention generally comprises manual and power operated knife switches characterized by the provision of bolt means to apply pressure to the blades at one or both ends thereof when the switch is in the closed position. These are sometimes called bolted contact switches. The purpose of such pressure is to reduce contact resistance and to resist electromagnetic forces generated by relatively high currents, which forces may produce unintended opening of the switch. In the switches pertinent to this invention, the pressure bolting means are automatically operated by the blade pivoting means when the switch is in closed position.

The prior art includes applicant's joint patent with Charles E. Burt No. 2,960,590 dated Nov. 15, 1960, describing a pressure switch in which the terminal parts are formed of square copper tubing to which various kinds of connections, busses or fuses can be bolted. The end of one copper tubing has slots to receive a bolt supported in the free ends of the switch blades. A collapsible triangular operating mechanism somewhat like that of the patent to Burt et al. No. 2,845,512 is employed, and as in the Burt et al. switch, two pairs of blades are provided with the operating mechanism mounted between the two pairs. The mechanism includes, in each case, a yoke and an operating handle which, together with the blades, form a triangle that is collapsible by reason of a slotted pivotal connection between the yoke and the blades. Patent No. 2,960,590 includes, as an additional part having no necessary current-carrying function, a fixed cam plate which cooperates with a cam follower on the yoke to maintain the triangle in an uncollapsed position after the switch has been opened more than a prescribed initial movement. This is an improvement over the Burt et al. switch in that it provides added means to prevent the undesired operation of the pressure applying devices when the switch is open.

The switch in Patent No. 2,960,590 has a certain complexity and inherent cost of fabrication which restrict its utility for handling current loads where two blades would be sufficient and where the square tubing type of conductor has substantially greater load capacity than is necessary. Also, it has a certain number of parts which are necessary to its operation. The problem to which this invention is addressed is to provide a simple structure with fewer parts, operating in a straightforward, reliable manner to produce results as good as those provided by the switch described in the last-mentioned patent. These de-

2

sirable results include ease of unlocking and opening the switch, positive locking and pressure application in the closed position, freedom from inadvertent operation of the pressure applying means in the open position, and mechanical stability of the structure particularly in the open position.

Summary of the invention

The features of this invention include a mirror sheet metal image configuration of parts based on the use of terminals comprising flat, spaced parallel sheet members. This arrangement provides an advantageous mode of connection to external circuit parts, and at the same time forms the basis for a simple operating mechanism.

A related feature is that the terminals are not only current-carrying but also have cam surfaces that form a part of the collapsible triangle operating mechanism.

Another feature is the use of the pivot point between the operating handle and the yoke as a slotted connection for collapsing the triangular operating mechanism, with attendant simplification of the structure.

Still another feature resides in the incorporation in the design of a bolt locking mechanism operable by angular movement between the blades and the yoke and operating handle.

Brief description of the drawing

FIG. 1 is a side elevation of the preferred embodiment shown in open position;

FIG. 2 is a plan view of the preferred embodiment shown in closed position; and

FIG. 3 is a side elevation corresponding to FIG. 2.

Description of the preferred embodiment

The switch is assembled on one side of an insulating base 12 formed of a reinforced phenolic, or cast in some other suitable material such as another plastic. The base preferably has an elongated central recessed undersurface 14 of sufficient depth to include the heads of eight screws 16, permitting a clearance between these screws and the surface of the housing in which the switch may be mounted, for example a sheet metal switch box.

Secured to the base by the screws 16 are a pair of cam terminals 18a and 18b and a pair of jamb terminals 20a and 20b. These terminals are all formed of sheet metal, preferably copper, and have sufficient thickness and cross section to carry the current for which the switch is designed. Suitable means such as ears 22 are provided for the attachment of other circuit parts such as busses or fuses. Metal spacers 24 receive screws 26 threaded in the pairs of terminals to hold them in spaced relationship, with the two pairs of terminals being in mutual alignment as shown in FIG. 2. The terminals have mounting flanges 28 for receiving the screws 16.

