

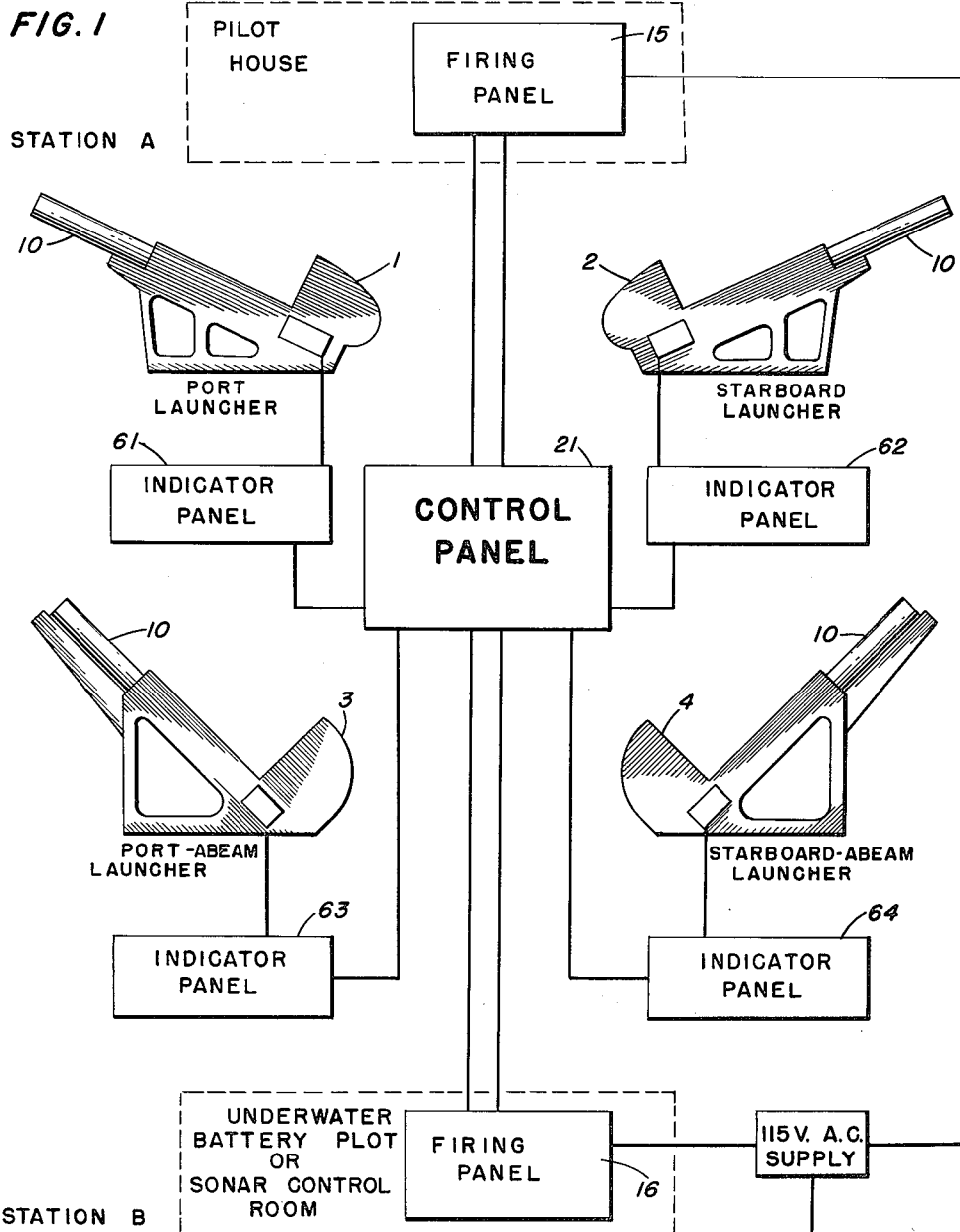
Nov. 20, 1962

M. H. BALLER ETAL
BEACON LAUNCHING SYSTEM

3,064,537

Filed Aug. 4, 1953

6 Sheets-Sheet 1



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FIG. 2

