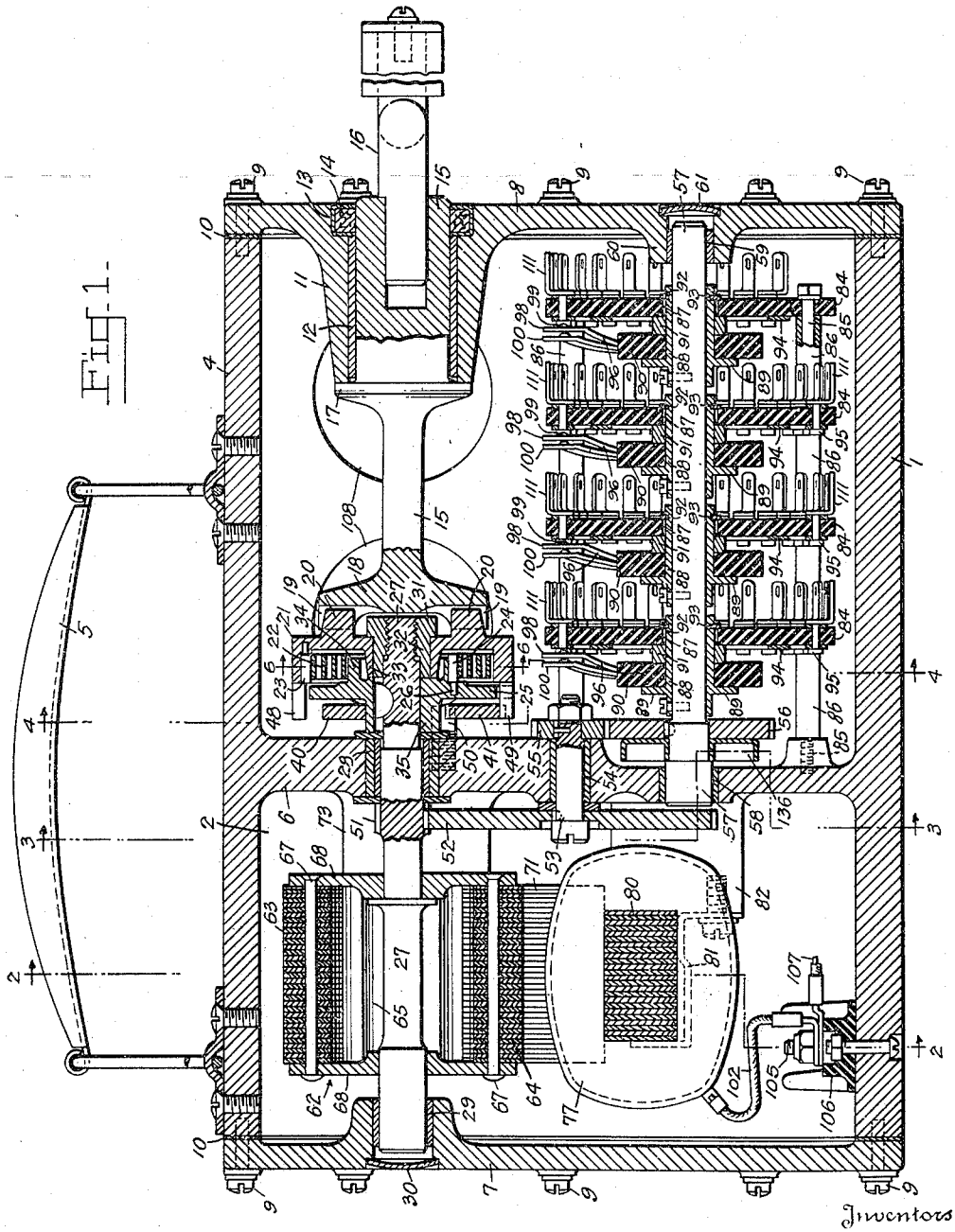
Nov. 15, 1949 P. T. NIMS ET AL 2,488,228

FIRING SWITCH FOR ROCKET LAUNCHERS

Filed May 27, 1947 4 Sheets-Sheet 1

Fig. 1.



