Jan. 8, 1952 W. E. LEEK 2,582,140

SHOOTING REST

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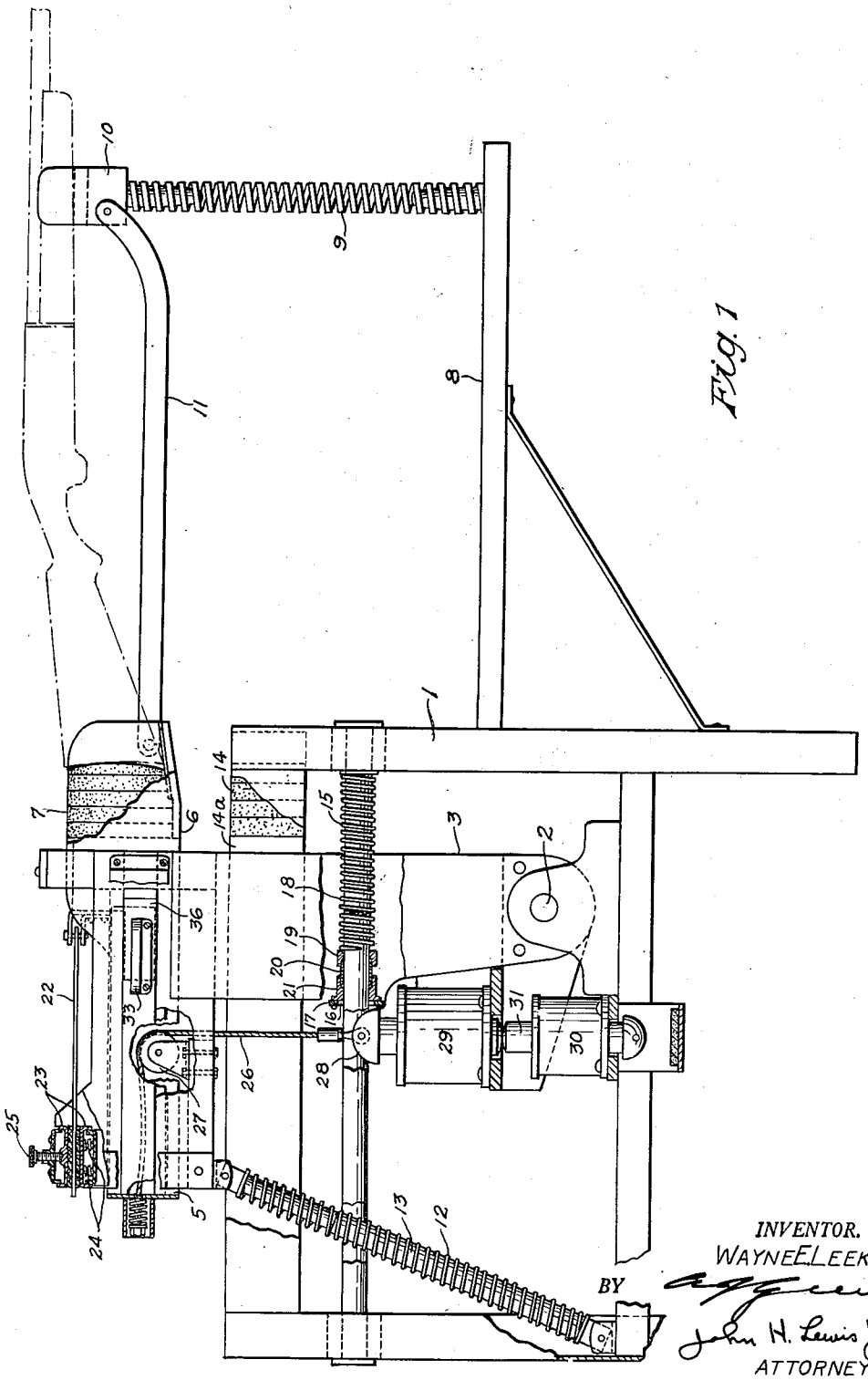