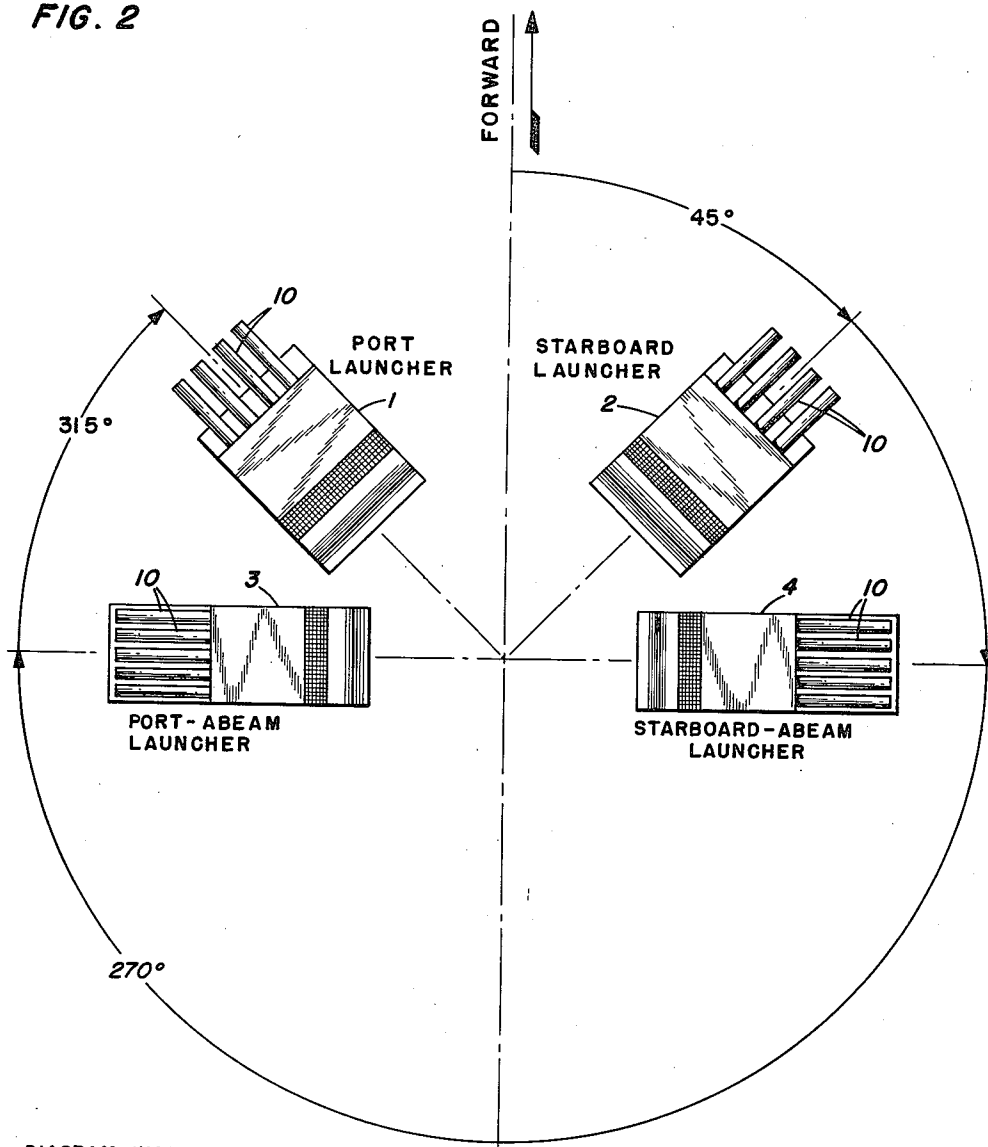


DIAGRAM INDICATES LINE-OF-FIRE
POINTING ONLY. ACTUAL POSITIONS
OF LAUNCHERS RELATIVE TO EACH
OTHER AND TO SHIP CENTER LINE
VARY IN DIFFERENT SHIPS

