

July 22, 1952

T. A. DALY ET AL

2,604,556

SWITCH

Filed Nov. 21, 1946

2 SHEETS—SHEET 1

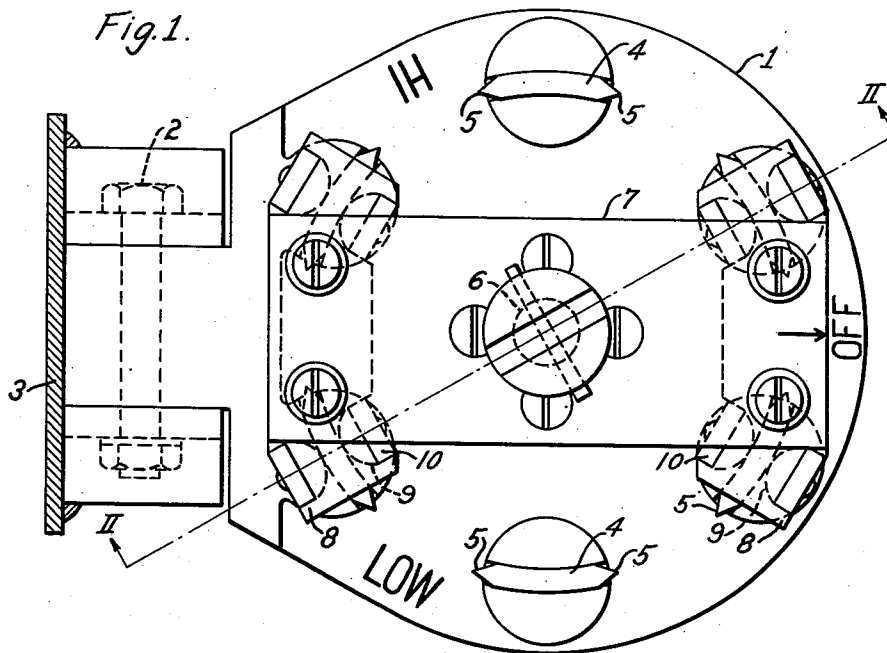
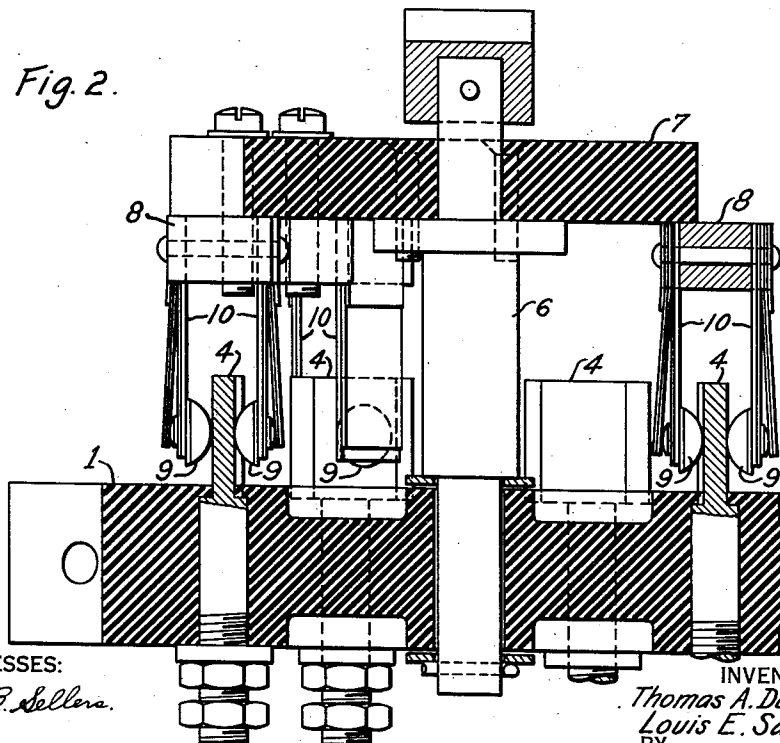


Fig. 2.



