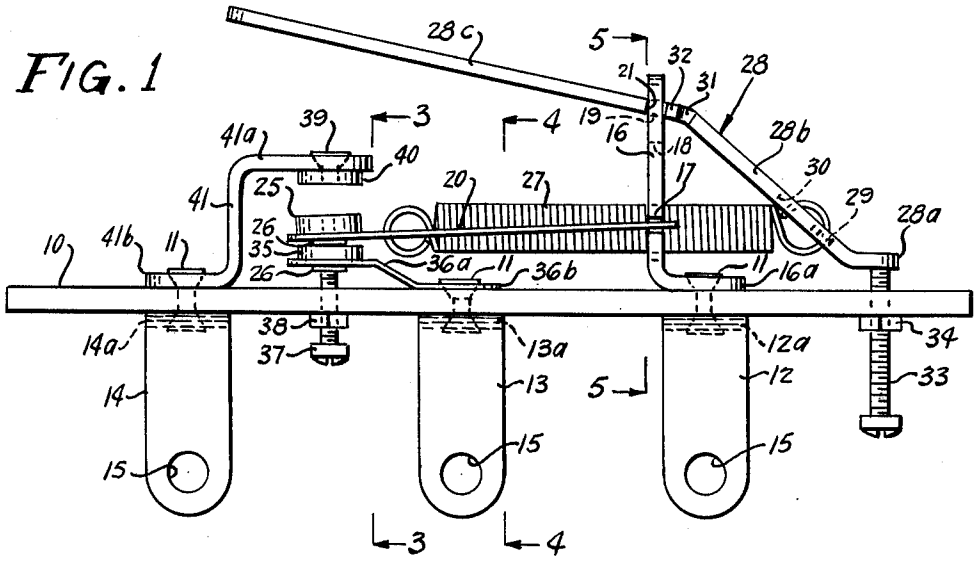
Aug. 10, 1965 F. W. MURPHY, JR 3,200,213

ADJUSTABLE LEVER-ACTUATED OPEN-BLADE SNAP-ACTION ELECTRICAL SWITCH

Filed July 19, 1963

FIG. 1



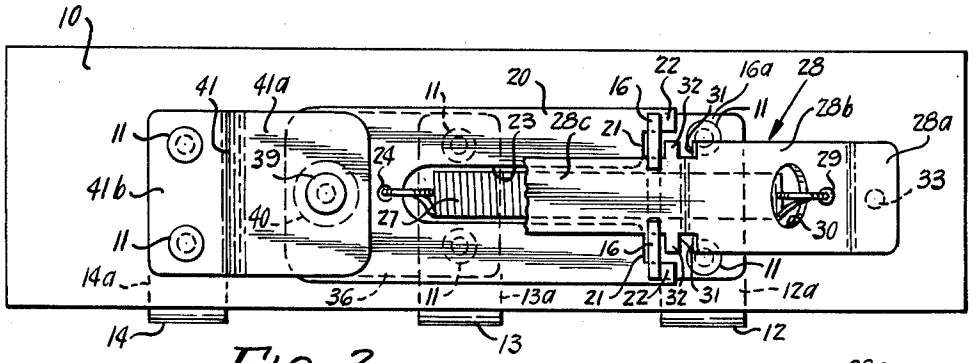




FIG. 2

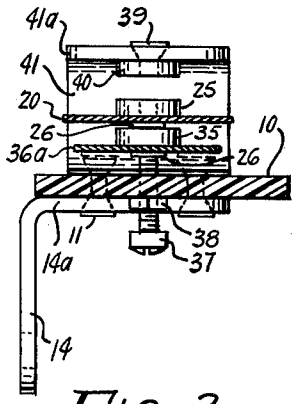



FIG. 3

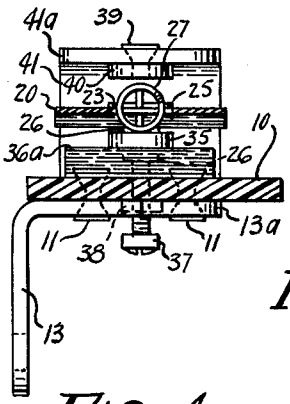



FIG. 4

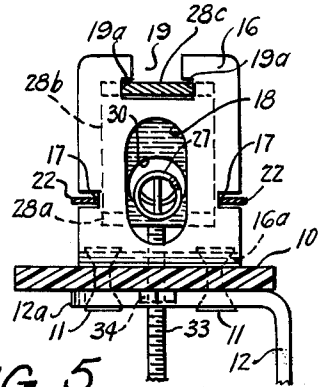



FIG. 5

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# 3,200,213
# ADJUSTABLE LEVER-ACTUATED OPEN-BLADE SNAP-ACTION ELECTRICAL SWITCH

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This application relates to a precision snap action switch, which is characterized by quick movement of the movable contact member from either open circuit to closed circuit position, or from one closed circuit to another closed circuit position.