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Filed May 27, 1947 4 Sheets-Sheet 2

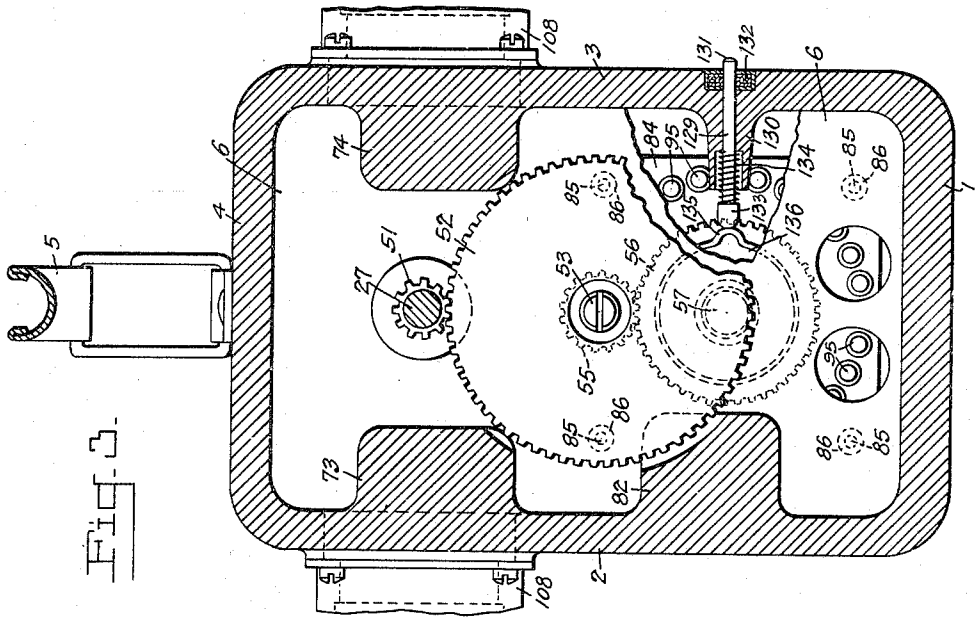


Fig. 3.

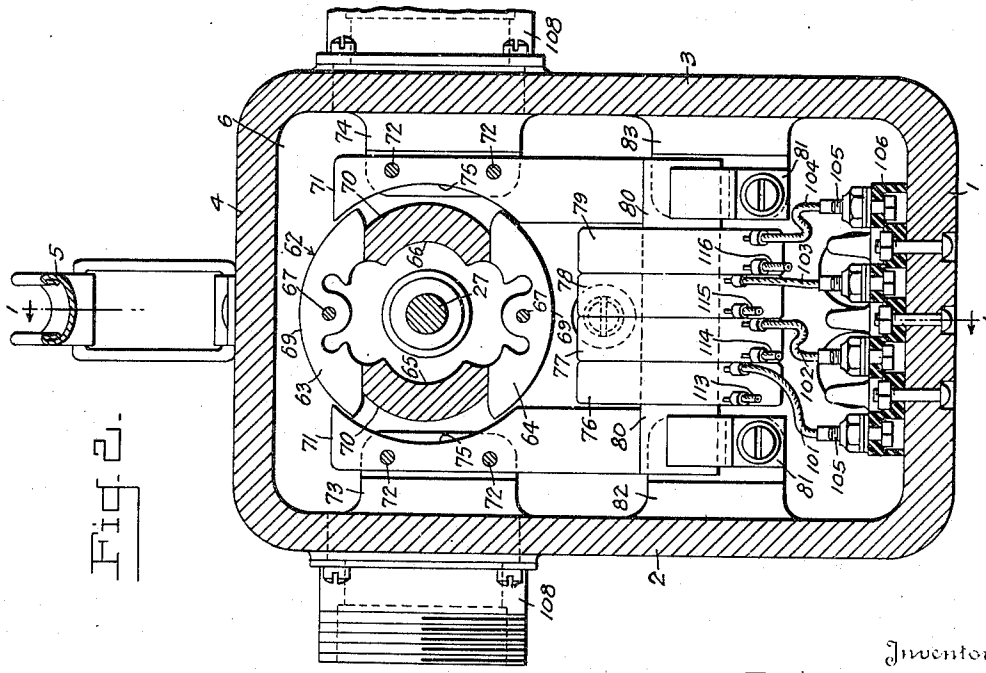


Fig. 2.

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Filed May 27, 1947 4 Sheets-Sheet 3

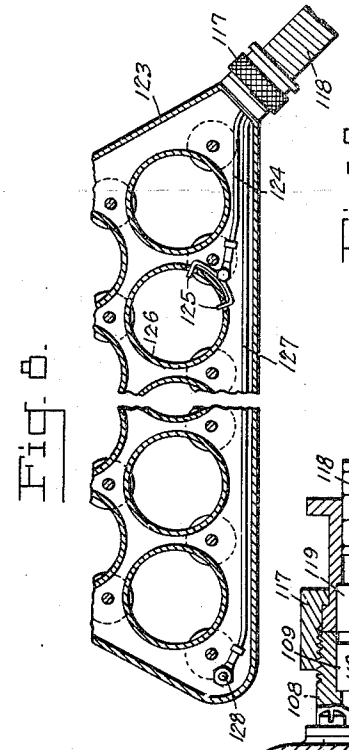


Fig. 8.