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2 SHEETS—SHEET 2

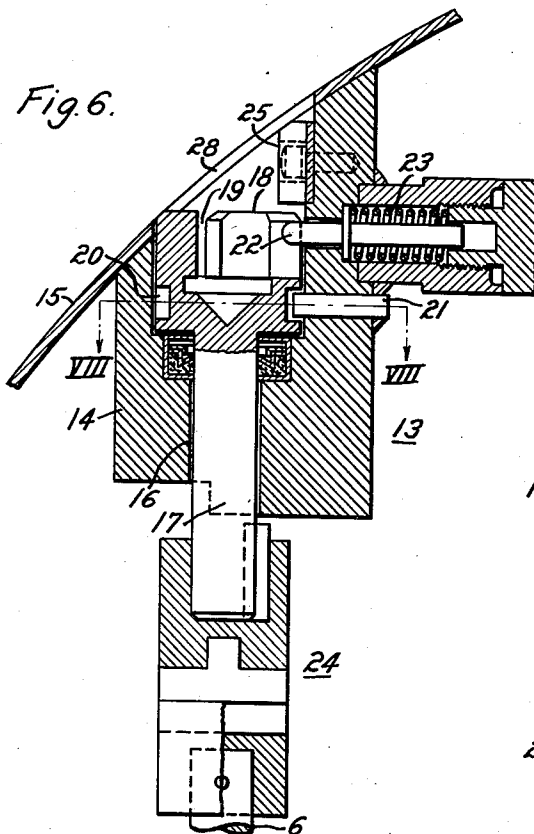


Fig. 9.

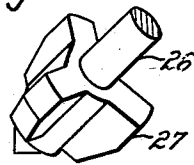


Fig. 7.

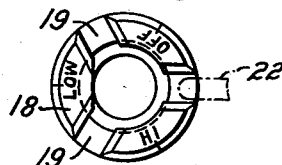


Fig. 8.

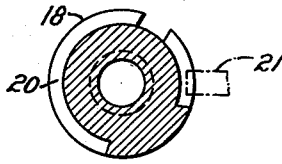


Fig. 3.

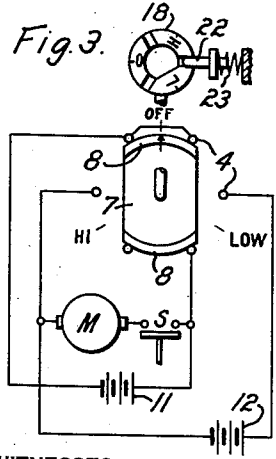


Fig. 4.

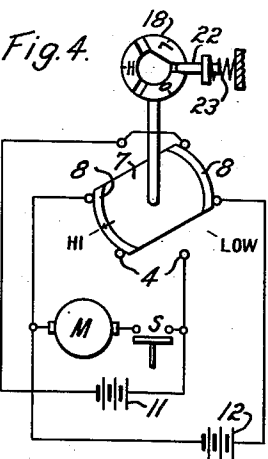
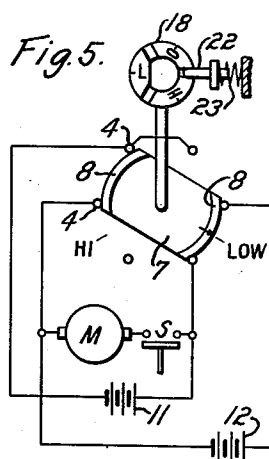


Fig. 5.



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SWITCH

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Application November 21, 1946, Serial No. 711,419

3 Claims. (Cl. 200—42)

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This invention relates to an electric torpedo operating mechanism, and, more particularly, to a novel form of electric switch and associated circuit for supplying electric current to the torpedo propulsion motor by which the sources of potential may be selectively connected in series or parallel with, or disconnected from the propulsion motor.

In electrically driven torpedoes, several trays of batteries are provided for furnishing electrical energy to the electric motor which drives the propeller shaft. It is desirable to provide series and parallel connections of the motor with the trays of batteries in order that maximum power will be delivered by the propulsion motor when the torpedo is fired at short ranges, and in order that the more efficient parallel connection of the trays may be employed when the torpedo is fired at longer ranges. In order to provide these connections, a switch must be provided which is capable of handling an extremely large ampere current in the nature of about several hundred amperes for the short period of time which the torpedo takes to reach its target.

One of the principal objects of this invention is to provide an electric switch which is capable of handling the current drawn by an electric torpedo propulsion motor.

A further object is to provide a switch of the character referred to which is operative to selectively connect the torpedo propulsion motor in series or parallel with separate sources of potential and to disconnect the motor from such sources of potential.

Another object is to provide a novel form of operating mechanism for an electric torpedo switch and an associated detent mechanism for locking the switch in any one of a plurality of positions.

Other objects and advantages of the invention will become apparent during the course of the following description.