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FIG. 3

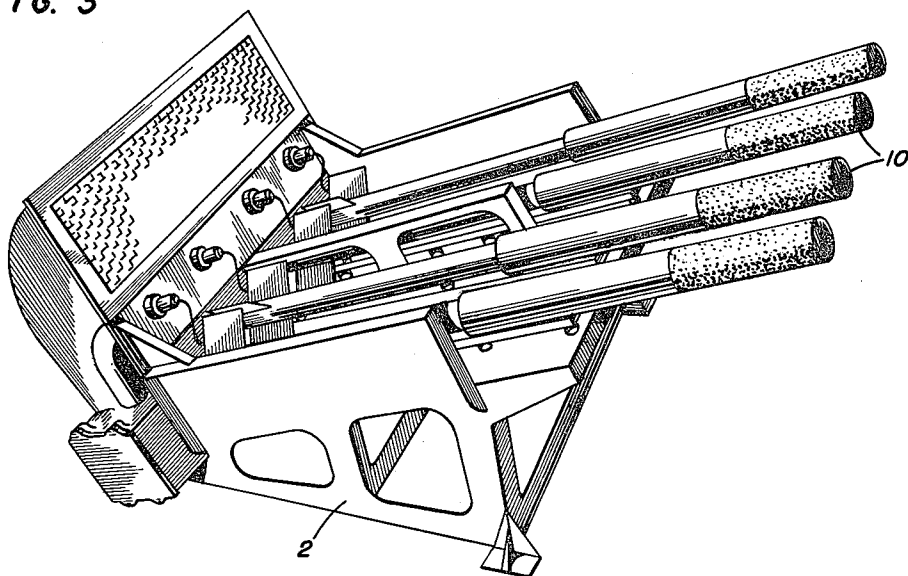
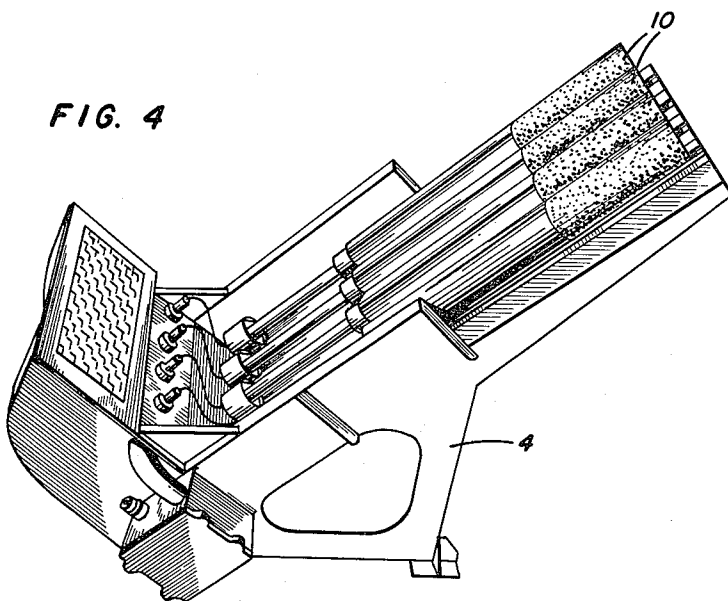


