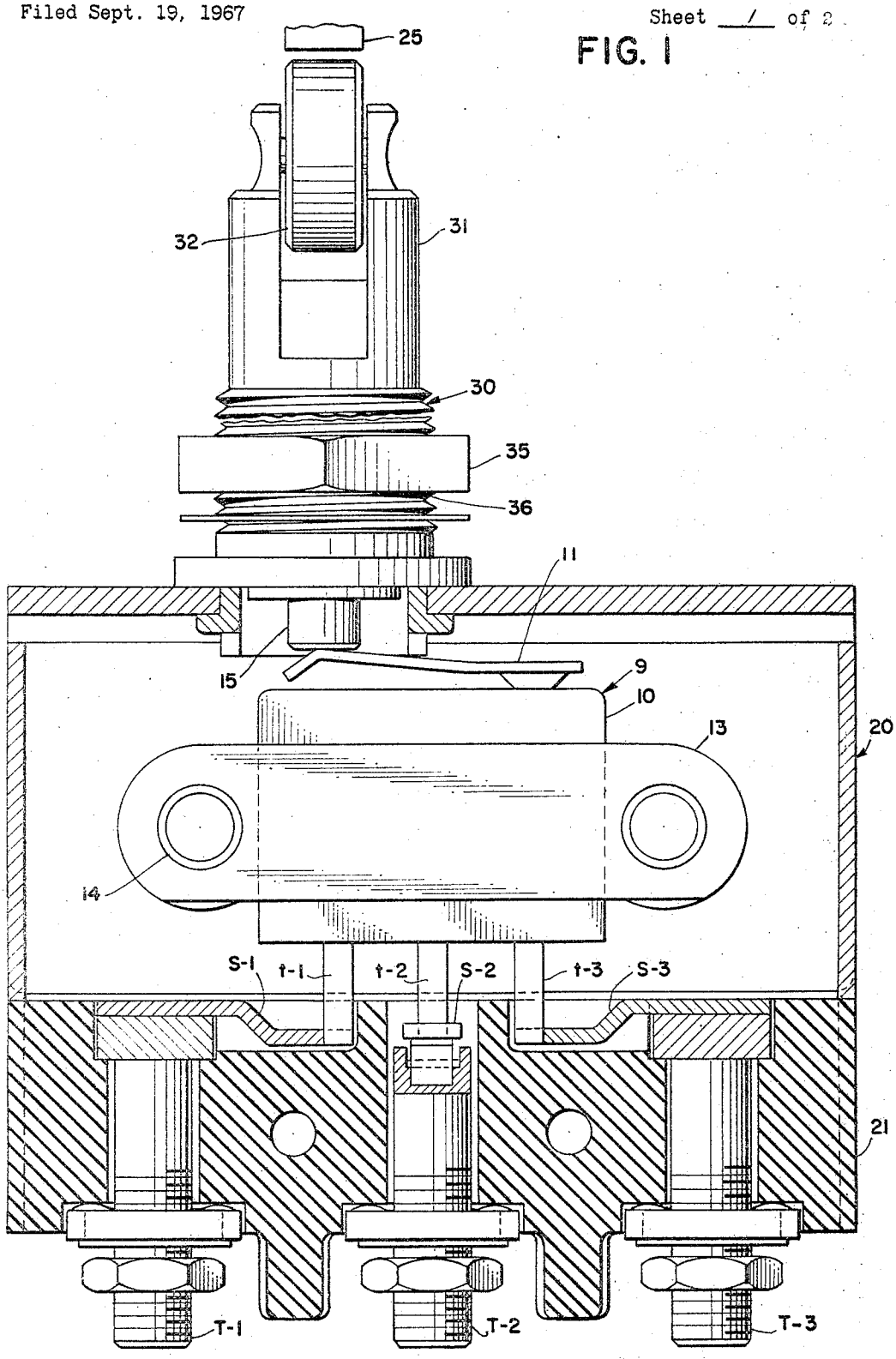
Feb. 11, 1969 L. F. GEREMIA ET AL 3,427,420