In the drawings, we have shown one embodiment of the invention. In this showing:

Figure 1 is a top plan view of a switch constructed in accordance with the principles of this invention;

Fig. 2 is a vertical sectional view taken along the line II—II of Figure 1;

Figs. 3, 4 and 5 are schematic views illustrating, respectively, the manner in which the switch is operative to provide interrupted, series, and parallel connections of the potential sources with the propulsion motor;

Fig. 6 is a vertical sectional view of the operat-

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ing mechanism for the switch shown in Figure 1;

Fig. 7 is a top plan view of the tool engaging head shown in Fig. 6;

Fig. 8 is a sectional view of the tool engaging head taken along the line VIII—VIII of Fig. 6; and

Fig. 9 is a perspective view of the speed-setting spindle for actuating the mechanism shown in Fig. 6.

As best shown in Figs. 1 and 2, the switch comprises an insulating support 1 adapted to be secured by a bolt 2 to a bulkhead wall 3 located within an electric torpedo. The insulating support 1 is provided with a plurality of stationary contact members 4 connected to the electric circuit of the propulsion motor in a manner to be described. The stationary contact members are arcuately shaped and have beveled ends 5. A shaft 6 is rotatably supported centrally of the insulating support 1 and has an insulating member 7 mounted at the upper end thereof. A pair of electrically conductive bridging members 8 are secured to the under surface of the rotatable support.

Each end of the bridging members 8 is provided with a pair of movable button contacts 9 carried by electrical conducting strips 10 which electrically connect the contacts 9 to the bridging members 8. Upon rotation of the support 7, the beveled ends 5 of the stationary contacts 4 will cam the contact buttons 9 away from each other. In this manner, the resilient bias provided by the conducting strips 10 will maintain the movable contacts 9 in engagement with the stationary contacts 4. When the rotatable member 7 is in any of the switch operating positions, it will be noted that each of the bridging members 8 is operative to electrically connect two of the stationary contacts 4.

The manner in which the stationary contacts 4 and bridging members 8 cooperate to provide the desired electrical connections is best shown in Figs. 3, 4 and 5. In this showing, the electric motor M is provided with a control switch S, and there are provided separate trays of batteries 11 and 12 providing separate sources of electric energy for the motor M. Each of the leads in the circuit for connecting the motor M to the batteries 11 and 12 is shown terminating in one of the stationary contacts 4. It is to be noted that one of the contacts 4 has no lead connected thereto and could be omitted if desired.

In the showing of Fig. 3, the switch is operative to prevent connection of the batteries 11 and 12 to the motor M. In the showing of Fig. 4,

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the bridging members 8 so connect oppositely disposed pairs of the stationary contacts 4 that a series circuit connection of the batteries 11 and 12 will be provided to the motor M upon closure of the control switch S. In Fig. 5, different pairs of oppositely disposed stationary contacts 4 are bridged by the members 8 and, in the position there shown, a parallel connection of the batteries 11 and 12 will be provided with a motor M upon closure of the control switch S. The series connection shown in Fig. 4 is desirable where the torpedo is being fired at short ranges and high speed operation is the paramount interest. The parallel connection shown in Fig. 5 is desirable where the torpedo is being fired at a long range and more efficient battery operation is the paramount interest.

In order to operate the switch shown in Figs. 1 and 2, operating mechanism indicated as a whole by the numeral 13 shown in Fig. 6 is provided. The operating mechanism 13 comprises a boss 14 welded to the shell 15 of the torpedo and is provided with an opening 16 for the reception of a shaft 17. The shaft 17 is provided with an enlarged annular head 18 having three slots 19 formed therein, and arranged to correspond to the different operating positions of the switch. An annular groove 20 is provided in the head 18 for cooperating with a locking pin 21 to prevent undesirable movement of the shaft 17 in an axial direction. A detent 22 having a spring 23 biasing it to the position shown in Fig. 6 is provided for locking the shaft 17 against rotation out of the positions to which it is moved. When the switch is in any of its operating positions, the detent 22 will move into one of its slots 19 and prevent rotation of the shaft 17 and the switch operated thereby. A flexible coupling indicated as a whole by the numeral 24 is provided for mechanically connecting the shaft 17 to the shaft 6, whereby rotation of the shaft 17 will be effective to rotate the shaft 6 and the movable contact members carried thereby.