FIG. 4



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FIG. 5

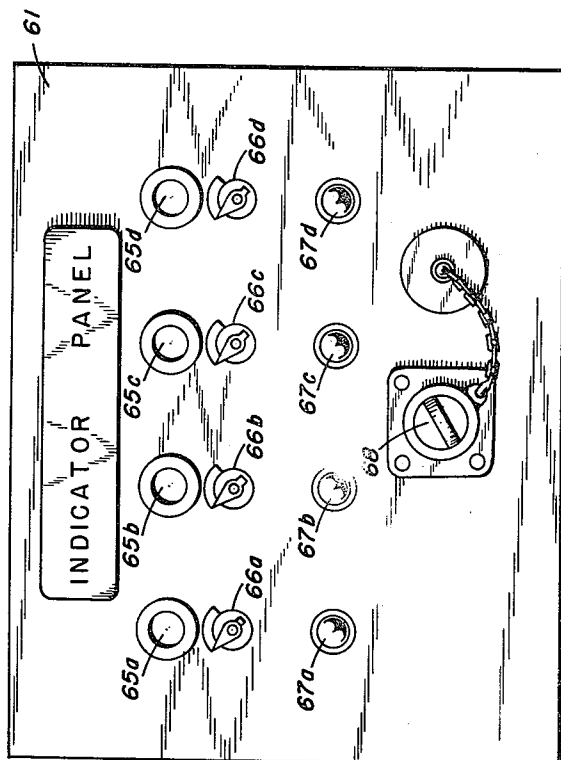
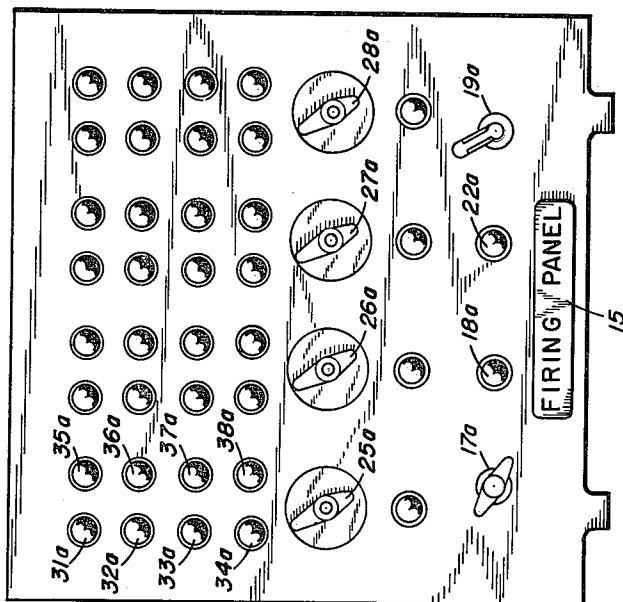


FIG. 6

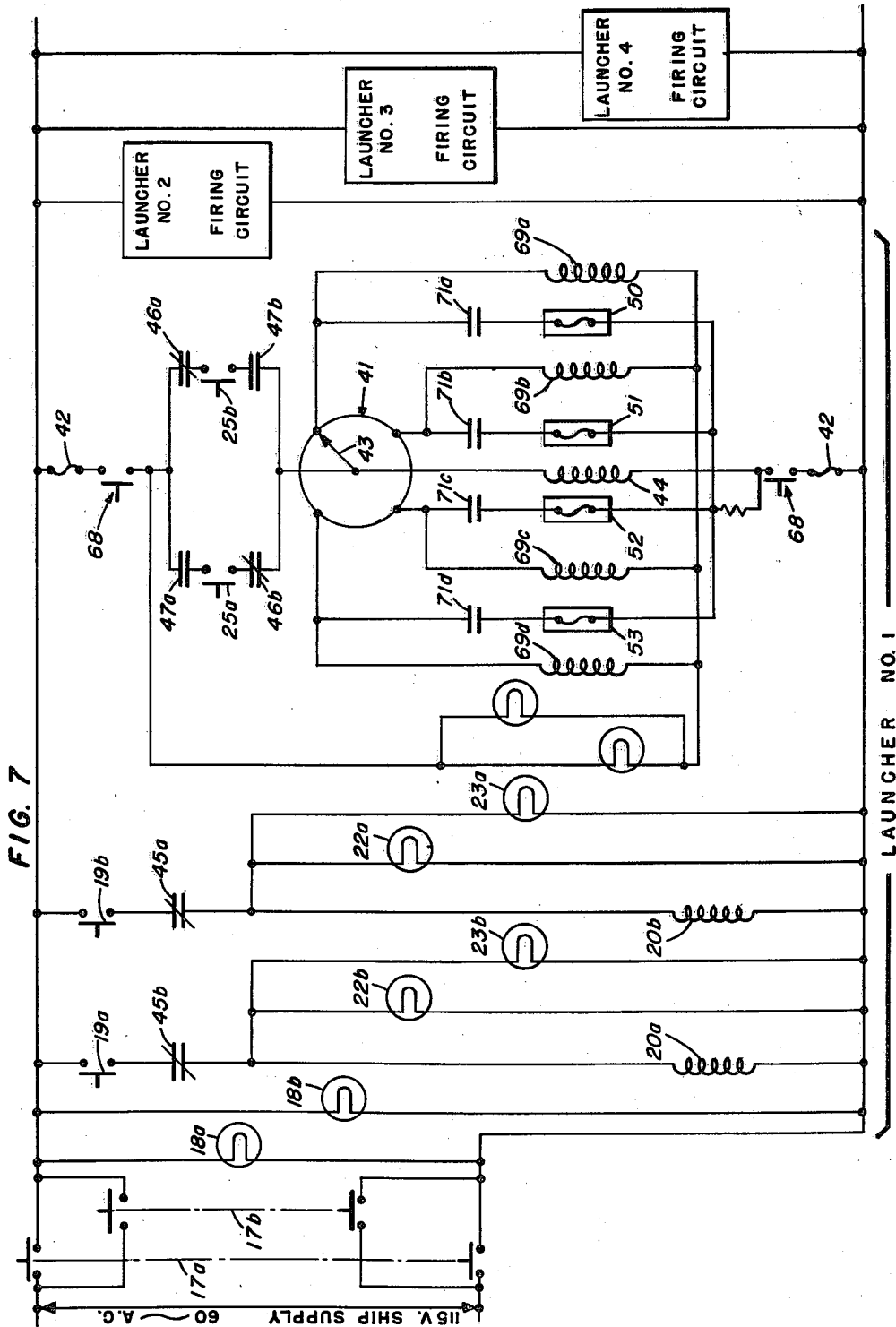
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BEACON LAUNCHING SYSTEM