SWITCH ASSEMBLY

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FIG. 1



SWITCH ASSEMBLY

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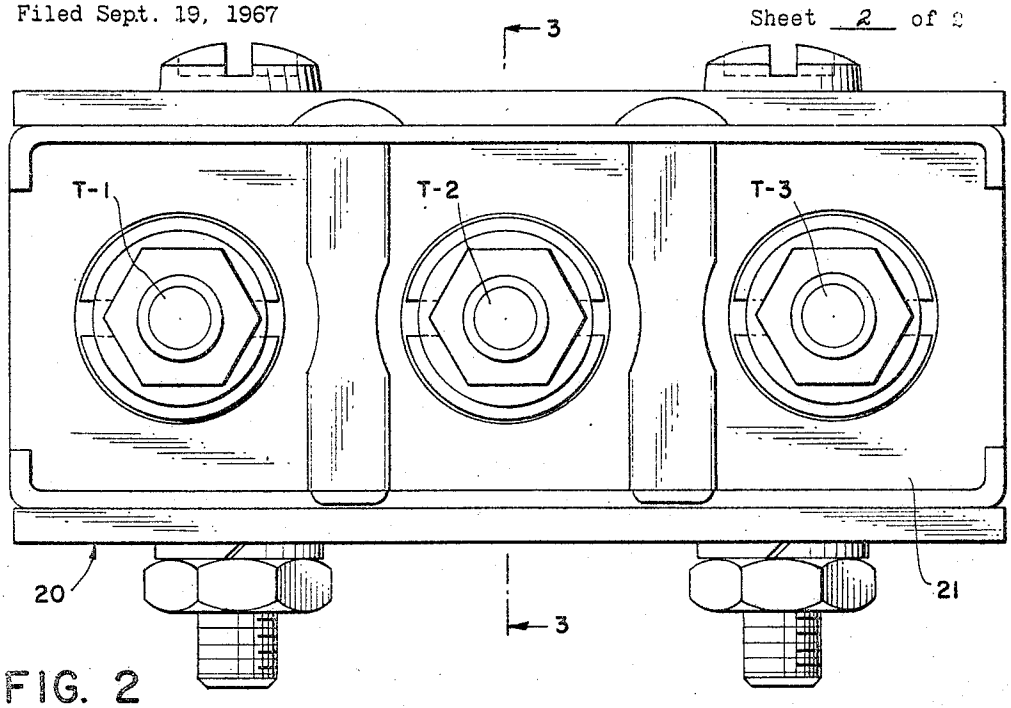
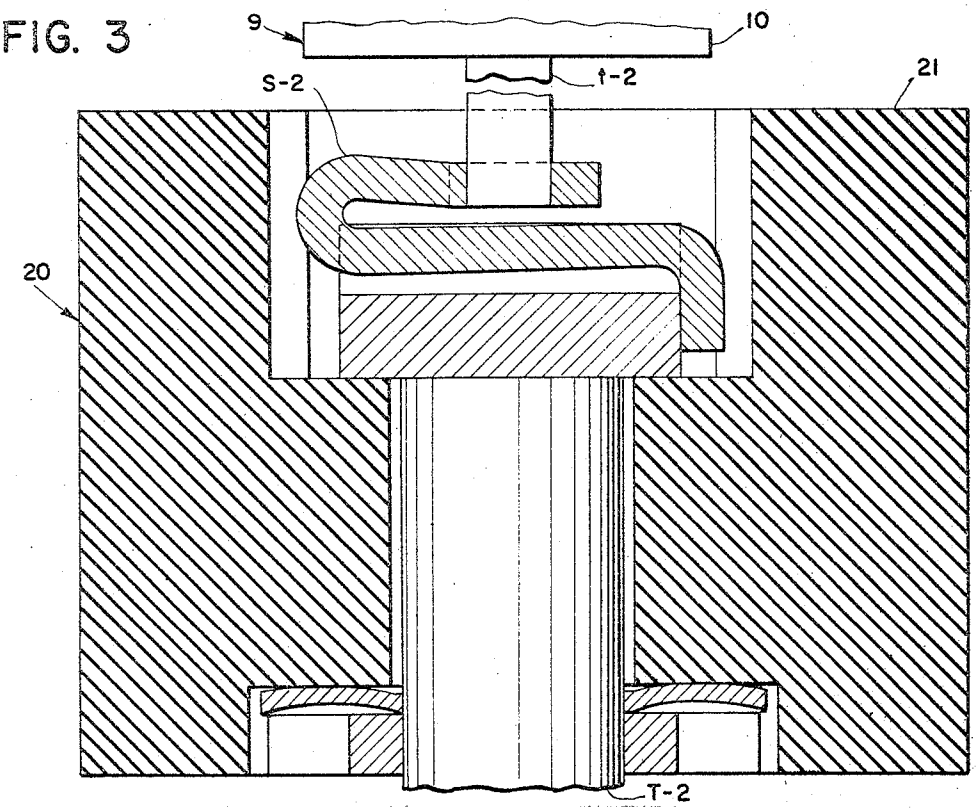


FIG. 2

FIG. 3



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SWITCH ASSEMBLY

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Int. Cl. H01h 3/02

ABSTRACT OF THE DISCLOSURE

A signaling switch assembly for responding to the movement of a heavy actuating member such as the thrust reversing baffle of a jet engine for an aircraft. The assembly comprises a small sealed snap-action switch mounted in a massive housing with a motion reducing linkage connecting the switch to the actuating member. The switch has sealed terminals which are connected by buffer means to rugged exterior terminals to inhibit the transmission of movement which might break the seals. The assembly provides protection against motion damage due to temperature differences, vibration, buffeting, etc.