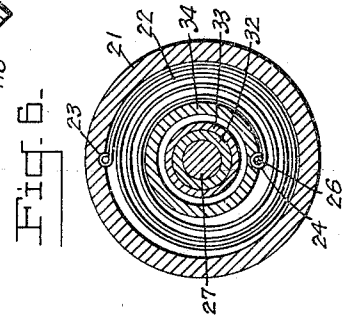


Fig. 6.

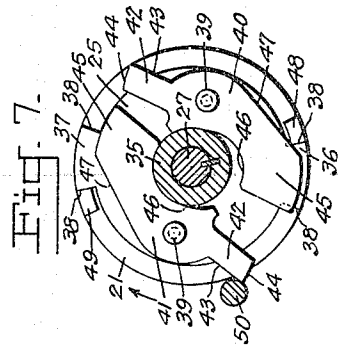


Fig. 7.

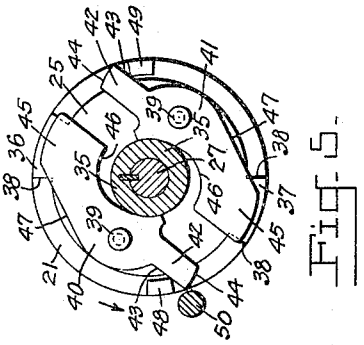


Fig. 5.

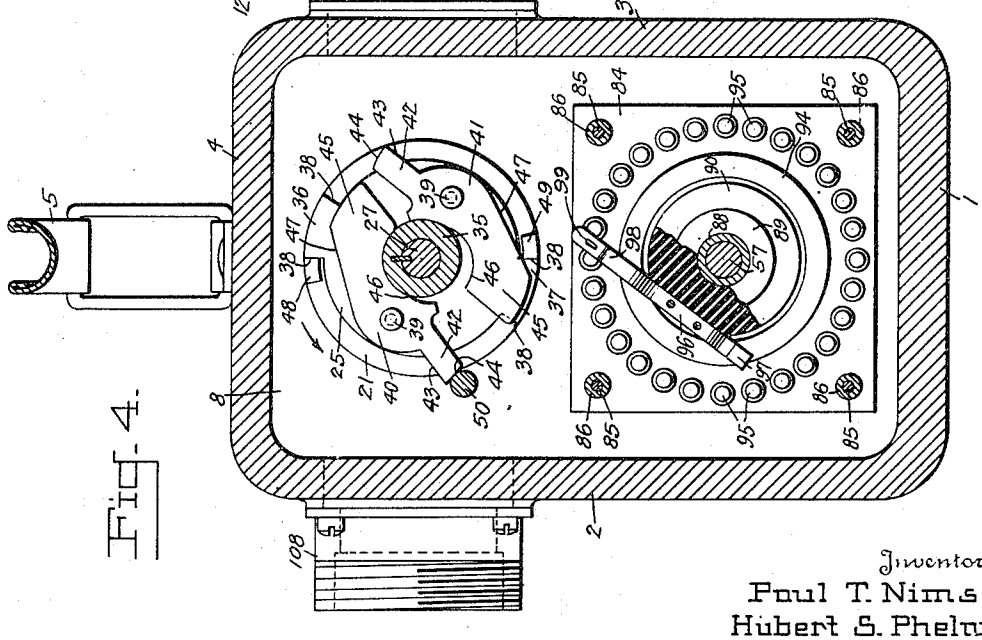


Fig. 4.