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1 Claim. (Cl. 89-1.7)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The invention relates to improvements in missile launching systems and more particularly to an improved system for launching electrically-fired rocket-propelled acoustic beacons.

An important object of the invention is to provide an improved system for selectively launching one or more rocket-powered acoustic beacons from ship to water. Acoustic beacons have previously been used for producing off-board submarine sounds blanketing those emanating from a ship so as to divert an approaching acoustic torpedo from the ship. The former systems of launching such acoustic beacons provided no indication whether or not a rocket in any given launcher was ready to be fired, no indication which rockets had been fired, and no indication whether the launcher contained a misfire.

Another important object of this invention is to provide a launching system for electrically-fired rocket missiles with indicators providing safety information and assurance as to what has happened in the system.

A further object is the provision of a launching system including a plurality of launchers each mounting a multiplicity of rocket missiles with means for selectively firing missiles from one or more of the launchers and for firing the missiles from each launcher in sequence.

A still further object is to provide a missile launching system including a plurality of launchers having dual controls operable at spaced stations remote from the launchers and so arranged that whichever set of controls is first actuated to fire a selected combination of missiles simultaneously acts to exclude the other set from control.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. 1 is a diagrammatic view of the dual control system as applied to a battery of four launchers each mounting four missiles;

FIG. 2 is a diagrammatic plan view illustrating the azimuth orientation of the four launchers of FIG. 1 with respect to a ship's forward centerline;

FIGS. 3 and 4 are perspective views of two different types of launchers preferably utilized in the system;

FIG. 5 is a front elevational view of one of the firing panels for the dual control missile launching system diagrammed in FIG. 1;

FIG. 6 is a front elevational view of one of the indicator panels diagrammed in FIG. 1; and

FIGS. 7 and 8 are complementary parts of a diagrammatic view of the electrical circuitry for the system diagrammed in FIG. 1, simplified by omitting details of some duplicate circuits thereof.

In the drawings which for the purpose of illustration show only a preferred embodiment of the invention and wherein similar reference characters denote corresponding parts throughout the views, there are shown four launchers adapted for shipboard mounting and oriented in azimuth relative to a ship's forward centerline as

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shown in FIG. 2. Port and starboard forward launchers 1, 2 are pointed at 45° azimuth from each side of the ship centerline in the forward direction and at a 20° elevation angle. Port and starboard abeam launchers 3, 4 are pointed at 90° azimuth from each side of the ship centerline and at a 45° elevation angle.

