

Aug. 13, 1968

J. J. NASH

3,396,628

WEAPONRY FIRING DEVICES

Filed July 6, 1965

5 Sheets-Sheet 1

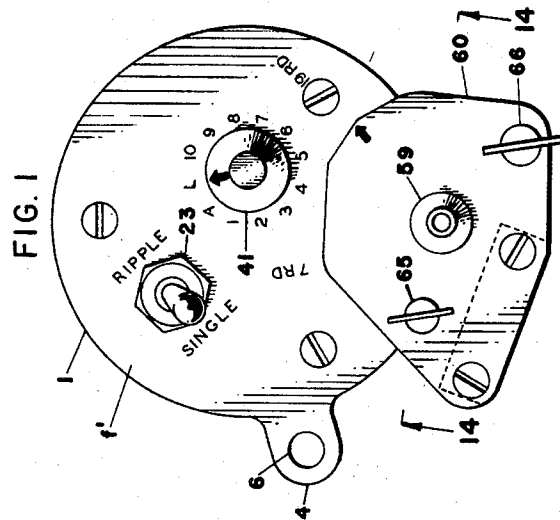


FIG. 14

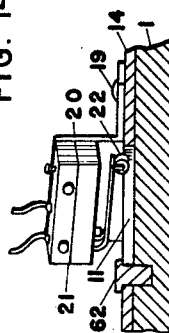


FIG. 15

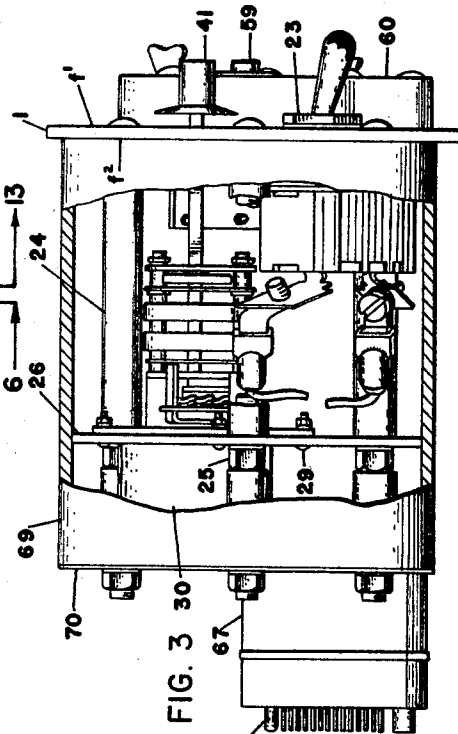
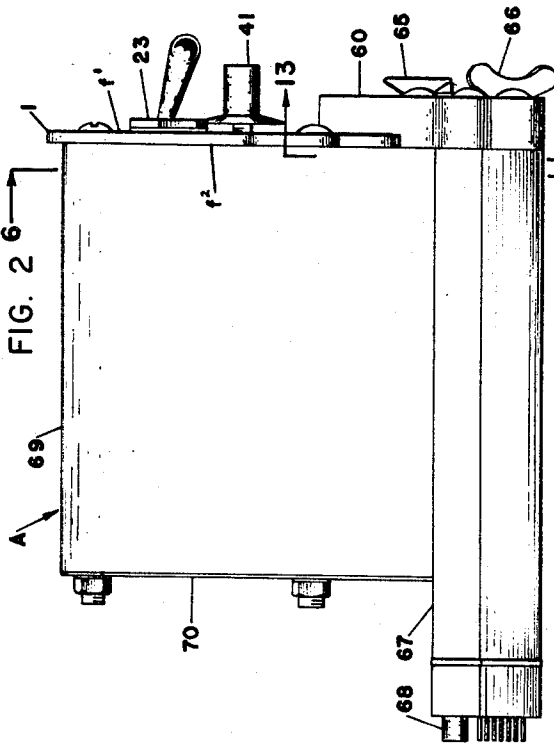
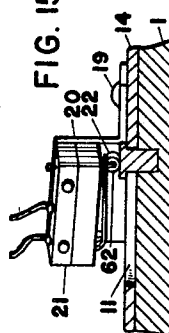


FIG. 3

INVENTOR

JOHN J. NASH

BY

Alfred W. Hetchaft

ATTORNEY

Aug. 13, 1968

J. J. NASH

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FIG. 4

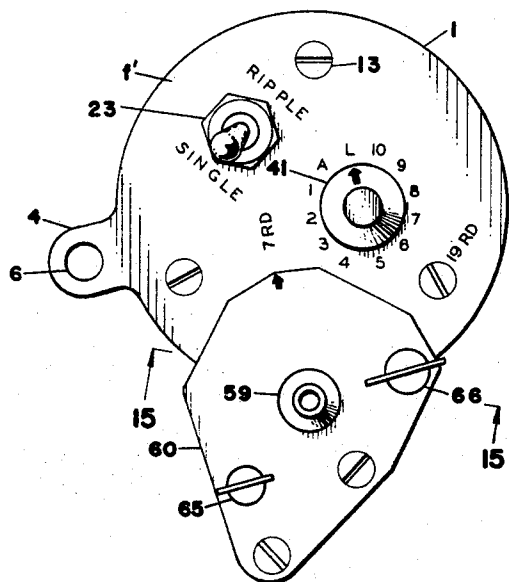


FIG. 6

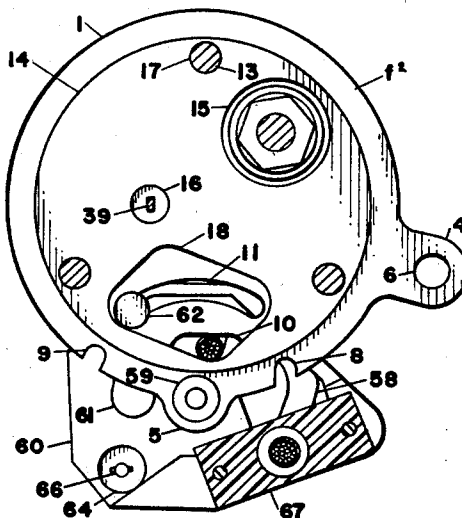


FIG. 7

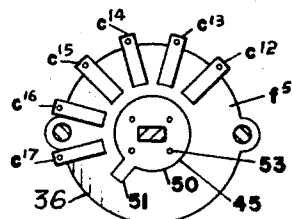
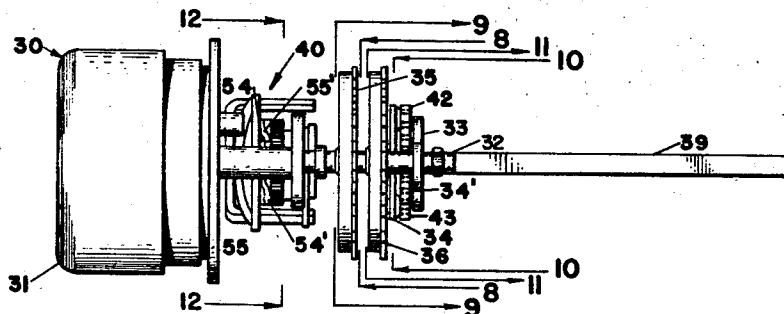


FIG. 10

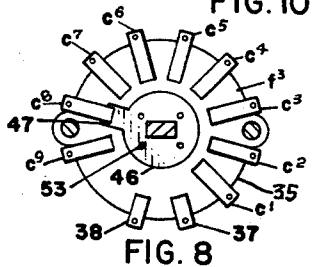
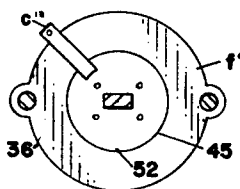