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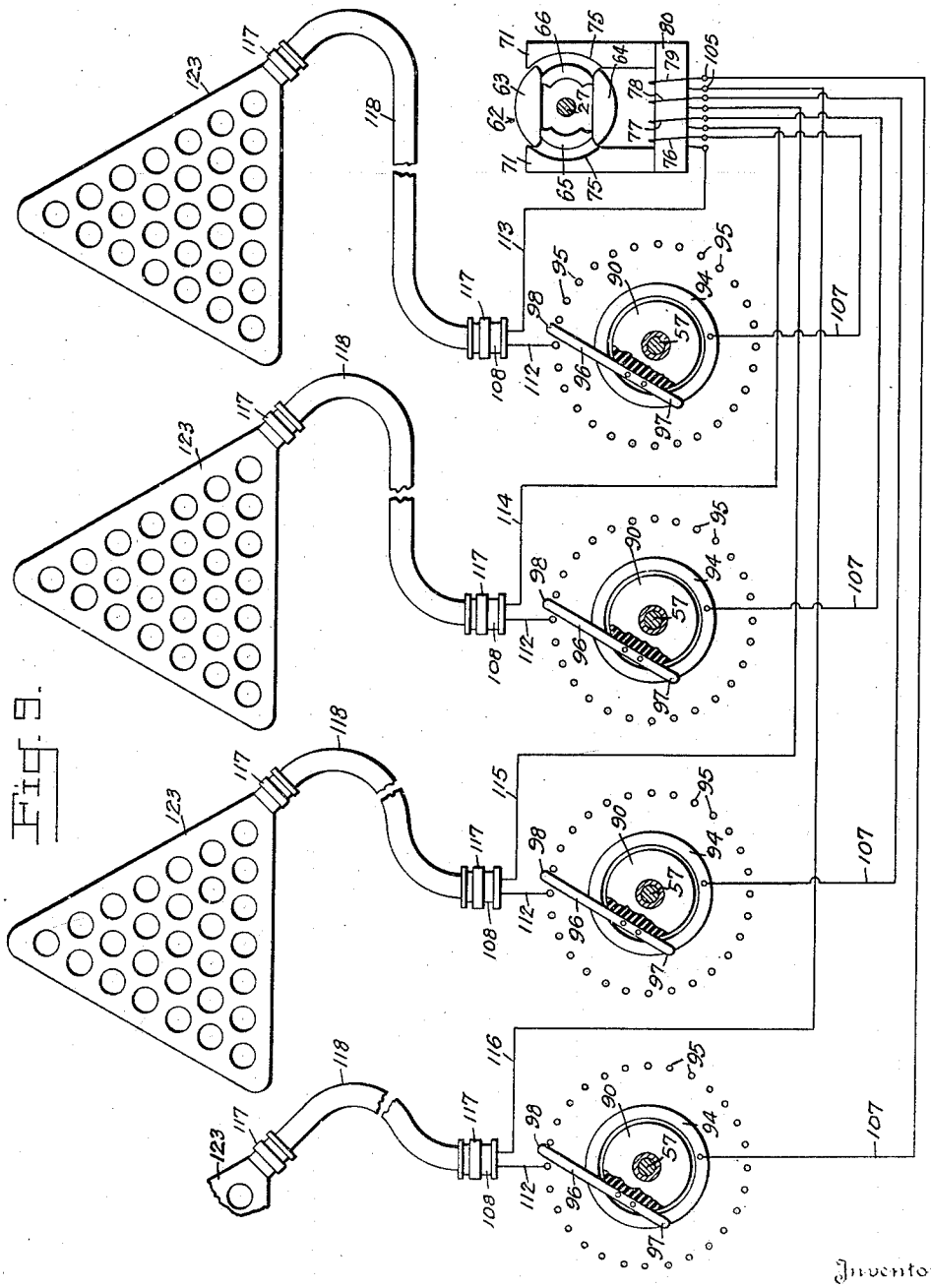


Fig. 9.

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Patented Nov. 15, 1949 2,488,228

UNITED STATES PATENT OFFICE

2,488,228

FIRING SWITCH FOR ROCKET LAUNCHERS

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Application May 27, 1947, Serial No. 750,808

2 Claims. (Cl. 175—115)

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This invention relates to a new and useful improvement in firing switches for rocket launchers and is designed to provide a device for firing salvos of electrically ignited rockets launched from a plurality of launcher frames, by manual operation of a magneto and a plurality of coils and distributors. The particularly novel and useful feature of the device is the peculiar relation of the magneto and coils, for the current generation, and the distributors, whereby the peak current generation by the coils and the closing of the circuits by the distributors precisely coincide. Another valuable feature is the actuation of the magneto by the manual driving means through an impulse coupling, the rotor of the magneto being driven by spring means precisely tensioned by the manual driving means. The novel structure effects uniform high-speed driving of the rotor to produce a current, from each of a plurality of coils, of voltage requisite for firing, regardless of the speed of the manual driving means. The device can be driven reversely whereby all of the distributors can be "set" for initial firing of a selected series of rockets in the launcher frames, respectively. This adjustment of the distributors is effected by mere reversal of direction of movement of the manual driving means, the device requiring no adjusting modification. Such reverse movement permits adjustment of the distributors for effecting contact to such rockets as may have failed to ignite.