In the present embodiment, these launchers 1-4 are intended for firing electrically-ignited rocket powered beacons 10 of known types containing mechanism which periodically generates sound following immersion in water so as to act as a decoy attracting any oncoming acoustic homing torpedoes and diverting them from the ship.

The launching system is remotely controlled by manual operation for selective firing of one beacon per launcher from any one or any possible combination of the four launchers as conditions may require. Firing can be accomplished from either one of two firing panels 15, 16 respectively located at a station A in the pilot house and at a station B in the underwater battery plotting room or sonar control room.

Mounted on the respective firing panels 15, 16 are gang switch assemblies 17a, 17b controlling the supply of 115 volt 60 cycle A.C. power to the system, such energization of the system being indicated by the lighting of lamps 18a, 18b on the respective firing panels 15, 16.

Also mounted on the respective firing panels 15, 16 are firing switches 19a, 19b adapted to be manually closed to energize separate firing relays 20a, 20b within the control panel 21 shown in FIG. 1. These firing relays 20a, 20b are cross-connected so that firing can be accomplished only from the first station A, B at which the firing circuit is completed. Lamps 22a, 22b on the respective firing panels 15, 16 and buzzers 23a, 23b, respectively serially connected to the firing switches 19b, 19a, indicate visually and audibly when rockets are being fired under control of the firing panels 15, 16 remote from the respective lamps and buzzers. Referring to FIG. 7, it will be seen that only the firing circuit for launcher 1 is shown therein in detail, the firing circuits for launchers 2-4 because of their similarity being shown as blocks to simplify illustration of the invention. Likewise, in FIG. 8, only the "misfire" and "guide loaded" circuits for launcher 1 are shown in detail.

Also provided on the respective firing panels 15, 16 are manually controlled selector switches 25a, 25b for the firing circuit of launcher 1, and similar selector switches for the firing circuits of launchers 2-4, those on the firing panel 15 shown in FIG. 5 being designated 26a-28a respectively.

Mounted on the firing panels 15, 16 above the selector switches 25a, 25b for launcher 1 are "guide loaded" lamps 31a-34a, 31b-34b, respectively, and "misfire" lamps 35a-38a, 35b-38b, respectively. Affixed interiorly on the control panel 21 are four stepping relays, for the respective firing circuits of the launchers 1-4, the stepping relay for launcher 1 being designated 41 in FIG. 7. The control panel 21 also mounts other electrical accessories including fuzes 42 required for the interconnection of the other components of the system. Inasmuch as stepping relays are well-known in the art, as exemplified by expired U.S. Patent 1,334,037, granted to Kaisling on March 16, 1920, the stepping relay has been shown only diagrammatically in FIG. 7. The relays preferred for use in the example of circuitry shown in FIG. 7 are of a conventional ratchet type wherein a contact finger, such as finger 43 of relay 41 indexes one step for each complete make-and-break of the relay solenoid circuit.

The firing cycle is initiated and the respective relay 20a or 20b energized by movement of the firing switch lever 19a, 19b to fire whichever rockets are in circuit

with the respective stepping switches of the selected launchers. The same movement of the firing switch lever, through the action of the relay 20a or 20b, energizes a solenoid, such as 44, in the stepping relays of each of the selected launchers, through the firing relay contacts now to be described. The firing relay 20a is equipped with normally closed contacts 45a in series with its companion firing relay 20b, normally closed contacts, such as 46a, in series with the respective manual selector switches, such as 25b, for the station B firing panel 16, and normally open contacts, such as 47a, in series with the respective manual selector switches 25a, 26a, 27a, 28a for the station A firing panel 15. Likewise, the firing relay 20b is equipped with normally closed contacts 45b in series with its companion firing relay 20a, normally closed contacts, such as 46b in series with the respective manual selector switches 25a, 26a, 27a, 28a for the station A firing panel 15, and normally open contacts, such as 47b, in series with the respective manual selector switches, such as 25b for the station B firing panel 16. The condition of the just described normally closed and normally open relay contacts of either one of the relays 20a, 20b is reversed upon energization of that one relay. Thus, it is clear from an inspection of FIG. 7 that energization of one of the relays 20a, 20b opens the circuit to the other relay to exclude the latter relay from control of the firing circuit. It is also clear that any selection of launchers for firing that may have been made by manipulation of the selector switches at one of the stations will in effect be cancelled upon closing the firing switch at the other station, and that squibs in the firing circuits for any combination of launchers that may have been selected at the latter station will be energized to fire the selected rockets. Should the firing circuit for launcher 1 be among those energized, squib 50 will be ignited, provided the ratchet relay finger 43 is in the position shown in FIG. 7. Subsequent de-energization of the stepper relay solenoid 44 permits finger 43 to advance responsive to the usual ratchet relay spring tension, so that the next energization of the firing circuit for launcher 1 will ignite squib 51 and thereby fire another rocket from the same launcher.