The terminals 18a and 18b have identical cam surfaces 30 and 32 and the terminals 20a and 20b have identical aligned slots 34 that function as a part of the operating and locking mechanism described below.

The switch has two identical pivotal blades 36 formed of sheet metal, preferably copper, of rectangular shape with curved corners 38 for clearance at their pivotal ends. The blades are mounted with the spaced parallel portions of the terminals between them.

The means for mounting the blades 36 upon the terminals also form parts of the switch operating and pressure applying mechanism. These means include an operating handle 40 which serves as a link in a collapsible triangle linkage, and a yoke 42 with bifurcated cam follower portions 44 between which a pivot pin 46 is secured, the pin passing through an elongated slot 48 in the operating handle 40. The operating handle prefer-

ably has a flat portion 50 for attachment of manual or power operating means of any desired type.

A bolt 52 with its ends respectively threaded in opposite senses is secured to the operating handle 40 by welding or other suitable means. A bolt 54 with its ends also threaded in opposite senses is similarly welded or otherwise secured to the yoke 42. The bolts 52 and 54 pass freely through holes in the ends of the blades 36, and the bolt 52 also passes freely through holes in the terminals 18a and 18b. Thus the blades are pivotal about the bolt 52, while the bolt 54 is in a position to be moved into or out of the slots 34 in the terminals 20a and 20b.

Flanged nuts 56 are threaded on the ends of the bolts 52 and 54, the nuts having a plurality of holes such as 58 which may be used selectively to receive set screws 60 threaded into holes in the blades 36. Once so adjusted, the nuts 56 remain fixed in relation to the blades.

The threads on the bolts are so directed that the pair of nuts on each bolt are closer together, when the operating handle and yoke are aligned with the blades 36 as in the fully closed position of FIG. 3, than they are when the handle and yoke are at an angle to the blades, as in the open position of FIG. 1. Thus the movement together of the nuts in response to the pivotal action of the yoke and operating handle, respectively, in relation to the blades forces the blades to apply pressure against the terminals, and opposite rotation of the parts releases such contact pressure.

The cam followers 44 on the yoke 42 are aligned with the cam surfaces 32 of the terminals 18a and 18b, and have a similar curvature at their opposing ends 62, such ends having a small clearance from the cam surfaces 32 when the switch is in the fully closed position of FIG. 3, with a shoulder 64 of the operating handle abutting the base 12.

The opening of the switch is described as follows, having initial reference to FIGS. 2 and 3. An initial unclamping movement occurs as the operating handle 40 is pivoted counter clockwise as viewed in FIG. 3 through a fixed acute angle. The slot edge 48 bears on the pin 46, pivoting the yoke 42 clockwise about the axis of the bolt 54 until the cam follower surfaces 62 reach a position clear of the cam surfaces 32 of the terminals 18a and 18b. During this initial movement the pressure applied to the blades and terminals by the nuts 56 is released.

Further counter clockwise rotation of the operating arm 40, as viewed in FIG. 3, causes the blades 36 to pivot about the bolt 52 with the cam followers 44 in contact with the cam surfaces 30 of the terminals 18a and 18b, the parts ultimately reaching the fully open position shown in FIG. 1. During this final phase of the opening movement the triangle linkage formed by the operating arm, the yoke and the blades is prevented from collapse, thus insuring that the pressure applying means remain unoperated.

The closing of the switch comprises two movements which are the reverse of the movements described above. The initial closing movement ends when the cam follower surfaces 62 of the yoke pass beyond the cam surfaces 30, thus putting the yoke 42 in position to pivot counter clockwise in relation to the blades, and when the bolt 54 has entered the slots 34 in the terminals 20a and 20b. The further clockwise rotation of the operating handle 40 during the second movement results in such counter clockwise rotation of the yoke 42 about the axis of the bolt 54, with the cam follower surfaces 62 guided by the cam surfaces 32 and the nuts 56 tightened together to apply pressure between the blades and terminals.