The invention provides an improved electric switch suitable for many uses other than firing rockets, such as for instance for progressive or selective blasting.

While a specific embodiment of the invention is illustrated in the drawings filed herewith and is hereinafter fully described, it is to be distinctly understood that the invention is not considered to be limited to said specific embodiment and that its scope is defined by the claims appended hereto.

In the drawings:

Figure 1 is a longitudinal vertical section on the line 1—1 of Figure 2, in the direction of the arrows, parts being broken away;

Figure 2 is a transverse, vertical section on the line 2—2 of Figure 1, in the direction of the arrows;

Figure 3 is a transverse, vertical section on the line 3—3 of Figure 1, in the direction of the arrows, parts being broken away;

Figure 4 is a transverse, vertical section on the line 4—4 of Figure 1, in the direction of the arrows, parts being broken away;

Figure 5 is a detail view of the impulse coupling

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shown in Figure 4, the parts being in releasing position;

Figure 6 is a transverse, vertical section on the line 6—6 of Figure 1, in the direction of the arrows;

Figure 7 is a detail view, similar to Figure 5, the parts being in reversing position;

Figure 8 is a fragmentary, vertical section of a rocket launcher frame;

Figure 9 is a wiring diagram.

As illustrated in the drawings, the firing switch is housed in a casing comprising a bottom 1, side walls 2 and 3, and top 4 on which is suitably mounted a carrying handle 5. The casing has a vertical partition 6 from bottom 1 to top 4, and end walls 7 and 8, removably mounted on bottom 1, side walls 2 and 3 and top 4 by bolts 9 and provided with sealing gaskets 10. End wall 8 has an enlarged portion 11 forming a boss extending into the casing and having a bearing 12 and concentric socket 13 for a seal 14. A driving shaft 15 is journaled in bearing 12 and seal 14 with one of its ends projecting out of the casing and slotted to receive the co-acting end of a removable hand crank 16. Shaft 15 has a thrust collar 17 bearing on the inner end of portion 11, and a head 18 on the inner end of shaft 15. Head 18 has a pair of diametrically spaced female coupling members 19 receiving co-acting male members 20 diametrically spaced on a circular drum 21 co-axial with shaft 15, and constituting one member of the impulse coupling. A helical spring 22 disposed in drum 21 has its outer end 23 attached to drum 21 and its inner end 24 attached to a plate 25 constituting the other member of the impulse coupling, by a post 26 on plate 25 and projecting into drum 21 (Figures 1 and 6). Plate 25 is keyed on a driven shaft 27 journaled in aligned bearings 28 and 29 in partition 6 and end wall 7, respectively, co-axial with driving shaft 15. Bearing 29 has a closure cap 30. It will be noted (Figure 1) that the right end of the driven shaft 27 is slightly spaced from the left end of head 18 of the driving shaft 15, and has threaded thereon a nut 31 with a sleeve 32 about shaft 27 and serving as a bearing for central flange 33 of the drum 21, thereby mounting drum 21 for free rotation about shaft 27, between the nut 31 and plate 25. Plate 25 has a circular flange 34 concentric with shaft 27 and projecting into drum 21 adjacent flange 33 of drum 21. Plate 25 has a central sleeve 35 about shaft 27 spacing plate 25 from bearing 28 in partition 6. Plate 25 has, at diametrically opposite portions on its periphery, radial extensions 36 and 37

forming abutments 38 (Figures 4, 5 and 7), and a pair of pintles 39 diametrically spaced from sleeve 35, on which are pivoted latches 40 and 41 having heads 42 having straight edges 43 and convex ends 44 concentric with pintles 39, and tails 45 having inner concave edges 46 and outer shoulders 47. Drum 21 has a pair of lugs 48 and 49 on diametrically opposite sides of drum 21 and projecting parallel with axis of shaft 27 over plate 25, for co-action with edegs 43 of heads 42 of latches 40 and 41, and with abutments 38 of extensions 36 and 37. A cylindrical stop-pin 50 is mounted on the partition 6 adjacent sleeve 35 and so disposed as to engage the convex ends 44 of heads 42 of latches 40 and 41 when heads 42 swing outwardly (Figure 4) when latches 40 and 41 pivot about pintles 39.

The driven shaft 27 has formed thereon, at its portion projecting through bearing 28 in partition 6, a pinion 51 meshing with a gear 52 keyed on a shaft 53 journaled in a bearing 54 in partition 6. Shaft 53 has, on its end projected through partition 6 opposite to its end carrying gear 52, a pinion 55 meshing with a gear 56 keyed on the distributor shaft 57 journaled in aligned bearings 58 and 59 in partition 6 and enlarged portion 60 of the end wall 8, respectively. Bearing 59 has a closure cap 61.