FIG. 9

FIG. 11



INVENTOR
JOHN J. NASH

BY *Alfred W. Hestchert*
ATTORNEY

Aug. 13, 1968

J. J. NASH

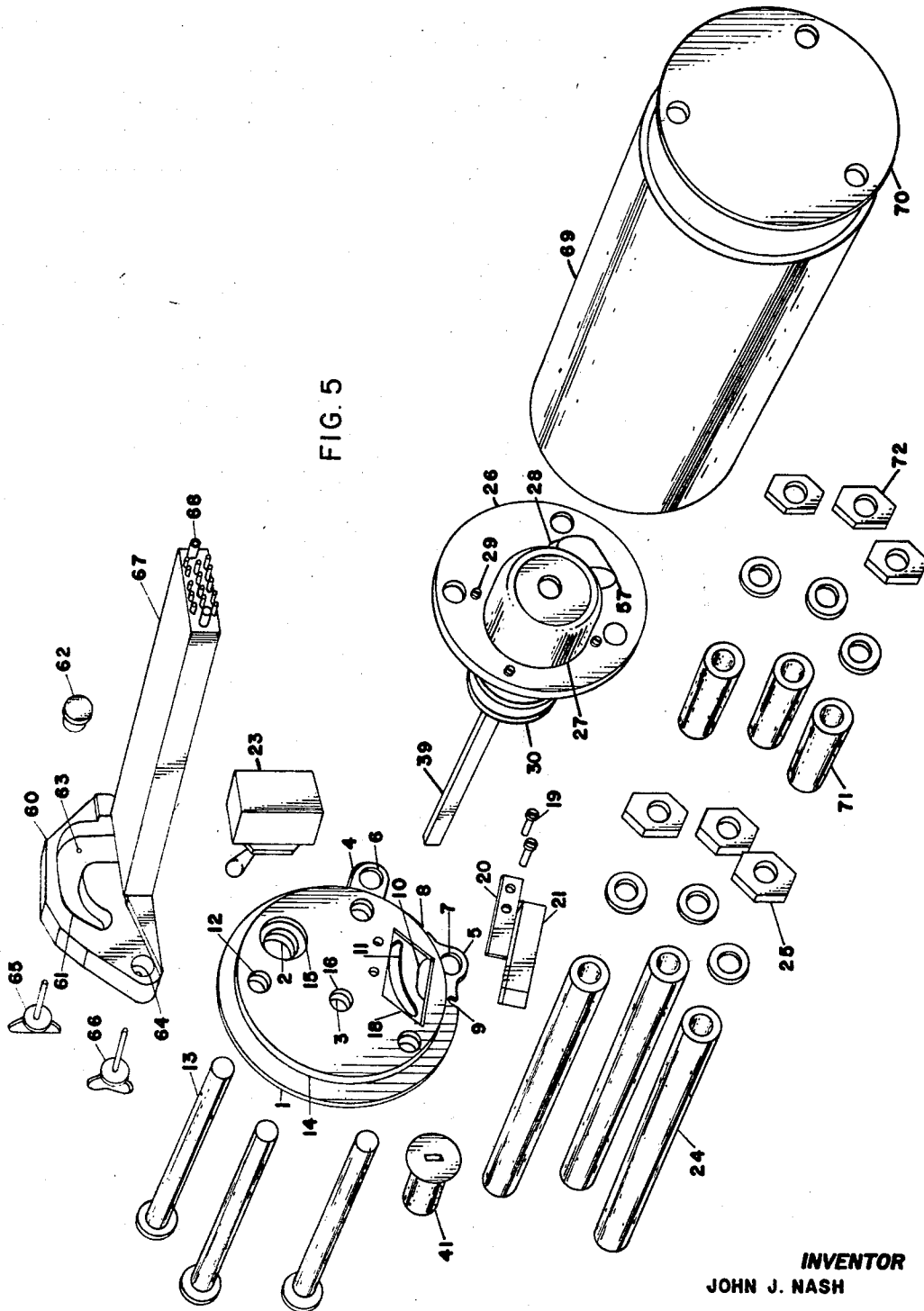
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FIG. 5



INVENTOR

JOHN J. NASH

BY

Alfred W. Ketchaft

ATTORNEY

Aug. 13, 1968

J. J. NASH

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FIG. 18

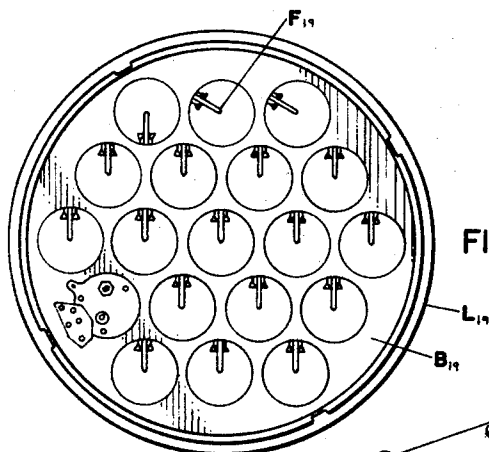
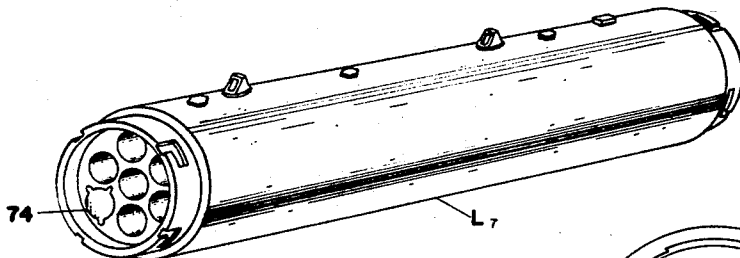