It will be observed that the current is split into two parallel paths, and two suitable arcing chambers of any desired type may be mounted over the jamb terminals 20a and 20b. These conventional arcing means are not shown in the drawing to avoid confusion with the operating parts herein described.

It will be understood that various modifications in the

configuration of the parts and in their relative relationships, which will occur to those skilled in this art in connection with different specific applications, may be provided without departing from the spirit or scope of this invention.

Having thus described the invention, I claim:

1. A pressure switch having, in combination, first and second pairs of terminals, each pair comprising two conductive sheet members having substantially flat, parallel, spaced portions, said portions forming congruent cams on said first pair and having aligned edge slots on said second pair;

means for mounting said pairs of terminals in fixed, mutually insulated relationship,

a pair of flat parallel blades having said parallel terminal portions therebetween,

first and second threaded bolts, a link secured to the first bolt and extending between said cams,

a yoke secured to the second bolt and having a pivotal and slotted connection with the link, the first bolt being received in one end of said pair of blades and pivoted in said first pair of terminals, the second bolt being received in the other end of said pair of blades in position to lie in said slots in a closed switch position, the yoke having spaced parallel cam follower portions respectively engageable with said cams, the yoke, link and blades being adapted to form a triangle collapsible in said closed switch position,

and nut means on the blades, threaded on the bolts and adapted to draw the blades and parallel terminal portions together when the link and yoke are pivoted to the closed switch position.

2. A pressure switch having, in combination, first and second pairs of terminals, each pair comprising two conductive sheet members having substantially flat, parallel, spaced portions, said portions forming congruent cams on said first pair and having aligned edge slots on said second pair;

means for mounting said pairs of terminals in fixed, mutually insulated relationship,

a pair of flat parallel blades having said parallel terminal portions therebetween,

first and second threaded bolts, a link secured to the first bolt and extending between said cams,

a yoke secured to the second bolt and pivoted to the link, the first bolt being received in one end of said pair of blades and pivoted in said first pair of terminals, the second bolt being received in the other end of said pair of blades in position to lie in said slots in a closed switch position, the yoke having spaced parallel cam follower portions respectively engageable with said cams, the yoke, link and blades being adapted to form a triangle collapsible in said closed switch position, the cams being shaped to permit an initial rocking of the yoke upon an opening operation of the switch and to engage with the cam follower portions during a further opening movement to prevent the collapse of said triangle during said further movement,

and nut means on the blades, threaded on the bolts and adapted to draw the blades and parallel terminal portions together when the link and yoke are pivoted to the closed switch position.

3. A pressure switch having, in combination, first and second pairs of terminals, each pair comprising two conductive sheet members having substantially flat, parallel, mutually spaced portions, said portions having edges formed as congruent cams on said first pair and formed with aligned edge slots on said second pair,

means for mounting said pairs of terminals in fixed, mutually insulated relationship,

a pair of flat parallel blades having said parallel terminal portions therebetween,
 first and second bolts each having its ends respectively threaded in opposite senses,
 a link secured to the first bolt and extending between 5 said cams,
 a yoke secured to the second bolt and pivoted to the link, the first bolt being received in one end of said pair of blades and pivoted in said first pair of terminals, the second bolt being received in the other 10 end of said pair of blades in position to lie in said slots in a closed switch position, the yoke having spaced parallel cam follower portions respectively engageable with said cams, the yoke, link and blades being adapted to form a triangle collapsible in said 15 closed switch position, and

nut means fastenable to the blades, threaded on the bolts and adapted to draw the blades and parallel terminal portions together when the link and yoke are pivoted to the closed switch position.
 4. The combination according to claim 3, in which the link is formed as an operating handle.

References Cited

UNITED STATES PATENTS

10	2,660,649	11/1953	Luebker	200—162	X
	2,845,512	7/1958	Burt et al.	200—162	
	2,960,590	11/1960	Kussmaul et al.	200—162	X

ROBERT K. SCHAEFER, *Primary Examiner.*

H. BURKS, *Assistant Examiner.*