Background of the invention

Modern aircraft, more particularly jet aircraft of the multi-engine type, require many electrical switches and signaling devices to inform the pilots of the position and condition of the large number of necessary adjuncts and appurtenances and to perform other switching functions. In order to reverse the direction of the jet stream to aid in the stopping of the aircraft, for example, a baffle is moved into a position to deflect the stream forwardly and thus act as a brake, and the pilots should be apprised of the position of this baffle for each of the engines. Accordingly, a switch actuated by the baffle customarily is employed to open or close a circuit leading to signal lights or other indicators in the cockpit which provide a visual indication of the baffle position.

It is desirable that the switch per se be small and positive in action. A small switch may be readily constructed to absorb shock and vibration without damage, while the design of larger switches meeting these requirements becomes progressively more complex as the size of the switch increases. A so-called snap-action switch gives quick and positive circuit closings and openings. One particularly advantageous switch of this type is disclosed in A. W. Haydon Patent 2,700,079, granted Jan. 18, 1955.

The location of such a switch, however, may dictate a large and rugged structure. For example, the environment of the illustrative embodiment of the invention subjects the switch to much vibration, to heat and cold on opposite sides, and to the buffeting force of the slip stream. In addition, the baffle-controlled actuating member for the switch has considerable bulk, and the switch must be of sufficiently rugged construction to withstand repeated actuation thereby without deleterious effect. One problem has been to provide a switch which meets these requirements and yet is of small size with rapid and positive control of the electrical circuit.

Summary of the invention

The foregoing and other problems have been solved in accordance with the invention by encasing a small sensitive switch within a rugged housing in a novel and unique manner. A relatively large switch actuator is connected to the baffle or other massive switch-controlling device, and this actuator extends through the wall of the housing into controlling relationship with the operating member of the small switch. The small switch has slim sealed-in terminals which are connected by buffering means to heavy external terminals protruding from the housing. The arrangement is such that the switch is positively protected at all times against such adverse conditions as buffeting, vibration, dimensional changes because of variations in temperature, etc.

Brief description of the drawings

The invention and its features will appear more clearly and fully from the following description of a preferred embodiment thereof, when read with reference to the appended drawings in which:

FIGURE 1 is a vertical sectional view, with portions shown in elevation, of a switch assembly in accordance with one illustrative embodiment of the invention;

FIGURE 2 is a bottom view of the assembly; and

FIGURE 3 is an enlarged sectional view taken along the line 3—3 in FIGURE 2.

Description of a preferred embodiment

Referring to FIGURE 1, there is shown a small switch **9** having a casing **10** which is mounted by means of bars or plates **13** and spacing sleeves **14** in a rugged, massive housing **20**. The switch **9** is a snap switch and in the particular case of this illustrative description is a transfer switch having three terminals *t*–**1**, *t*–**2** and *t*–**3**. The switch is in one position or condition when its actuator **11** is moved toward the casing **10** and in another condition when its actuator is moved away from the casing.

The switch terminals *t*–**1**, *t*–**2** and *t*–**3** are sealed through one wall of the casing **10**. The seals are fragile, being customarily of ceramic or glass material, and are easily broken by excessive bending or deflection of the terminals.

Because the switch assembly is subject to severe environmental conditions, it is provided with large external terminals T–**1**, T–**2** and T–**3**. These terminals are mounted in a massive insulating block **21** which comprises one wall of the housing **20**. As will be apparent from FIGURES 1 and 2, the terminals T–**1**, T–**2** and T–**3** are in line and are widely spaced apart, with one of the terminals being located in the center of the block **21** and the other two terminals adjacent the ends of the block. It will be further apparent that the small terminals *t*–**1**, *t*–**2** and *t*–**3** of the switch are fairly close together, with the terminals *t*–**1** and *t*–**3** offset inwardly from the terminals T–**1** and T–**3**. This arrangement allows cantilever springs S–**1** and S–**3**, each of somewhat S-shaped configuration, to be connected as buffers between corresponding terminals T–**1** and *t*–**1**, and T–**3** and *t*–**3**, respectively. The arrangement is such that any thermal expansion and contraction or other movement of the large terminals T–**1** and T–**3** is taken up by the buffer springs and is not transmitted to the small terminals *t*–**1** and *t*–**3**.

A similar but slightly different arrangement is used for connecting the centrally located terminals *t*–**2** and T–**2**. The terminals *t*–**2** and T–**2** being in axial alignment with each other, a folded cantilever spring S–**2** is employed. This spring also is somewhat S-shaped, as shown in FIGURE 3, and likewise performs the function of permitting relative motion between the terminals without damage.