Snap action switches are of course well known. However, none of the forms at present known have parts of sufficient rigidity for long lasting service in oil field work. The particular defect that militates against long lasting service is that the parts do not have adequate strength to mount contacts large enough to carry the heavy currents required in oil field work. It is also the case that the known snap action switches have their parts made of metals that are not corrosion resistant to hydrogen sulfide gas, which is commonly present in oil fields.

An object of the present invention is to provide a snap action switch in which the parts are made of rigid metal structural elements and the overall device is of sturdy construction.

Another object of the present invention is to provide a snap action switch having a unique adjusting means for the range of travel of the movable contact member.

A further object of the present invention is to provide a snap action switch having unique adjusting means for both the movable and the fixed contacts, the adjusting means for the fixed contact cooperating with the adjusting means for the movable contact to limit the travel of the latter from one circuit closing position, through dead center, to another circuit closing position.

Still other objects, advantages, and improvements will become apparent from the following specification, taken in connection with the accompanying drawing, in which:

FIGURE 1 is a side elevational view of the snap action switch according to the present invention;

FIGURE 2 is a top plan view with part of the operating lever broken away;

FIGURE 3 is a transverse vertical sectional view taken on the section line 3—3 of FIGURE 1 and looking in the direction of the arrows;

FIGURE 4 is also a transverse vertical sectional view taken on the section line 4—4 of FIGURE 1 and looking in the direction of the arrows; and

FIGURE 5 is a partial transverse vertical sectional view, taken on the section ilne 5—5 of FIGURE 1 and looking in the direction of the arrows.

Referring now to the drawing in detail and to FIGURE 1 in particular, the precision snap switch according to the present invention is mounted on a base **10**, which is preferably made of "Bakelite," or one of the other well known phenolic condensation products. Three L-shaped terminals **12**, **13**, and **14** have their upper arms **12***a*, **13***a*, and **14***a* positioned below and transversely of the base **10** and held in place by rivets **11**, which extend through suitable holes in the base and aligned holes in the upper arm. These terminals have holes **15** therein adjacent the bottoms of their vertical arms for the reception of binding posts (not shown) to which the conductors (also not shown) from the associated circuit are attached.

The terminal **12** is the connection for the movable contact of the switch. An L-shaped bracket **16** has a flange **16***a* at its bottom and is positioned longitudinally of the base **10**. It is held in place by the same rivets **11** that hold the L-shaped bracket **12** on the underside of the base, these rivets passing though holes in the flange **16***a* which are aligned with the holes in the base and the holes in the



arm **12***a* on the bracket. Below its mid-horizontal plane the bracket **16** has in its opposite edges slots **17**—**17**. Along its longitudinal center line and on the opposite sides of its transverse center line the bracket is formed with an opening **18** having rounded ends, for a purpose that will appear hereinafter. Also along its longitudinal center line and extending from its top, the bracket is formed with a slot **19**, which slot at its bottom merges with oppositely and transversely extending grooves **19***a*—**19***a*, likewise for a purpose that will appear hereinafter.

The movable contact member of the switch is a rectangular plate **20**. At its rear end this plate is cut away along a rectangle **21**, which has one side parallel to the end of the plate and which side is narrower than the width of the plate to form lugs **22**—**22** at the rear end. These lugs **22**—**22** are respectively received in the slots **17**—**17** in the sides of the bracket **16** to form a pivotal mounting for the contact member. From the transverse cutaway section **21** the contact member is also cut away at **23** along its longitudinal center line to a point beyond its transverse center line. Adjacent the front end of the longitudinal cut-away section **23** there is a hole **24** in the contact member, for a purpose that will appear hereinafter. A contact **25** is secured to the front end of the movable contact member **20** by a flat headed screw **26**.