FIG. 17

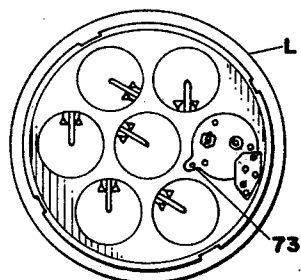


FIG. 19

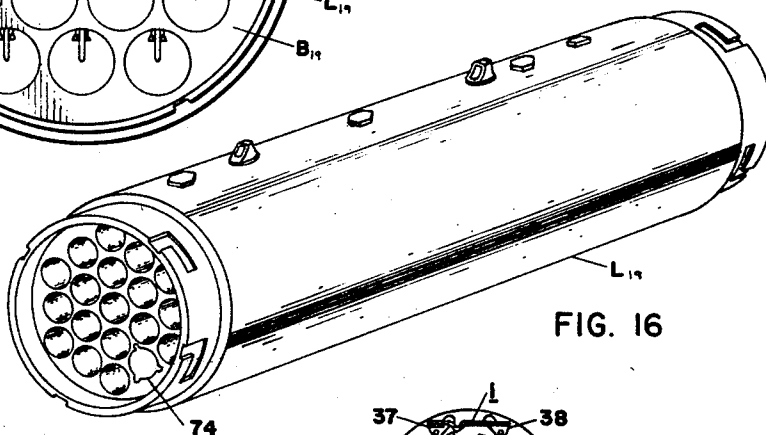


FIG. 16

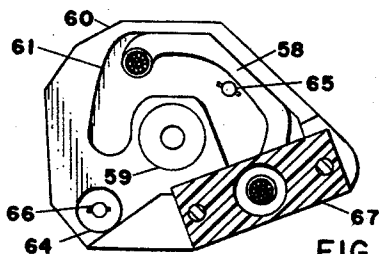


FIG. 13

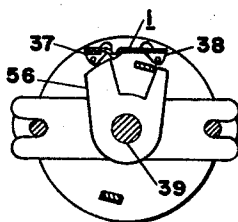


FIG. 12

INVENTOR
JOHN J. NASH

BY

Alfred W. Heston
ATTORNEY

Aug. 13, 1968

J. J. NASH

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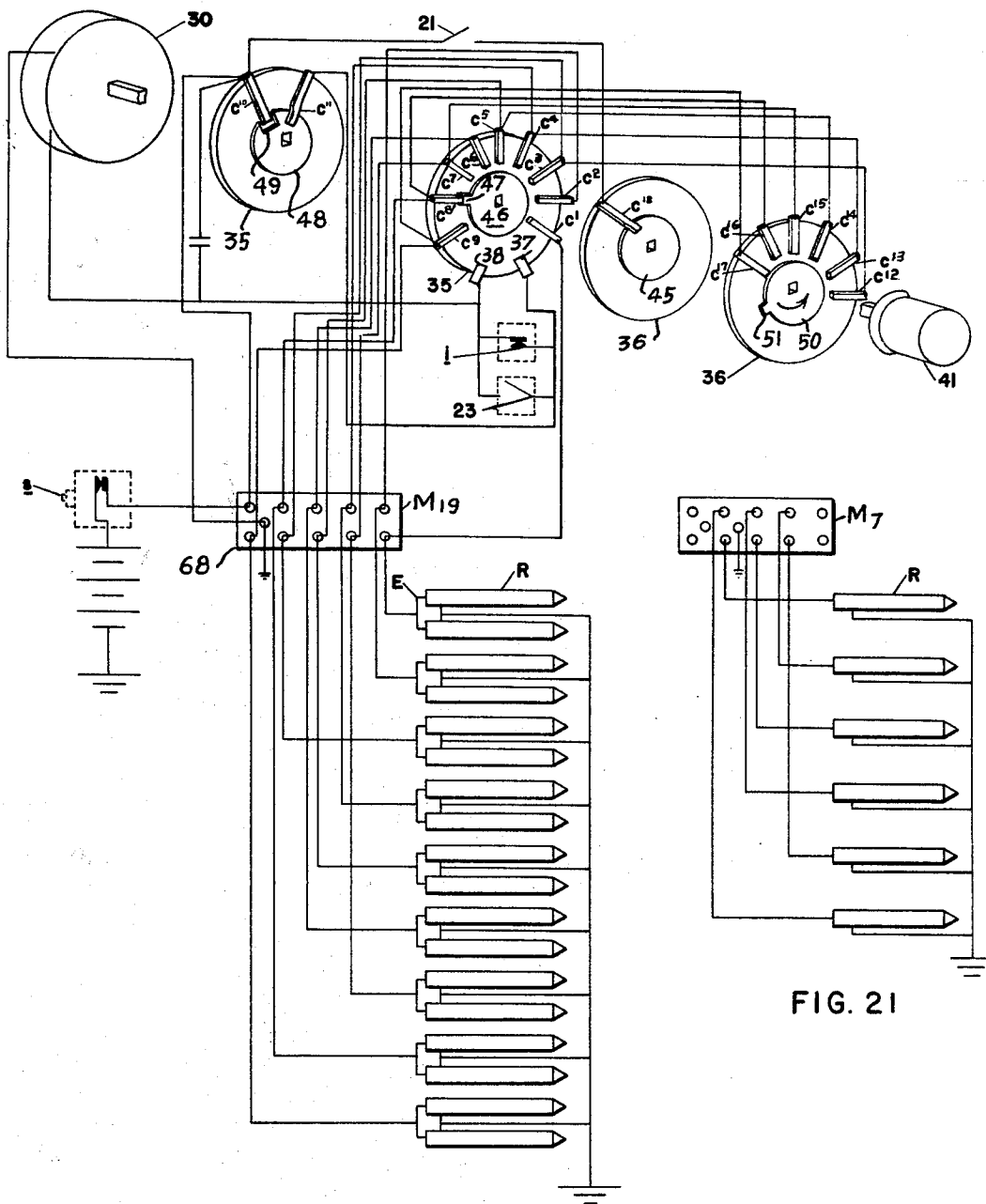


FIG. 20

FIG. 21

INVENTOR

JOHN J. NASH

BY

Alfred W. Hetcher

ATTORNEY

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3,396,628

WEAPONRY FIRING DEVICES

John J. Nash, Ferguson, Mo., assignor to AlSCO, Inc.,
St. Louis, Mo., a corporation of Delaware
Filed July 6, 1965, Ser. No. 469,406
23 Claims. (Cl. 89—1.814)

ABSTRACT OF THE DISCLOSURE

A rocket launcher firing device including an intervalometer contained within a cylindrical housing sized for insertion into one of the launcher tubes of either a 7 or 19 tube rocket launcher. The intervalometer has two contact decks suitable for firing 6 and 18 rockets respectively, and further includes a switch for isolating the former deck from the source of electrical energy. The switch is activated by a pivotally mounted adapter plate which carries a plug-like connector element adapted for insertion into a receptacle in either one of the launchers. The disposition of the receptacle in the 7 tube launcher is such that the adapted plate will be shifted to a position where it holds the switch closed, while in the 19 tube launcher the switch will be open. The intervalometer has a load position wherein no rocket will fire when the firing switch is closed and an arm position wherein the first rocket will fire when the firing switch is closed. The launcher will fire the rockets in individual bursts or sequential bursts.

This invention relates in general to certain new and useful improvements in weaponry firing devices and, more particularly, to a switching control unit for firing airborne rocket launchers.

At the present time, the United States Air Force possesses a large quantity of disposable air-borne rocket launchers each comprising in general a cylindrical housing having either seven or nineteen rocket tubes axially disposed therein, each rocket tube being capable of launching one rocket. The launcher, which is fabricated from an inexpensive material such as pressed paper, mounts on the underside of a fighter aircraft and is electrically connected to a switch in the cockpit thereof for firing. The launcher, being relatively inexpensive, is designed to be jettisoned after firing its complement of rockets.

Recently the United States Air Force has adopted a new weapons system which appears similar to the launcher previously described but contains an internally mounted control means which can program the firing of the rockets. This control means makes it possible for the pilot selectively to fire rockets one at a time, or in sequence, the latter usually being referred to as "ripple" firing. This "programmed" method of firing has been found to be so effective and desirable militarily that the former type of rocket launchers have become obsolete.

It is therefore the primary object of the present invention to provide a control device which can be quickly and simply added to obsolete rocket launchers so as to modernize them and render them useable to meet current military requirements.

It is another object of the present invention to provide a device of the type stated which can be optionally connected to and inserted within either a seven or a nineteen tube rocket launcher.

It is a further object of the present invention to provide a device of the type stated which is rugged in construction and is economical to manufacture.

With the above and other objects in view, my invention resides in the novel features of form, construction, arrangement, and combination of parts presently described and pointed out in the claims.

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In the accompanying drawings:

FIG. 1 is a front elevational view of a firing control device constructed in accordance with and embodying the present invention, and showing the adapter plate rotated so that the control device accommodates a 19-tube rocket launcher.

FIG. 2 is a side elevational view of a firing control device constructed in accordance with and embodying the present invention.