A guide member 25 is provided for cooperating with the speed-setting spindle 26 having lugs 27 corresponding in location to the slots 19. The guide member 25 is provided with a slot which is aligned with one of the slots 19 whenever the switch is in one of its operating positions. To rotate the shaft 17 and the switch operated thereby, the spindle 26 is inserted through an opening 28 in the torpedo shell 15 to a position with the spindle fingers 27 positioned in the slots 19. The annular head 18 has a flat on the inner diameter corresponding to a similar surface on the spindle 26 which permits engagement in only one position. This is necessary in order to align the speed-setting indicating dial with the proper switch position. Upon movement of the spindle 26 in such a position, one of the fingers 27 will have passed through the slot in the guide members 25 and will have cammed the detent 22 axially to the right of the position shown in Fig. 6 permitting the spindle 26 to rotate the shaft 17 and the switch into a selected operating position. The guide member 25 will function to insure that the switch is moved exactly into one of its operating positions. For example, if the switch is not moved completely into one of its operating positions, the slot in the guide member 25 will not be aligned with one of the slots and withdrawal of the spindle 26 will be prevented. Upon removal of the spindle 26, the spring 23 will move the detent 22 into the adjacent slot 19 and prevent undesired rotation of the shaft 17.

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From the foregoing, it will be apparent that the switch described above is effective to provide three operating positions by which a torpedo propulsion motor may be disconnected from its battery trays or selectively connected in series or parallel with such trays. It will also be noted that the operating mechanism 13 and associated setting-spindle 26 provide a novel form of mechanism for selectively moving the three-position switch into any one of its operating positions and for preventing undesired movements of the switch out of such positions.

It is to be understood that the form of the invention herewith shown and described is to be taken as a preferred example of the same, and that various changes in the size, shape and arrangement of parts may be resorted to without departing from the spirit of the invention and the scope of the subjoined claims.

We claim as our invention:

1. Operating mechanism for a rotary switch of the type adapted to selectively establish a plurality of different electrical circuits within a torpedo shell, comprising; a member adapted to be secured within the torpedo shell and rotatably carrying a shaft having a head portion accessible through an aperture in the shell, means operatively connecting said shaft and switch for conjoint rotation, said head portion having a plurality of angularly spaced radially extending slots therein corresponding to the various positions of the switch, a resiliently biased detent movably carried by said member engageable selectively in said slots for locking rotation of the shaft and switch in selective positions thereof, a guide member carried by the first named member having a slot therein, an operating tool having a plurality of angularly spaced radially extending projections engageable with the slots in said head member when the tool is inserted through the aperture in the shell, one of said projections being slideable through the slot in the guide member and adapted to cam the detent out of engagement with a slot in the head member, whereby the shaft and switch may be unlocked and rotated to a selected position, said guide member being constructed and arranged to abut one of said projections and prevent removal of the tool from the slots in the head member when the detent is out of engagement with a slot in the head member, the slot in the guide member permitting removal of the tool from the head member only when the detent is in engagement with a slot in the head member, whereby the switch may be locked only in predetermined angular positions when the tool is removed from the head member.

2. Operating mechanism for a rotary switch of the type adapted to selectively establish a plurality of different electrical circuits within a torpedo shell, comprising; a member adapted to be secured within the torpedo shell rotatably carrying a shaft operatively connected to the switch for rotating the latter and having an accessible portion adapted to be rotated to selective predetermined angular positions, releasable locking means for locking rotation of the shaft in said positions, an operating tool releasably engageable with said accessible portion for rotating the latter and having another portion rotatable from a position outside of the shell, said tool being constructed and arranged to unlock the releasable locking means when it is in engagement with said accessible portion, means fixed relative to said member for preventing removal of the tool from the accessible portion in angular positions of the

latter when the releasable locking means is unlocked, and means for permitting removal of the tool from the accessible portion in all positions wherein the releasable locking means is locked.

3. Operating mechanism for a rotary switch of the type adapted to selectively establish a plurality of different electrical circuits within a torpedo shell, comprising; a rotatable shaft disposed within the shell operatively connecting it and the switch for conjoint rotation and having an accessible portion adapted to be rotated to selective predetermined angular positions, releasable locking means for locking rotation of the shaft in said positions, an operating tool releasably engageable with said accessible portion in a plurality of selective angular positions relative thereto for rotating the latter and having another portion rotatable from a position outside of the shell, said tool being constructed and arranged to unlock the releasable locking means when it is in engagement with said accessible portion, means for preventing removal of the tool from the accessible portion in angular positions of the latter when the releasable locking means is

unlocked, and means for permitting removal of the tool from the accessible portion in all positions wherein the releasable locking means is locked.

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