The driven shaft 27 carries the magneto rotor 62 composed of laminated magnetic-metal transfer members 63 and 64 for permanent magnet members 65 and 66 welded between members 63 and 64 which are mounted by bolts 67 on non-magnetic end plates 68 mounted on shaft 27. Members 63 and 64 have convex ends 69 concentric with shaft 27, and members 65 and 66 have convex ends 70, on radii less than those of ends 69 (Figure 2). Pole shoes 71 of the magneto are mounted by bolts 72 on lugs 73 and 74 on side walls 2 and 3, respectively, and have concave portions 75 concentric with rotor 62 on radii slightly greater than ends 69. Four coils 76, 77, 78 and 79 have a common core 80 disposed against the ends of shoes 71 by clips 81 on lugs 82 and 83 on side walls 2 and 3, to connect shoes 71 through core 80, the coils 76, 77, 78 and 79 being between the shoes 71.

The device has four distributors (Figure 1), each one of which has a rectangular panel 84 of suitable insulating material. These panels 84 are mounted on partition 6 by four bolts 85 with spacing sleeves 86 to properly space panels 84. Panels 84 have central orifices 87 through which passes freely the rotatable shaft 57 above mentioned. Suitably bolted on the shaft 57 there are four sleeves 88. Each sleeve 88 has a peripheral flange 89 to which is attached a disc 90, of suitable insulating material, about shaft 57. Each sleeve 88 extends through the orifice 87 of one of the panels 84 and has a spacing collar 91 between the panel 84 and the disc 90, and a snap ring 92 in a peripheral groove 93 in sleeve 88 and disposed on the face of panel 84 opposite that against which is the spacing collar 91. Each panel 84 has a contact ring 94 suitably mounted concentric with shaft 57 on the face of panel 84 adjacent disc 90, and on the same face a series of twenty-eight contact plates 95 arranged symmetrically in a circle concentric with shaft 57. Each disc 90 has mounted thereon a double contact arm 96 having its longitudinal axis normal to the radius of disc 90 and having one end 97 projecting from disc 90 in constant contact with contact ring 94 and its other end 98 projecting from disc 90 over contact plates 95. The end 98 has a struck-up head 99 to effect contact between arm 96 and contact plates 95, successively, as shaft 57 is rotated (Figure 4). It will be noted that head 99 is so designed, and contacts 95 are so relatively spaced that head 99 passes off of the plates 95 to break the circuit, in its passage from one plate 95 to the next. Spring fingers 100 are mounted on each disc 90 to press ends 97 and 98 into contact with ring 94 and contact plates 95, respectively.

The coils 76, 77, 78 and 79 have wires 101, 102, 103 and 104, respectively, which connect one end of each of said coils with binding posts 105, respectively, in an insulated connector block 106 mounted on bottom 1 of the casing. Binding posts 105 are connected by wires 107 to the contact rings 94, respectively.

The casing of the device has four outlets 108 arranged in pairs in side walls 2 and 3. Each outlet 108 has a terminal block 109 provided with twenty-nine female coupling members 110 (Figure 4). Each contact plate 95 has a connector 111 by which it is connected by a wire 112 to one of the coupling members 110. It is to be understood that wires 112 connect contact plates 95 of the insulated panels 84 of the four distributors with coupling members 110 of the terminal blocks 109 of the four outlets 108, respectively. As there are twenty-eight contact plates 95 on each insulated panel 84, twenty-eight couplings 110 in each block 109 are connected by wires 112 to plates 95.

The coils 76, 77, 78 and 79 have wires 113, 114, 115 and 116, respectively, which connect the other end of each coil with the remaining couplings 110 in blocks 109, respectively.

Each outlet 108 has threaded thereon a coupling collar 117 for removably attaching a cable 118 having a terminal block 119 provided with twenty-nine male coupling members 120 co-acting with coupling members 110 of blocks 109 (Figure 4). Each cable 118 has twenty-eight wires 121 connected by couplings 110 and 120 to wires 112 of one of the outlets 108, and a single wire 122. The four wires 122 are connected by couplings 110 and 120 with wires 113, 114, 115 and 116, respectively. Cables 118 are connected to four rocket launcher frames 123, respectively, by terminal blocks having co-acting coupling members, and coupling collars such as above described. Wires 121 of each cable 118 are connected thereby with wires 124 connected with contact points 125 in each of twenty-eight rocket-receiving sockets 126 of one of four frames 123 (Figure 8). Contact points 125 co-act with the electrical firing mechanism of the rocket (not shown). The wire 122 of each cable 118 is connected by the couplings, of cable 118 and frame 123, with a wire 127 of one of the frames 123 which is suitably grounded at 128 on frame 123, the said firing mechanism of the rocket being also grounded on the frame 123 when the rocket is seated in socket 126.