FIG. 3 is a top plan view partially broken away and in section of the firing control device.

FIG. 4 is a front elevational view of the firing control device showing the adapter plate rotated so as to permit the control device to fit within a 7-tube rocket launcher.

FIG. 5 is an exploded perspective view of the rocket launcher constructed in accordance with and embodying the present invention.

FIG. 6 is a sectional view taken along line 6—6 of FIG. 2.

FIG. 7 is a side elevational view of an intervalometer forming part of the present invention.

FIGS. 8, 9, 10, 11 and 12 are sectional views taken along lines 8—8, 9—9, 10—10, 11—11 and 12—12, respectively, of FIG. 7.

FIG. 13 is a sectional view taken along line 13—13 of FIG. 2.

FIG. 14 is a sectional view taken along line 14—14 of FIG. 1.

FIG. 15 is a sectional view taken along line 15—15 of FIG. 4.

FIG. 16 is a perspective view of a 19-tube rocket launcher.

FIG. 17 is a rear elevational view of a 19-tube rocket launcher showing the firing control device operatively mounted therein.

FIG. 18 is a perspective view of a 7-tube rocket launcher.

FIG. 19 is a rear elevational view of the 7-tube rocket launcher showing the firing control device operatively mounted therein.

FIG. 20 is a schematic wiring diagram showing the firing control device connected to the 19-tube rocket launcher.

FIG. 21 is a schematic wiring diagram showing the firing circuit of the 7-tube rocket launcher.

Referring now in more detail and by reference characters to the drawings which illustrate a preferred embodiment of the present invention, A designates a firing control device comprising a substantially circular face or mounting plate 1 having an exterior face f^1 and interior face f^2 and being provided with apertures 2 and 3. Integrally formed on the periphery of the mounting plate 1 are radially projecting tabs 4 and 5, respectively provided with circular apertures 6, 7, for purposes presently more fully appearing. In proximity to aperture 7 mounting plate 1 is cut away in the provision of notches 8 and 9, an elongated aperture 10, and an arcuate aperture 11 concentric with the aperture 7. Near its periphery, mounting plate 1 is provided with a plurality of spaced apertures 12 which accept the bolts 13. Finally, the mounting plate 1 is stamped or otherwise provided on its exterior face f^1 with various indicia as best illustrated in FIGS. 1 and 4. Disposed upon the interior face of f^2 of mounting plate 1, and held facewise in abutment therewith by the bolts 13 is a diametrically reduced circular dielectric backing plate 14 having apertures 15, 16 which register with apertures 2, 3, respectively, of the mounting plate 1. Backing-plate 14 is further provided near its perimetral margin with equally spaced apertures 17 which register with the apertures 12 and similarly accept the bolts 13. In the area in juxtaposition to and substantially defined by the arcuate

aperture 11 and elongated aperture 10, the backing-plate 14 is cut away in the provision of an aperture 18. Secured to backing-plate 14 by screws 19 is a switch mount 20 which supports a micro-switch 21 so as to permit the roller 22 thereof to extend into aperture 18 above the innermost end of arcuate aperture 11, all as best seen in FIGS. 14 and 15. Conventionally mounted in apertures 2, 15 is a conventional single throw, double pole, toggle selector switch 23.

Rearwardly mounted on bolts 13 and held in spaced parallel relation to backing plate 14 by spacer sleeves 24 and nuts 25, is circular support plate 26 which is equivalent to backing plate 14 in diametral size and is provided with a circular aperture 27 having a notch 28 extending radially therefrom. Operatively secured to support plate 26, by bolts 29 and extending partially through aperture 27 is a rotary solenoid-actuated stepping switch or so-called intervalometer 30.

Referring now to FIGS. 7 through 11, intervalometer 30 includes a ratchet rotary solenoid 31 which is mechanically connected by means of support rods 32 to an elongated end plate 33 and a spring biased detent member 34 having two opposed forwardly projecting hemispheres 34¹ mounted on the face thereof. Also supported in spaced parallel relation between the rotary solenoid 31 and the elongated end plate 33 are two stationary annular dielectric wafers 35, 36 having annular faces f^3 , f^4 and f^5 , f^6 , respectively. Dielectric wafer 35 is provided on its face f^3 with 9 contacts c^1 , c^2 , c^3 , c^4 , c^5 , c^6 , c^7 , c^8 , c^9 , and on its opposite face f^4 with two contacts c^{10} , c^{11} . Intermediate the contacts c^1 , c^9 the wafer 35 is provided with spaced radially projecting terminals 37, 38. Similarly, the dielectric wafer 36 is provided on its face f^5 with six contacts c^{12} , c^{13} , c^{14} , c^{15} , c^{16} , c^{17} and on its face f^6 with one contact c^{18} , all wired as schematically illustrated in FIG. 20. Extending concentrically through the dielectric wafers 35, 36, the spring biased detent member 34, and the elongated end plate 33 is a rotor shaft 39 which is operatively connected at one end to rotary mechanism 40 of solenoid 31, and at its other end projects through aperture 16 of backing plate 14 and aperture 2 of mounting plate 1 where it is provided with a control knob 41. Operatively mounted on the rotor shaft 39 between the elongated end plate 33 and the spring biased detent member 34 is a circular detent plate 42 having a plurality of circumferentially spaced apertures 43 which engage the forwardly projecting hemispheres 34¹ of spring biased member 34. Rigidly mounted on rotor shaft 39 for rotation within the confines of the apertures of dielectric wafers 35, 36 are dielectric disks 44, 45, respectively, having opposed faces which are coplanar to the faces f^3 , f^4 , and f^5 , f^6 , respectively. One face of disk 44 is provided with an annular contactor plate 46 having a peripheral margin which is spaced inwardly from the contacts c^1 through c^9 . Radially projecting from the peripheral margin of contactor plate 46 is a contactor tab 47 which is in slidable abutment with the face f^3 and is adapted to pass under and thereby contact the contactors c^1 through c^9 , but not the terminals 37, 38. On its opposite face the disk 44 is provided with a contactor plate 48 having a notch 49 formed in the periphery thereof, the notch 49 being sized to fit around the contactor c^{10} , but not the contact c^{11} . For convenience of reference contactor plate 48 and contact c^{10} are referred to as a safety contactor and a safety contact, respectively. Similarly, on one face the disk 45 is provided with a contactor plate 50 having a radially projecting tab 51 which slidably abuts against the face f^5 and is adapted to contact the contacts c^{12} through c^{17} . On its opposite face, the disk 45 is provided with an annular contactor plate 52 which is in continuous contact with the contact c^{18} . The annular contactor plates 46, 48 and 50, 52 are secured to their respective disks 44, 45 and are electrically connected therethrough one to the other, by axially extending rivets 53. Thus, a rotation of the rotor shaft 37 will bring the tab 47 into successive contact with the con-

tacts c^1 through c^9 . The contact c^{11} will continually bear against the face of annular contactor plate 48 as will the contactor c^{10} except when aligned with notch 49 which occurs when tab 47 is pointed generally toward terminals 37, 38. Concurrently with the rotation of tab 47 through contacts c^3 through c^8 the tab 51 will be brought into successive contact with the contacts c^{12} through c^{17} . The contact c^{18} will continuously bear against the annular contactor plate 52, all for purposes presently more fully appearing.