An operating lever is generally designated by the reference numeral **28**. It is comprised by a horizontal foot **28***a*, a lower leg section **28***b* inclined at an obtuse angle with respect to the foot **28***a*, and an upper leg section **28***c* merging with the lower leg section **28***b* in a knee and inclined at a greater obtuse angle with respect to the foot **28***a*. The lower leg section **28***a* is formed with a large hole **30** along its transverse center line and a smaller hole **29** below the hole **30**, for a purpose that will appear hereinafter. Immediately below the knee the lower leg section is formed with transversely extending slots **31**—**31** in its sides. The forward sides of these slots are formed by oppositely extending lugs **32**—**32** at the knee. The upper leg section beyond these lugs is narrower than the lower leg section **28***b*.

The slot **19** and the oppositely extending grooves **19***a*—**19***a* in the top of the bracket **16** form a selective dual pivotal mounting for the operating lever **28**. As shown the narrower upper leg section **28***b* of the lever extends through the grooves **19***a*—**19***a* in the bracket **16** and the oppositely extending lugs **32**—**32** abut the bracket on one face. In order to shift the pivoted mounting of lever **28** it is merely necessary to turn the lever **28** horizontally in one direction to disengage one side thereof from its associated end of slot **19** or groove **19***a* until that side has engaged the other portion, and then turn the lever in the opposite direction, past the center line of the base to complete the shift from slot **19** to grooves **19***a*, or vice versa. After such shifting the lever is again centered with respect to the longitudinal axes of the base.

A coiled tension spring **27** has one end attached in the hole **24** in the movable contact member **20**, is received in the longitudinal cutaway section **23** in the latter, extends through the elongated opening **18** in the bracket **16**, and has its opposite end freely received in the larger hole **30** and attached in the smaller hole **29** in the lower leg section **28***b* of the operating lever. It will be apparent that when the operating lever is in the last described position, that is, with the slots **31**—**31** receiving the bracket **16** beyond the oppositely extending grooves **19***a*—**19***a* in the latter, the spring **27** will be under greater tension than in the position of the operating lever shown when the lugs **32**—**32** on the latter abut one face of the bracket **16**.

An adjustable rest stop is provided for the operating lever **28**. A screw **33** extends through a suitable screw threaded hole in the base **10** and has a lock nut **34** thereon for abutting the underside of the base. The foot

38*a* of the operating lever abuts the screw 33, when the operating lever is in its rest position.

The terminal 13 is the connection for one fixed contact of the switch, this being the rest or back contact. A contact member 36 is of flattened or Z-shape. This contact member has a bottom flange 36*a*, which is positioned on the top side of the base 10. It is held in place by the same rivets 11 that hold the arm 13*a* of the terminal 13 on the underside of the base, these rivets passing through holes in the flange 36*a*, which are aligned with the holes in the base and the holes in the arm 13*a*. A fixed contact 35 is secured on the upper flange 36*a* of the contact member by a flat head screw 26. The head of the screw 26 that holds the movable contact 25 onto the movable contact member 20 rests on the fixed contact 35, when the operating lever 28 is in non-operated position.

An adjusting means is provided for the fixed contact 35. A screw 37 extends through a suitable screw threaded hole in the base 10 and has a lock nut 38 thereon for abutting the underside of the base. The upper end of this screw abuts the head of the screw 26, which holds the movable contact 35 onto the upper flange 36*a* of the contact member 36.

The terminal 14 is the connection for the fixed open circuit contact 40. A bracket 41 has oppositely extending right angle flanges 41*a* and 41*b* and its top and bottom, respectively. The bottom flange 41*b* is positioned on the top side of the base 10. It is held in place by the same rivets 11 that hold the arm 14*a* on the terminal 14 on the underside of the base, these rivets passing through holes in the flange 41*b*, which are aligned with the holes in the base and the holes in the arm. A fixed contact 40 is secured on the upper flange 41*a* by a frusto-conical head screw 39. The movable contact 25 abuts the fixed contact 40 when the lever 28 is operated.

As above stated, the base 10 is made of "Bakelite," or some other well known phenolic condensation product. The movable contact 25 and the fluid contacts 35 and 40 are made of silver and gold plated to further increase conductivity. All parts, including the coiled tension spring 27, are made of "Monel" metal, so as to be highly resistant to the corrosive effects of hydrogen sulfide gas which is commonly present in oil fields.