Four identical indicator panels 61-64 are located in sight of but at a safe distance from the respective launchers 1-4. These panels display signals hereinafter described which indicate to the missile loaders whether or not any of the missiles carried by the respective launchers are misfires. These signals are duplicated in the firing panels 15, 16 at the respective firing stations A, B so that the operators can know the conditions of the various launchers.

Each indicator panel 61-64 is provided with four annunciator windows 65a-65d, reset knobs 66a-66b, misfire indicating lamps 67a-67d and a safety plug assembly 68. These indicator panel annunciator windows, reset knobs and misfire indicating lamps are arranged in four banks each relating to a different launcher guide rail. An important component of each indicator panel bank is an annunciator relay, each relay being in series with a different stepping relay contact, and energized when the firing circuit for the respective launcher guide is closed. These annunciator relays are of a conventional type which, when energized are mechanically latched and display a flag carrying the word "Fired." The relays for the firing circuit of launcher 1 are designated 69a-69d.

Each launcher guide is equipped with a normally closed "guide loaded" switch, preferably of the type shown in copending U.S. Patent application of Sidney Hersh, Serial No. 353,698, filed May 7, 1953, now U.S. Patent No. 2,809,558. Each "guide loaded" switch is arranged to open when a rocket is carried by the launcher guide on which the switch is mounted. By referring to FIG. 8 it may be seen that the "guide loaded" switches, designated 70a-70d for the four guides of launcher 1, are serially connected with the parallel "guide loaded"

lamps 31a-34a, 31b-34b, respectively, so that the presence of a rocket in any launcher guide is indicated by absence of illumination of two lamps, such as 31a, 31b, one on each of the firing panels 15, 16.

The annunciator relays 69a-69d in the firing circuit of launcher 1 control normally open switches 71a-71d respectively serially connected with the squibs 50-53 for igniting the rockets of launcher 1 sequentially under control of the stepper relay 41. The annunciator relays 69a-69d also control normally closed switches 72a-72d respectively serially connected with the parallel "misfire" lamps 35a-38a, 35b-38b, 67a-67d, as shown in FIG. 8, and normally open switches 73a-73d respectively connected between switches 70a-70d and the just mentioned parallel "misfire" lamps. Thus for each launcher guide there are provided three lamps, such as lamps 35a, 35b and 67a for launcher 1, one 67a of which, in the present example, is on the indicator panel 61 for launcher 1, and the other two 35a, 35b of which are on the firing panels 15, 16 respectively. The condition of the just described normally open and normally closed switches 71a-71d, 72a-72d, 73a-73d is reversed upon energization of the respective annunciator relays 69a-69d.

The operator at either station A or B can initiate the firing cycle and the one who first actuates the firing switch lever 19a or 19b automatically takes control of the system for one salvo. By setting one or more of the selector switches 25a-28a on panel 15 the operator at station A may select one or a combination of launchers to be fired. Similarly the operator at station B by setting selector switches on panel 16 may select the same or a different combination of launchers to be fired. By virtue of the hereinbefore described circuitry, the combination of the operator who first moves the firing switch lever 19a or 19b and thus reverses the cross-connected contacts of the firing relay 20a or 20b is the combination that is fired.