Referring now to FIGS. 7 and 12, rotary mechanism 40 includes ratchet disks 54, 54', the former being operatively attached to the rotary solenoid 31, and adapted to oscillate therewith and the latter being operatively attached to the rotor shaft 39. Both ratchet disks 54, 54' are provided with pawls 55, 55' which engage one another for advancement of the rotor shaft 39, but freely slip with respect to one another when the solenoid 31 returns to its initial position. Also fastened operatively to the rotary solenoid 31 for oscillation therewith and with the ratchet disk 54 is a rocking cam 56 which momentarily opens a normally closed interrupter switch i which is secured to the terminals 37, 38 and breaks the circuit therebetween when the solenoid 31 rotates. It should be noted that the rotary solenoid 31 is internally spring biased and returns to its initial position after the rocking cam 56 has opened. Additionally, bridging the terminals 37, 38 is the selector switch 23. Operatively suspended to the rear of support plate 26 by its own lead wires which extend through notch 28 is a capacitor 57 which is wired as schematically shown in FIG. 20 and is adapted to suppress sparks. The various wires leading from intervalometer 30 are disposed within a loom 58.

Operatively journaled to mounting plate 1 by rivet 59 which extends through aperture 7 and for limited rotation thereon is adapter plate 60 having its rear face relieved in the provision of channel 61 which, despite the position of relative rotation, is continually in communication with elongated aperture 10 of mounting plate 1 and aperture 18 of backing plate 14. Secured to adapter plate 60 and extending through arcuate aperture 11 of mounting plate 1 is flat head rivet 62 which limits the relative angular movement between adapter plate 60 and mounting plate 1 to the arc defined by arcuate aperture 11. As will be seen in FIGS. 14, 15, the roller 22 of micro-switch 21 rides up onto the head of rivet 62 when the adapter plate 60 is rotated counterclockwise on mounting plate 1, that is to say, to the "7RD" position, whereby to close the micro-switch 21. Adapter plate 60 is furthermore provided with two apertures 63, 64, having loosely disposed therein bayonet fasteners 65, 66 respectively, which are each provided with pinned ends adapted to receive a conventional bayonet fitting, all for purposes presently more fully appearing. Suitably secured to the back face of adapter plate 60 at one end and extending therefrom is a tubular conduit 67 having a rectangular cross-section. At its other end the tubular conduit 67 is provided with a conventional male connector element 68 having a plurality of connector pins extending therefrom. Loom 58 extends from intervalometer 30 through aperture 18 in backing plate 14, through elongated aperture 10 in mounting plate 1 though channel 61 and into conduit 67 wherein the respective wires disposed in loom 58 are connected to the various pins of male connector element 68, as schematically illustrated in FIG. 20.

Intervalometer 30, micro-switch 21, support plate 26 and selector switch 23, are all encased in a tubular housing 69 which is diametrically sized internally to slidably receive the support plate 26 and the backing plate 14. Provided for endwise closure of tubular housing 69 is circular end cap 70 which is held in spaced parallel relation to support plate 26 and backing plate 14 by the spacer sleeves 71 and nuts 72. For convenience of reference mounting plate 1, backing plate 14, support plate 26, end cap 70, bolts

13, and spacer sleeves 24 are referred to conjointly as a frame.

Firing control device A is operatively emplaced within a 19-tube rocket launcher L_{19} as best seen in FIG. 17. It should be noted the male connector element 68 engages a mating receptacle element M_{19} having wires connected thereto which lead to the tail contacts F_{19} on the launcher L_{19} , to the power supply of the aircraft and to the firing switch s in the cockpit, all as schematically illustrated in FIG. 20. Tubular housing 69, being slightly smaller in diametral size than launcher tube T_{19} fits slidably therein whereupon the face f^2 of mounting plate 1 comes into abutment with the aft launcher bulkhead B_{19} to which it is secured by self-tapping screws 73 and lock fastener 66 which registers with and engages a bayonet fitting disposed therein. In such position adapter plate 60 will be rotated clockwise relative to mounting plate 1 and the notch 8 will accommodate the shank of fastener 65. The head of rivet 62 will be displaced to the outer end of arcuate aperture 11 and the micro-switch 21, of course, will be open.

Firing control device A is similarly received by a 7-tube launcher L_7 , as best seen in FIG. 19. However, to fit within the 7-tube launcher L_7 the adapter plate 60 must be rotated fully counterclockwise with respect to mounting plate 1. Such a rotation places the shank of lock fastener 65 in position to engage a bayonet fitting in the aft bulkhead B_7 while the notch 9 accommodates the shank of fastener 66. Such a position brings the head rivet 62 into contact with the roller 22 of micro-switch 21 whereby to close the micro-switch 21.

The forwardly presented ends of launcher tubes T_7 and T_{19} , are each covered with a blast plate 74 to deflect the blast ejected by rockets in adjacent tubes as best seen in FIGS. 16 and 18.

To prepare the 19-tube rocket launcher L_{19} for firing it is first operatively secured to the underside of the aircraft. Thereafter rockets are inserted in eighteen of the rocket tubes T_{19} . The nineteenth tube T_{19} carries the firing control device A in the manner previously described herein. It should be noted that each of the rockets R includes a pair of contactors E which bear against corresponding electrical contactors F disposed within each of the tubes T_{19} whereby to include the ignition system of each of the rockets R within the firing circuit of the launcher L_{19} . One of the contactors F is grounded to the aircraft while the other is connected to the receptacle element M_{19} and thence to the intervalometer 30 as schematically illustrated in FIG. 20. It should be further noted that the rockets R are connected in pairs through the connector elements 68, M_{19} so that one electrical impulse will fire two rockets R.

Knob 41 is set to L or the load or safety position in which notch 49 of the contactor plate 48 is disposed in surrounding relationship to the contact c^{10} , so as to preclude electrical current flow between the plate 48 and contact c^{10} . Advancing the knob 41 to A or the armed position brings contactor plate 48 into electrical contact with contact c^{10} . Now when the pilot presses the firing switch s a circuit to the rotary solenoid 31 is closed, the circuit being traced as follows: from the electrical energy source of the aircraft, through the firing switch s through the connector elements 68, M_{19} , to the contact c^{10} , through the contactor plate 48, to the contact c^{11} to terminal 37 of the dielectric wafer 35 through the closed interrupter switch i to terminal 38, through solenoid 31 and thence to ground again through the connector elements 68 and M_{19} . Once the solenoid 31 is energized it advances one increment and thereby brings the tab 47 into contact with the contact c^1 . In this position, of course, a circuit to a pair of rockets R is established which, for purposes of illustration can be traced as follows: from the electrical energy source of the aircraft through the firing switch s , through the connector elements 68, M_{19} , to contact c^{10} and to the contactor plate

48, through the rivets 53 into the contactor plate 46, through the tab 47 into the contact c^1 , through the connector element 68 and M_{19} , thence to the contactors E of two rockets R, through the rockets R, and to ground which carries the current back to the power source. The next eight incremental advances of the tab 47 will successively complete the circuit through two pair of rockets R until all sixteen of the remaining rockets R are expended. If the selector switch 23 is closed, that is to say, is in the "single" position, the rotary solenoid 31 and ratchet disk 54 will return to the initial position until the switch s is released. Thus, in the "single" position, the switch s must be depressed each time the pilot desires to fire a salvo of two rockets R. However, when the selector switch 23 is opened, that is to say, is in the "rippled" position, upon closure of switch s the solenoid 31 will advance and the rocking cam 35 will open the interrupter switch i , thereby breaking the circuit and allowing the solenoid 31 to return to its initial position. Of course, by the time the solenoid 31 has returned to its initial position, the rocking cam 35 will have released the interrupter switch i whereby to again close the circuit and advance the tab 47 an additional increment. Thus, the pilot by holding the firing switch s closed can ignite all eighteen rockets R in closely spaced bursts of two.