Figure 9 shows diagrammatically the above described circuits. One end of each of the coils 76, 77, 78 and 79 is connected by a wire 107 to the contact ring 94 of one of the insulated panels 84 of the four distributors. Each ring 94 is connected by contact arm 96 with the contact plates 95, successively. Each plate 95 is connected by its wire 112 and cable 118, and, as shown in Figure 8, by wire 124 and contact points 125, with the firing mechanism of one of the rockets. The other ends of the coils 76, 77, 78 and 79 are connected by wires 113, 114, 115 and 116, respectively,

and through cables 118 (Figure 8) to wires 127 grounded on the frame 123, respectively.

Since the casing of the device is made of opaque material and the rotatable contact arms 96 of the four distributors cannot, therefore, be observed by the operator, the device is provided with means to indicate the positions of contact arms 96 when firing is to be commenced. An indicator rod 129 is slidable in an enlargement 130 on side wall 3 of the casing of the device (Figure 3) with one end 131 extended through a seal 132 in wall 3 and its other end 133 formed as an enlarged head and provided with a coil spring 134 about rod 129 and confined between enlargement 130 and the head 133 to bias rod 129 to the left as viewed in Figure 3. Rod 129 is reciprocated by a cam shoulder 135 on the periphery of a drum 136 fixed on shaft 57 adjacent gear 56 (Figure 1). It is obvious that when drum 136 is properly disposed on shaft 57, in relation to the disposition of arms 96 on shaft 57, rotation of shaft 57 will project the end 131 of rod 129 outwardly of wall 3 to indicate the position of arms 96.

The device operates as follows: When the crank handle 16 has been connected with the driving shaft 15 and its outer portion is horizontally disposed (Figure 1), the rotor 62 of the magneto is so disposed that its magnets 65 and 66 are positioned adjacent the pole shoes 71, respectively, (Figure 2) and the contact arm 96, of each of the four distributors, is so positioned that the struck-up head 99 of its end 98 is intermediate two of the contact plates 95 (Figure 4). The impulse coupling is positioned as shown in Figures 1, 4, and 6. It will be noted (Figure 4) that plate 25 is so disposed that the pintle 39 on which is pivoted latch 40 is above the horizontal diameter of plate 25 causing tail 45 of latch 40 to drop, its inner edge 46 contacting sleeve 35 of plate 25, thereby projecting head 42 of latch 40 radially of plate 25, the convex end 44 of head 42 engaging stop-pin 50 thereby immobilizing plate 25 and driven shaft 27 against rotation.

The crank handle 16 is moved through an arc of 180° thereby turning driving shaft 15, and through coupling members 19 and 20 rotating drum 21 counterclockwise as viewed in Figure 4. This rotation of drum 21 about immobilized plate 25 and shaft 27 tensions spring 22 about flange 34 and moves drum-lug 48 from its position shown in Figure 4 to the position of lug 49 in Figure 4. When lug 48 has moved 90°, reaching its position shown in Figure 5, it has moved over edge 43 of head 42 of latch 40 to retract latch 40, the convex end 44 of head 42 moving off of the arcuate surface of stop-pin 50. This retraction of latch 40 releases plate 25 which is rotated with shaft 27 at high-speed through an arc of 180°, under impulse of tensioned spring 22. It will be noted (Figures 4 and 5) that this spring-actuated rotation of plate 25 brings pintle 39 of latch 41 above the horizontal diameter of plate 25, causing tail 45 of latch 41 to drop thereby projecting head 42 of latch 14, so that when by the said rotation of plate 25 the latch 41 is brought to the position, in which latch 40 is shown in Figure 4, the end 44 of head 42 of latch 41 will engage the stop-pin 50 thereby again immobilizing the plate 25 and shaft 27 after rotating through an arc of 180°.

This high-speed movement of shaft 27, driving rotor 62 of the magneto, at high-speed through an arc of 180° counterclockwise as viewed in Figure 2, causes the magneto to perform its normal function, viz. this high-speed movement of the rotor 62 produces a flux change in the magnetic

circuit, which links each of the coils 76, 77, 78 and 79, producing from each coil an electric current of the desired voltage.