In operation, with the parts in the position shown, the axis of the coiled tension spring 27 is inclined at a lesser angle with respect to the horizontal than the plan of the movable contact member 20. Depression of the upper leg portion 28*c* of the operating lever will raise the right end of the spring 27 and shift the axis of the latter above the plane of the contact member 20. The spring 27 will then swing the contact member in the clockwise direction with snap action, the movable contact 25 abutting the fixed contact 40. The switch will remain in this latter closed position as long as the upper leg section 28*c* of the lever is held depressed. When the latter is released, the spring 27 will swing the movable contact member 20 back to the rest position shown in FIGURE 1, also with snap action. In this position the movable contact 25 is on the first fixed contact 35. The angle of the upper leg section 28*c* of the operating lever in the rest position of the latter indicates the number of degrees that the operating lever 28 must be moved through in order to operate the switch. This can be changed by altering the setting of the stop screw 33. Also, the acute angle of the axis of the coiled tension spring 27 with respect to the plane of the movable contact member 20 determines the degree of movement that must be imparted to the latter member before it will pass through dead center and complete its movement with the movable contact 25 abutting the normally open circuit fixed contact 40 in one direction of operation, or pass through dead center and complete its movement with the movable contact 25 abutting the normally closed circuit contact 35 in the reverse direction of operation. As above stated, the tension of the coil spring 27 can be varied by changing the pivotal mounting



of the operating lever 28 from the position shown, where the lugs 32—32 on the lever abut the bracket 16, to the alternate position, where the slots 31—31 receive the opposite faces of the bracket at the grooves 19*a*—19*a*.

I claim:

1. A snap switch comprised by a planar base, a rest contact mounted on said base, a bracket mounted on said base, a movable contact carrying member pivotally mounted at its rear end on said bracket and normally positioned at an acute angle with respect to said base, a movable contact on said movable contact carrying member positioned over the rest contact, a lever, plural pivot means carried by said lever selectively engageable with said bracket for varying the effective length of said lever relative to its pivot point and a coiled tension spring having its axis inclined at a lesser acute angle with respect to the base than the movable contact carrying member, one end connected to said member and the other end connected to said lever.

2. A snap switch comprised by a planar base, a rest contact mounted on said base, a bracket mounted on said base, a movable contact carrying member pivotally mounted at its rear end on said bracket and normally positioned at an acute angle with respect to said base, a movable contact on said movable contact carrying member positioned over the rest contact, a lever having one leg section inclined at an obtuse angle with respect to said base, a foot section on said leg section normally disposed parallel to the base, and another leg section united to the first leg section in a knee and inclined at a greater obtuse angle with respect to said base, pivotal mounting means at the knee of said lever securing same to said bracket, an adjustment means between the base and the foot section of the lever for varying the position of the latter with respect to the former, and a coiled tension spring having its axis inclined at a lesser acute angle with respect to the base than the movable contact carrying member, one end connected to said member and the other end connected to the first leg section of the lever.

3. A snap switch comprised by a planar base, a rest contact mounted on said base, an adjustment means between the base and the rest contact for varying the position of the latter with respect to the former, a movable contact carrying member pivotally mounted at its rear end on said bracket and normally positioned at an acute angle with respect to said base, a movable contact on said movable contact carrying member positioned over the rest contact, a lever having one leg section inclined at an obtuse angle with respect to said base, a foot section on said leg section normally disposed parallel to the base, and another leg section united to the first leg section in a knee and inclined at a greater obtuse angle with respect to said base, pivotal mounting means at the knee of said lever securing same to said bracket, an adjustment means between the base and the foot section of the lever for varying the position of the latter with respect to the former, and a coiled tension spring having its axis inclined at a lesser acute angle with respect to the base than the movable contact carrying member, one end connected to said member and the other end connected to the first leg section of the lever.

4. A snap switch comprised by a planar base, a first fixed contact mounted on said base, an adjustment means between the base and the first fixed contact for varying the position of the latter with respect to the former, a first bracket mounted on said base, a second fixed contact mounted on said first bracket in alignment with the first fixed contact, a second bracket mounted on said base, a movable contact carrying member pivotally mounted at its rear end on said second bracket, extending at its front end between said fixed contacts and normally positioned at an acute angle with respect to said base, a movable contact on said movable contact carrying member normally on the first fixed contact and movable onto the second fixed contact, a lever one leg section inclined at an obtuse

angle with respect to said base, a foot section on said leg section normally disposed parallel to the base, an another leg section united to said first leg section in a knee and inclined at a greater obtuse angle with respect to said base, pivotal mounting means at the knee of said lever securing same to said second bracket, an adjustment means between the base and the foot section of the lever for varying the position of the latter with respect to the former, and a coiled tension spring having its axis inclined at a lesser acute angle with respect to the base than the movable contact carrying member, one end connected to said



member and the other end connected to the first leg section of the lever.

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