Finally, it should be again noted that when each firing control device A is emplaced in launcher L_{19} the micro-switch 21 will be open, thereby inactivating the contacts c^{12} through c^{17} on the dielectric wafer 36.

The 7-tube rocket launcher L_7 is prepared for firing in a manner similar to launcher L_{19} . Since one of the tubes T_7 carries the firing control device A, only six tubes will be available for carrying rockets R. Moreover, since firing control device A mounts in launcher L_7 with the micro-switch 21 closed, the circuit elements associated with dielectric wafer 36 will form a part of the firing circuit as best seen in FIGS. 20 and 21.

One advance of tab 47 past the armed position will bring it to c^1 , but since no rocket R of the seven tube launcher L_7 is connected to contact c^1 , no rockets R will fire. It should be noted that the contactor tab 51 of annular contactor plate 50 at this increment does not complete a circuit to a rocket R. The next incremental advance of rotor shaft 39 will bring tab 47 into contact with contact c^2 and the tab 51 into contact with contact c^{12} which is connected by a lead wire to contact c^3 and from there to and through the connector elements 63, M_7 to a single rocket R which, of course, will fire. In this regard, it should be noted that the contactor tab 47 also completes circuits to the contactors F in the launchers L_7 , but in effect electrically trails the tab 51 by one increment. In other words, when tab 51 completes a circuit and fires a rocket R, the tab 47 will also complete a circuit to a rocket tube T_7 , but the rocket R in such a tube T_7 will have previously been fired by the tab 51. Thus, the rockets R in launcher L_7 are fired one at a time by the successive incremental rotation of the tab 47 through the contacts c^{12} through c^{17} . Again, the operation of rotary solenoid 31 is controlled by the circuit associated with the contactor plate 48, and the position of selector switch 23 has the same effect, that is to say, when selector switch 23 is open the pilot must press and release the firing switch s each time he desires to fire a single rocket R. In other words, when the firing switch s is pressed inwardly to close the circuit, the rotary solenoid 31 will energize and will advance one step and will remain in this advanced position as long as it is energized. As has been above indicated, the single-step advance of the rotary solenoid 31 will complete a firing circuit to a single rocket, and once the rocket has been fired it makes no difference if the pilot keeps his finger on the firing switch s for a moment or two beyond the period actually required to fire the rocket because that particular rocket has already left the launcher or is in the process of doing so and the firing circuit associated with it no longer has any function during such particular cycle of firing. As soon

as the pilot releases the firing switch *s*, after having closed it, the rotary solenoid 31 becomes deenergized and is pulled back to initial position by means of a spring-return which is a part of its mechanism, so that the rotary solenoid 31 thus becomes "cocked" for the next stepwise advance of the contactor tab 51. Thus, as has been previously pointed out, the rockets *R* will be fired, one at a time, by successive manipulations of the firing switch *s* at the will of the pilot.

If, on the other hand, the selector switch 23 has been shifted to the open or so-called "ripple fire" position, the interrupter switch *i* will not be by-passed and the rotary solenoid 31 will be automatically de-energized at the end of each stepwise advance even though the pilot holds the firing switch *s* closed, and the rockets *R* will therefore be fired in closely spaced successive order. Since a complete salvo can be fired in this manner within a period of less than 30 seconds, the pilot can fire a complete salvo in the "ripple fire" sequence merely by holding the firing switch *s* closed for about a minute. It is possible, although not considered to be desirable, for the pilot to close the firing switch *s* for a period of 10 seconds or so and thereby fire a partial salvo and subsequently fire the remainder of the salvo by a second manipulation of the firing switch *s*.

Thus, by the use of the firing control device A obsolete rocket launchers can be quickly provided with either single-fire or "ripple fire" capabilities. The firing control device A is actually a very small, compact unit which can be very readily shipped to remote supply depots and therefore greatly simplifies the logistical problem of handling obsolete rocket launchers. Moreover, the firing control device A can be very quickly and easily inserted in either 7-tube or 19-tube rocket launchers without requiring any complicated machine tools or hand tools. In fact, the conversion can be effected within a matter of minutes by any ordnance mechanic without any great degree of special training or skill. Inasmuch as the mounting arrangement is positioned differently for 7-tube or 19-tube rocket launchers and the change of position automatically consists of a change in firing circuitry, it is impossible to make mistakes in the conversion procedure.

It should be understood that changes and modifications in the form, construction, arrangement and combination of several parts of the firing control device A may be made and substituted for those herein shown and described without departing from the nature and principle of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A firing control device for use with airborne rocket launchers having a plurality of rocket tubes which are adapted to carry rockets, said rocket launcher being provided with an electrical circuit including an electrical receptacle, said firing control device comprising a face plate, an intervalometer carried by said face plate, an adapter plate rotatably journaled to said face plate and having a tubular conduit extending rearwardly therefrom substantially perpendicular to said face plate, an electrical connector element operatively mounted on said tubular conduit and being adapted for insertion into said electrical receptacle, and a switch actuated by the adapter plate and associated with the intervalometer for adapting the intervalometer for use with rocket launchers of different rocket quantities.

2. A firing control device for use with airborne rocket launchers having a plurality of rocket tubes which are adapted to carry rockets, said rocket launcher being provided with an electrical circuit including an electrical receptacle, said firing control device comprising a face plate, an intervalometer carried by said face plate and sized to fit within a rocket tube, means for securing said face plate to the end of the rocket launcher so as to substantially cover the end of one rocket tube, an adapter plate journaled to said face plate for rotation through a limited arc, a tubular conduit fastened at one end to said adapter

plate and extending rearwardly therefrom substantially perpendicular to said face plate, said conduit being provided at its other end with an electrical connector element, and a switch actuated by the adapter plate and associated with the intervalometer for adapting the intervalometer for use with rocket launchers of different rocket quantities.

3. A firing control device for use with airborne rocket launchers having a plurality of rocket tubes which are adapted to carry rockets, said rocket launcher being provided with an electrical circuit including an electrical receptacle, said firing control device comprising a face plate, an intervalometer carried by said face plate and sized to fit within a rocket tube, means for securing said face plate to the end of the rocket launcher so as to substantially cover the end of one rocket tube, an adapter plate journaled to said face plate for rotation through a limited arc from a first position to a second position, a tubular conduit fastened at one end to said adapter plate and extending rearwardly therefrom substantially perpendicular to said face plate, said conduit being provided at its other end with an electrical connector element, and a switch operatively associated with said intervalometer, said switch being closed by said adapter plate when said adapter plate is rotated to said second position.

4. A firing control device for use with airborne rocket launchers having a plurality of rocket tubes which are adapted to carry rockets, said rocket launchers being provided with an electrical circuit including an electrical receptacle, said firing control device comprising a face plate, an intervalometer carried by said face plate and sized to fit within a rocket tube, means for securing said face plate to the end of the rocket launcher so as to substantially cover the end of one rocket tube, an adapter plate journaled to said face plate for rotation through a limited arc, a tubular conduit fastened at one end to said adapter plate and extending rearwardly therefrom substantially perpendicular to said face plate, said conduit being provided at its other end with an electrical connector element, an electrical circuit operatively associated with said intervalometer and electrical receptacle for conveying electrical firing impulses to the electrical circuit of the launcher, and a switch in the circuit for adapting the intervalometer for use with rocket launchers of different rocket quantities, said switch being actuated by the adapter plate.