The rotation of shaft 27 drives shaft 57, through their associated gearing, moving the heads 99 on the four contact arms 96, counterclockwise (Figure 4), onto adjacent contact plates 95, respectively, thereby closing the four circuits from coils 76, 77, 78 and 79 to the electric firing mechanism of one of the rockets in each of the four frames 123.

It is to be noted (Figure 1) that the four contact arms 96 are so mounted on the shaft 57 as to contact corresponding plaes 95 of the four distributors to close the circuits, simultaneously to corresponding rockets in the four frames 123. Arms 96 are moved to contact one set of plates 95, on each of the said half-revolutions of shafts 15 and 27. The gearing is such that shaft 57 is driven through one revolution by fourteen revolutions of shafts 15 and 27. It is to be understood that the parts are so designed and related that the current generation and closing of the circuits precisely coincide, so that the heads 99 pass the axes of plates 95 during the period of peak current, and move from one plate 95 to the next during an interval of small or zero current. It will be noted that, by reason of the driving of the magneto rotor 62 by the tensioned spring 22 of the impulse coupling, uniform high-speed rotation of rotor 62 is effected, regardless of the speed of rotation of crank handle 16, to produce the desired rapid flux change generating the proper current to fire the rockets.

As the device is provided with the indicator rod 129, above described, the contact arms 96 can be adjusted relative to contact plates 95, preliminary to operation of the device for firing. To set the contact arms 96, as for instance to condition the device for firing Number 1 rocket in each of the four frames 123 by effecting contact between the arms 96 and contact plates 95 at the zeniths of the vertical diameters of the plates 84 (Figure 4), the crank handle 16 is rotated oppositely to its direction of rotation for firing, causing driving shaft 15, through couplings 19 and 20, to drive drum 21 clockwise as viewed in Figure 7. Lugs 48 and 49, engaging abutments 38 of extensions 36 and 37 of plate 25, effect direct drive of plate 25 and driven shaft 27. Straight edges 43 of heads 42 of latches 40 and 41, striking stop-pin 50, retract latches 40 and 41. Such rotation of driven shaft 27 effects such low-speed rotation of rotor 62 of the magneto relative to pole shoes 71 that coils 76, 77, 78 and 79 do not produce any current. Therefore, contact arms 96, driven by rotation of shaft 57 clockwise (Figure 4), pass over plates 95 innocuously.

It is obvious that the device can be thus conditioned to effect contact between arms 96 and any selected set of plates 95, on the initial operative rotation of crank handle 16, for initially firing a selected series of rockets in frames 123, and that the parts can be so related (Figures 3 and 4) that indicator rod 129 is projected by cam 135 when arms 96 are disposed so as to contact plates 95 for firing the Number 1 rocket in each frame 123.

Having described the invention, what we claim is:

1. In a firing switch for igniting electrically-fired rockets, the combination of a magneto; manually rotatable means for driving said magneto; an impulse coupling connecting said magneto and said driving means for producing sharp electrical impulses during uniform rotation of said

manually rotatable means; a plurality of electrically separate coils associated with said magneto for generation of currents, respectively, by operation of said magneto; a plurality of distributors, each having a rotatable contact arm and a plurality of contact plates; means for rotating said arms, by the driven magneto, to effect contact with their associated plates successively; and electrical connections between each of said coils and one of said contact arms, respectively, said impulse coupling being angularly synchronized with said magneto and distributors so that one of said sharp electrical impulses occurs at each successive contact between the rotating arms and their associated contact plates.

2. A firing device for igniting electrically fired rockets in rotation comprising, in combination, a continuously rotatably driving member, manually operable means for rotating said member, a driven shaft, an impulse coupling between said driving member and said driven shaft for storing energy during part of the continuous rotation of said driving member and delivering said energy in pulse form during another part of said continuous rotation to produce high-speed rotor pulses in

said driven shaft, a magneto rotor mounted on said driven shaft, magnetic poles on said rotor having non-polar areas between them, pole shoes associated with said rotor, a plurality of electrical coils having a common core connecting said pole shoes for producing a plurality of electrical currents, respectively, when said rotor is driven by said driven shaft, said impulse coupling being angularly synchronized with said rotor poles so that the high speed pulses occur as said rotor poles sweep past said pole shoes whereby the maximum voltage generated is increased.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
972,141	Porter et al.	Oct. 4, 1910
2,312,447	Schwarzmann et al.	Mar. 2, 1943
2,421,893	Lambert et al.	June 10, 1947