When each rocket is inserted in a launcher guide rail it opens a switch 70a-70d associated therewith thus opening the circuit to the respective "guide loaded" lamps of both firing panels 15, 16. Therefore, when a guide rail is loaded, its respective indicating lamp on each firing panel is dark. Conversely, when the guide rail is empty, the respective indicating lamps on each panel 15, 16 are lighted. As the rocket leaves it trips the respective switch 70a-70d, restoring it to closed position. This action relights the respective indicating lamps on the firing panels. Upon firing the rocket, the stepping relay for the launcher that was carrying rocket automatically indexes so as to make ready a different ignition circuit to another rocket. The operator, by making a new selection of launchers to be fired and by again closing the firing switch lever 19a or 19b, repeats the firing operation.

In normal firing, that is to say, when the rocket functions properly and leaves its guide rail, the misfire indicating lamps on the firing panels and pertaining to the fired rocket are lighted, the misfire indicating lamp pertaining to the fired rocket and located on the indicator panel for the rocket launcher that mounted the fired rocket is lighted, and in the annunciator window on the indicator panel above the lighted lamp there appears a flag displaying the word "Fired," indicating that the rocket has been successfully fired and that the guide rail no longer carries a rocket. In case of a misfire, the indicating lamp will remain unlighted but the annunciator window on the indicator panel will again indicate "Fired." Caution must then be exercised. The man at the launcher by looking at the appurtenant indicator panel observes that the respective misfire indicating lamp is unlighted, and consequently knows that the rocket has not left the guide rail even though the annunciator window indicates "Fired." After a waiting period the misfire is abstracted and thrown overboard.

Obviously many modifications and variations of the

present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claim the invention may be practiced otherwise than as specifically described.

What is claimed is:

In a shipboard missile launching system having port and starboard forward multirail missile launchers trained at an angle of 45° away from the forward center line of the ship and elevated at an angle of 20° and further having port and starboard beam multirail missile launchers each trained at an angle of 90° from the center line of the ship and elevated at an angle of 45°; a missile firing system comprising means on each of said launchers for firing a multiplicity of electrically firable missiles, a firing circuit for each launcher, a control panel, an indicator panel for each of said launchers, a pair of firing panels located at remote stations relative to one another, the control panel, the indicator panel, and to the missile launchers, a source of electric power, a ganged switch assembly on each firing panel connected across said source, means on each firing panel for indicating energization of the firing system, a pair of firing relays located within said control panel and each having two pairs of normally closed contacts and one pair of normally open contacts, a first pair of the normally closed contacts of one firing relay being connected in series to the other firing relay, a first pair of the normally closed contacts of the other firing relay being connected in series with said one firing relay, a firing switch on each firing panel and serially connected to said firing relays, said relays establishing control of the firing system at the firing panel on which the first-closed firing switch is located, means on each firing panel serially connected to said firing switches for indicating which firing panel is in control of the firing system, a plurality of sets of parallel connected selector switches, the number of sets of selector switches corresponding to the number of launchers in the launching system, one of said selector switches in each set being located on each of said firing panels, each set of selector switches being serially connected in the firing circuit of the launcher individual thereto, one of said selector switches of each set on one firing panel being serially connected to the second pair

of normally closed contacts of its respective firing relay, the other corresponding one of said set of selector switches on the other firing panel being serially connected to the normally open contacts of said last-mentioned firing relay, said one of said selector switches of each set being further connected in series with the normally open contacts of the other of said firing relays, the other corresponding one of said set of selector switches on the other firing panel being further connected in series to the second pair of normally closed contacts of said last-named firing relay whereby the condition of the firing relay contacts is reversed in response to the closing of the first operated firing switch, "guide loaded" indicating means for each of the launchers and located on each of said firing panels, "misfire" indicating means for each of the launchers and located on each of the firing panels, a stepping relay for the firing circuit of each launcher and located on the control panel, said stepping relay being connected in series with the selector switch common with the firing switch exercising control of the system, said firing circuit for each launcher including an ignition circuit for each launching rail, each contact on said stepping relay being connected to a different ignition circuit on its respective launcher whereby missiles on any launcher may be sequentially fired and precedence is given to the initial firing order given at any one of the firing panels.

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