In order to provide a suitable mechanical connection between the massive baffle, a small portion of which is illustrated at **25**, and the switch actuator **11**, a conventional motion reducing mechanism is housed in a generally tubular projection **30** secured to one wall of the housing **20**. An operating plunger of the mechanism has an end **15** projecting into the housing **20** in position to operate the actuator **11**.

The outer end of the projection **30** is bifurcated at **31** and mounts a roller **32**. The roller **32** is controlled by the

baffle **25**. The relatively extensive motion of the baffle is reduced to a slight motion of the plunger part **15** to similarly move the switch operator **11**.

A nut **35** on the threaded portion **36** of the projection **30** serves to secure the switch assembly to a suitable bracket on an engine nacelle (not shown) or other appropriate structure adjacent the baffle **25**. Because of its location, the assembly is subjected to extreme differences of engine heat and atmospheric cold. Furthermore, the adverse effects of vibration, buffeting, etc., must be overcome. The unique construction and arrangement of the assembly serves to lessen these hazards and to provide extremely reliable operating characteristics.

The external terminals T–1, T–2 and T–3 are connected by a heavy duty cable to the signal means inside the aircraft at the pilot's positions. With a transfer switch, as illustrated, a three wire cable may be connected to a pair of lamps so that one or the other is lighted depending upon whether the baffle is in a neutral or a braking position.

Although the switch assembly has been described in connection with the indication of the position of the thrust reversing baffle of a jet aircraft, other uses are contemplated in other environments. In many large vehicles an assembly of this kind is useful. For example, the assembly may be employed to indicate the positions of back doors, tail-gates and the like in large tractor-trailer rigs. Other uses for a sensitive but rugged assembly of this type will occur to the reader upon a perusal of the present disclosure.

The terms and expressions which have been employed are used as terms of description and not of limitation, and there is no intention, in the use of such terms and expressions, of excluding any equivalents of the features shown and described, or portions thereof, it being recognized that various modifications are possible within the scope of the invention claimed.

What is claimed is:

1. A switch assembly controlled by a comparatively massive movable member, the assembly comprising a small light-weight switch having an enclosing casing, said switch including a plurality of slim terminals and an actuating member projecting through the casing, a rugged housing enclosing and mounting the switch, a linkage member projecting through the housing and connecting the switch actuating member to the massive movable member, an insulating block secured to the housing, the block mounting heavy terminals for external connections, one of the heavy terminals being provided for each of the slim terminals on said switch, and motion absorbing means interposed between each of the slim terminals and the corresponding heavy terminal, each of the motion absorbing means comprising a generally S-shaped cantilever spring connected at one end to the slim terminal and at the other to the corresponding heavy terminal, to absorb relative movement between the corresponding terminals.

2. A switching assembly controlled by a comparatively massive movable member, the assembly comprising a rugged housing, a snap switch mounted in the housing and having sealed terminals, a massive switch actuator projecting from the housing and coupled to the movable member, a plurality of heavy terminals secured to the housing, and conductive buffer means connecting the sealed terminals of the switch to corresponding heavy terminals.

3. A switching assembly as in claim **2**, in which the buffer means comprises cantilever springs having their opposite ends respectively connected to a sealed terminal and a heavy terminal.

4. A switch assembly controlled by a comparatively massive movable member, the assembly comprising a small enclosed switch having slim terminals, a relatively massive housing enclosing the switch and its terminals, a connector assembly on one side of the housing and a terminal block on the other side, the connector assembly interconnecting the massive member and the switch to operate the same in response to movement of said massive member, the terminal block containing an array of heavy terminals corresponding in number to the number of slim terminals on the switch, and buffer means connecting each heavy terminal to a corresponding slim terminal.

5. Switching means for signaling the position of a massive movable element, the switching means comprising a small light-weight switch having sealed terminals, a rugged housing enclosing the switch, the housing having an enlarged insulating block forming a portion thereof, a motion reducing linkage extending through the housing for connecting the switch to the massive movable element, a plurality of heavy terminals carried by the insulating block, and buffer spring means connecting the sealed terminals to the heavy terminals.

6. Switching means as in claim **5**, in which the buffer spring means comprises cantilever springs having their opposite ends respectively connected to a heavy terminal and to a sealed terminal.

7. Switching means responsive to the motion of a massive member, the switching means comprising a strong rugged housing, a relatively small snap switch secured in the housing, the switch having a plurality of sealed terminals and an externally mounted actuator, the wall of the housing adjacent the sealed terminals comprising an insulating block, a motion reducing linkage including a movable element associated with the actuator and an outer portion associated with the massive member, a plurality of heavy external terminals carried by said insulating block in spaced relationship with corresponding ones of said sealed terminals, and buffer means connecting each of the sealed terminals with an external terminal.

8. Switching means as in claim **7**, in which each buffer means comprises a cantilever spring respectively secured at its opposite ends to a sealed terminal and to a heavy terminal.

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