5. A firing control device according to claim 2 in which the intervalometer includes a moving contactor means for completing an electrical connection to a plurality of contacts in successive order, said contacts being electrically connected to said rocket.

6. A firing control device according to claim 5 having means operatively associated with said intervalometer for optionally causing said moving contactor to continue movement until it has successively contacted all the contacts or to move from one contact to the next one step at a time.

7. A firing control device according to claim 2 in which the intervalometer includes first and second moving contactor means for completing electrical connections to a plurality of first and second contacts in successive order.

8. A firing control device according to claim 6 wherein the switch is in the circuit completed by said second contactor means whereby to electrically isolate said second contactor means and said second contacts.

9. A firing control device for use with first and second airborne rocket launchers having a plurality of rocket tubes which are adapted to carry rockets, each of said rockets being adapted to ignite upon receipt of an electrical impulse, said first rocket launcher being electrically wired to a first electrical receptacle so that a single impulse will ignite at least two rockets, said second launcher being electrically wired to a second electrical receptacle so that a single impulse will fire a single rocket, said firing control device comprising a face plate, a tubular housing projecting from said face plate and sized to slidably fit within said rocket tubes whereby said face plate abuts

against the end of said rocket launcher, an intervalometer operatively disposed within said tubular housing and being electrically connected to a source of electrical energy, an adapter plate journaled to said face plate for rotation through a limited arc from a first position to a second position, a tubular conduit fastened to said adapter plate at one end and extending therefrom in parallel spaced relation to said housing, said tubular conduit being provided at its other end with an electrical connector element adapted to engage either said first or second receptacles, conductor means operatively associated with said connector element and said intervalometer whereby to electrically connect said intervalometer and said rockets, said intervalometer being adapted to successively close circuits to said rockets whereby to transfer electrical impulses thereto for firing the same, and a switch actuated by the adapter plate and associated with the intervalometer for converting the intervalometer circuitry so that it fires one or two rockets depending on the launcher in which the firing control device is installed.

10. A firing control device for use with first and second airborne rocket launchers having a plurality of rocket tubes which are adapted to carry rockets, each of said rockets being adapted to ignite upon receipt of an electrical impulse, said first rocket launcher being electrically wired to a first electrical receptacle so that a single impulse will ignite at least two rockets, said second launcher being electrically wired to a second electrical receptacle so that a single impulse will fire a single rocket, said firing control device comprising a face plate, a tubular housing projecting from said face plate and sized to slidably fit within said rocket tubes whereby said face plate abuts against the end of said rocket launcher, an intervalometer operatively disposed within said tubular housing and being electrically connected to a source of electrical energy, said intervalometer including first and second contactor means for firing the rockets of said first and second launchers, respectively, an adapter plate journaled to said face plate for rotation through a limited arc from a first position to a second position, a switch operatively associated with said adapter plate for electrically isolating said second contactor means from said source of electrical energy when said adapter plate is in said first position, a tubular conduit fastened to said adapter plate at one end and extending therefrom in parallel spaced relation to said housing, said tubular conduit being provided at its other end with an electrical connector element adapted to engage said first receptacle when said adapter plate is in the first position and said second receptacle when said adapter plate is in the second position, and conductor means operatively associated with said connector element and said intervalometer whereby to electrically connect said intervalometer and said rockets, said intervalometer being adapted to successively close circuits to said rockets whereby to transfer electrical impulses thereto for firing the same.

11. A firing control device according to claim 10 in which said intervalometer is associated with selector means for optionally causing said intervalometer to fire all of its rockets in successive shortly spaced bursts or one burst at a time.

12. A firing control device for use with first and second airborne rocket launchers having a plurality of rocket tubes which are adapted to carry rockets, each of said rockets being adapted to ignite upon receipt of an electrical impulse, said first rocket launcher being electrically wired to a first electrical receptacle so that a single impulse will ignite at least two rockets, said second launcher being electrically wired to a second electrical receptacle so that a single impulse will fire a single rocket, said first and second electrical receptacles being electrically connected to an electrical energy source, firing means remotely mounted from said launchers and being interposed between said electrical energy source and said receptacles, said firing control device comprising a face plate, a tubular housing projecting from said face plate and sized

to slidably fit within said rocket tubes whereby to allow said face plate to abut against the aft end of said launcher, means for securing said face plate to said launcher, an adapter plate journaled to said face plate for rotation through a limited arc from a first position to a second position, a tubular conduit fastened to said adapter plate at one end and extending therefrom in parallel spaced relation to said housing, said tubular conduit being provided at its other end with an electrical connector element adapted to engage either said first or second receptacle, an intervalometer housed within said housing and including first and second contactor means, conductor means interposed between said intervalometer and electrical connector element whereby to connect said intervalometer to said source of electrical energy and said rockets, and a switch interposed between said electrical energy source and said second contactor means and being operatively associated with said adapter plate for electrically isolating said second contactor means from said electrical energy source when said adapter plate is in said second position, said intervalometer being adapted to transfer electrical impulses to said rockets through said conductor means when said firing means is closed whereby to fire said rockets.

13. A firing control device for use with first and second rocket launchers having a plurality of rocket tubes which are adapted to carry rockets, each of said rockets being adapted to ignite upon receipt of an electrical impulse, said first rocket launcher being electrically wired to a first electrical receptacle so that a single impulse will ignite at least two rockets, said second launcher being electrically wired to a second electrical receptacle so that a single impulse will fire a single rocket, said first and second electrical receptacles being electrically connected to an electrical energy source, firing means remotely mounted from said launchers and being interposed between said electrical energy source and said receptacles, said firing control device comprising a face plate, a tubular housing projecting from said face plate and sized to slidably fit within said rocket tubes whereby to allow said face plate to abut against the aft end of said launcher, means for securing said face plate to said launcher, an adapter plate journaled to said face plate for rotation through a limited arc from a first position to a second position, a tubular conduit fastened to said adapter plate at one end and extending therefrom in parallel spaced relation to said housing, said tubular conduit being provided at its outer end with an electrical connector element adapted to engage either said first or second receptacle, an intervalometer housed within said housing and having rotary means and first and second contactor means for firing the rockets of said first and second launchers, respectively, said contactor means including a plurality of spaced first contactors and a first rotary contactor element secured to said rotary means and adapted to contact said first contactors one at a time, said second contactor means including a plurality of spaced second contactors and a second rotary element adapted to contact said second contactors one at a time, conductor means interposed between said first and second rotary element and said first and second electrical receptacles, whereby to transfer electrical impulses successively to said rockets when said rotary means rotates, and a switch interposed between said electrical energy source and said second rotary element and operatively associated with said adapter plate, said switch being open when said adapter plate is in said second position.

14. A firing control device for use with first and second rocket launchers having a plurality of rocket tubes which are adapted to carry rockets, each of said rockets being adapted to ignite upon receipt of an electrical impulse, said first rocket launcher being electrically wired to a first electrical receptacle so that a single impulse will ignite at least two rockets, said second launcher being electrically wired to a second electrical receptacle so

that a single impulse will fire a single rocket, said first and second electrical receptacles being electrically connected to an electrical energy source, firing means remotely mounted from said launchers and being interposed between said electrical energy source and said receptacles, said firing control device comprising a face plate, a tubular housing projecting from said face plate and sized to slidably fit within said rocket tubes whereby to allow said face plate to abut against the aft end of said launcher, means for securing said face plate to said launcher, an adapter plate journaled to said face plate for rotation through a limited arc from a first position to a second position, a tubular conduit fastened to said adapter plate at one end and extending therefrom in parallel spaced relation to said housing, said tubular conduit being provided at its other end with an electrical connector element adapted to engage either said first or second receptacle, an intervalometer housed within said housing and having rotary means and first and second contactor means for firing the rockets of said first and second launchers, respectively, said rotary means being adapted for rotary incremental advancement when said firing means is closed, said first contactor means including a plurality of spaced first contactors and a first rotary contactor element secured to said rotary means and adapted to contact said first contactors, one at a time on incremental advances, said second contactor means including a plurality of spaced second contactors and a second rotary element adapted to contact said second contactors one at a time on incremental advances, conductor means interposed between said first and second rotary elements and said first and second electrical receptacles, whereby to transfer electrical impulses successively to said rockets when said rotary means rotates, and a switch interposed between said electrical energy source and said second rotary element and being operatively associated with said adapter plate, said switch being open when said adapter plate is in said second position.

15. A firing control device according to claim 14 and having a selector means operatively associated with said intervalometer for optionally causing said rotary means to advance in successive, closely spaced increments once said firing means is closed whereby to ignite said rockets of said first launcher in closely spaced salvos of two rockets each and the rockets of said second launcher in closely spaced bursts.

16. For interchangeable use with first and second rocket launchers adapted to carry rockets which are ignited by electrical impulses derived from a remote source of electrical energy; a firing control device comprising a frame, an intervalometer carried by the frame and connected to the electrical energy source, the intervalometer including first and second contactors which engage a plurality of spaced first and second contacts, respectively, conductor means for connecting the contacts with the firing circuitry of the first or second rocket launchers, and a switch for optionally connecting or disconnecting the second contactor from the electrical energy source.

17. A firing device according to claim 16 and further characterized by a connector element adapted to engage a mating connector element on the rocket launchers and forming part of rocket firing circuitry thereof, the conductor means interconnecting the connector element and the contacts.

18. A firing device according to claim 17 and further characterized by an adapter element shiftably mounted on the frame for movement between first and second positions, the adapter element carrying the connector element which registers with the mating coupler element on the first launcher when in the first position and registers with the mating coupler element on the second launcher when in the second position, the switch being actuated by the movement of the adapter element.

19. A firing control device for use on first and second

rocket launchers having a plurality of numerically different rocket tubes for carrying rockets, each of which is adapted to ignite upon the receipt of an electrical impulse, the first rocket launcher having a first electrical connector element disposed in a predetermined position with respect to a preselected tube thereof and the second rocket launcher having a second electrical connector element which is disposed in a different position with respect to a preselected tube thereof, each rocket launcher having electrical circuitry extending from their respective connector elements to the rockets carried thereby; said firing control device comprising a frame sized for insertion in the rocket tubes, an intervalometer carried by the frame and being connected to a source of electrical energy when the firing control device is installed in the launcher, the intervalometer including first and second contacts which successively engage a plurality of first and second spaced contacts, an adapter element shiftably connected to the frame for movement from a first position to a second position with respect to the frame, a mating connector element on the adapter element, the mating connector element being positioned so as to register with the first connector element on the first launcher when the adapter element is in its first position and the frame is inserted into the preselected tube of the first launcher, the mating connector element being adapted to register with the second connector element on the second launcher when the adapter element is in its second position and the frame is inserted in the preselected tube of the second launcher, conductor means connecting the contacts with the mating connector element whereby to electrically connect the rockets with the intervalometer, and a switch actuated by the adapter element for disconnecting the second contactor from the electrical energy source when the adapter element is in the first position.

20. A firing device for rocket launchers adapted to carry and launch rockets which are ignited by means of electrical impulses, the firing device being energized by a remote electrical energy source and actuated by a remote firing switch; said firing device comprising a frame adapted to fit on the rocket launcher, an intervalometer mounted on the frame and being connected to the remote source of electrical energy, the intervalometer including a firing contactor and a plurality of spaced firing contacts which lie in the path of the contactor firing, the intervalometer being adapted for incremental advancement sequentially through a load position wherein it cannot be actuated when the firing switch is closed, an arm position wherein it will advance one increment when the firing switch is closed and thereby move the firing contactor into electrical contact with the first of the spaced contactors firing contacts, and a plurality of firing positions wherein the contactor engages a firing contact and completes an electrical circuit from the remote electrical energy source to a predetermined rocket so as to ignite a predetermined rocket at each firing position, the intervalometer further including a safety contactor and a safety contact which electrically engages the safety contact except when the intervalometer is in the load position, the safety contactor and contact being connected in series between the electrical energy source and firing contactor, and motive means for advancing the safety and firing contactors, and being electrically connected to the safety contactor.

21. A firing device according to claim 20 and further characterized by means for optionally causing the motive means to advance the firing contactors one increment at a time through each of the firing positions each time the firing switch is closed or having it advance the firing contactors incrementally in closely spaced intervals through all of the firing positions once the firing switch is closed and held closed in the arm position.

22. A firing control device for use with first and second rocket launchers having a plurality of rocket tubes which rearwardly terminate at an aft bulkhead, the rock-

ets being adapted for ignition upon receipt of electrical impulses derived from a remote energy source, the first launcher having a connector element disposed in a predetermined position with respect to one of its tubes, the second launcher having a connector element disposed in a different predetermined position with respect to one of its tubes; said firing control device comprising a plate sized to fit over one of the rocket tubes and against the aft bulkhead, means for securing the plate to the aft bulkhead, a housing carried by the plate and sized to fit within the rocket tube carried by the plate, an intervalometer carried within the housing and connected to the remote source of electrical energy, an adapter element shiftably mounted on the plate for movement from a first to a second position, connector means carried on the plate and being adapted to releasably engage the connector element on the first launcher when the adapter element is in its first position and to releasably engage the connector element on the second launcher when the adapter plate is in its second position, and a switch actuated by the adapter element and connected to the intervalometer for conditioning the intervalometer to the firing circuitry of the first or second launchers.

23. A firing device for rocket launchers adapted to carry and launch rockets which are ignited by means of electrical impulses, the firing device being energized by a remote electrical energy source and actuated by a remote firing switch; said firing device comprising a frame adapted to fit on the rocket launcher and an intervalometer carried by the frame, the intervalometer including drive means adapted to advance incrementally upon receipt of electrical impulses from the electrical energy source, a firing contactor advanced incrementally by the

drive means, a plurality of spaced firing contacts connected to the rockets and lying in the path of the contactor, the firing contactor being in electrical contact with the electrical energy source when it passes the firing contacts so that the rockets are ignited in successive order, a safety contactor advanced incrementally with the firing contactor by the drive means and having a dead portion, and a safety contact in electrical engagement with the safety contactor except when it aligns with the dead portion, the safety contact and safety contactor being connected in series between the electrical energy source and drive means so that the electric circuit to the drive means is interrupted when the safety contact aligns with the dead portion whereby to define a load position, the location of the dead portion with respect to the firing contactor being such that at least two incremental advances are required to move the contactor beyond the load position and onto the first firing contact, the incremental advance immediately prior to the first contact placing the intervalometer in an arm position wherein the safety contact and safety contactor are in electrical contact so that when the firing switch is closed the firing contactor will advance to the first firing contact and ignite a rocket.

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SAMUEL W. ENGLE, *Primary Examiner.*