Fig. 1

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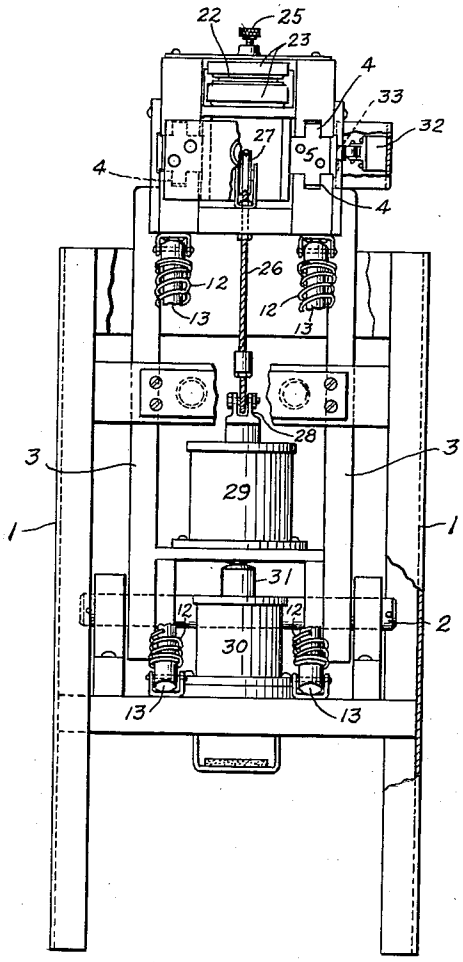


Fig. 2

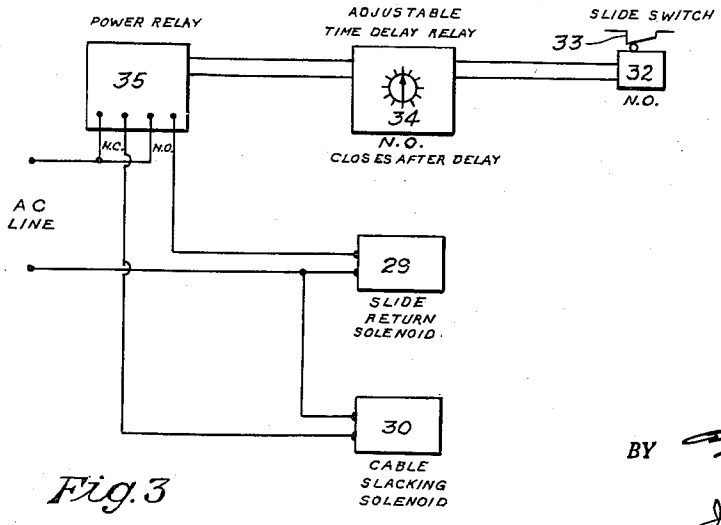


Fig. 3

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SHOOTING REST

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12 Claims. (Cl. 73—167)

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This invention relates to a shooting rest designed particularly for the casualty test firing of newly manufactured guns.

It is a well-known fact that guns tested in conventional machine rests where they are locked to a massive structure exhibit entirely different characteristics than they do when fired from the shoulder. These differences are most pronounced with repeating guns, and conventional machine rest testing of autoloading guns is substantially useless.

Since sporting firearms are designed to be fired from the shoulder, the obvious answer would be to employ test shooters to examine and fire all new guns, and this has been the practice particularly where autoloading guns were concerned. Such a course, however, is beset with difficulties. In the first place, newly developed guns are usually subjected to endurance tests which may run to 15,000 rounds per gun or more and an occasional gun from regular production will be withdrawn for a similar endurance test as a check on manufacturing practices. All regular production guns are test fired for 25 or more rounds as a final inspection to determine that they function satisfactorily in all respects. Such a test program takes a tremendous amount of daily shooting and the recoil from a 12-gauge shotgun, for example, is relatively severe. As a result, test shooters firing from the shoulder quickly tire and must be permitted to rest or be shifted to other work at frequent intervals.

Another not so obvious a disadvantage of manual casualty shooting lies in the fact that a hardened casualty shooter holds the gun in a different fashion from the typical hunter, and an automatic gun may function differently in his hands than in the hands of the field user. Further, as the casualty shooter tires, his style of holding and his reaction upon the operation of the gun mechanism changes.

All of these difficulties arise from the fact that no shooter presents a rigid base for the gun. The inevitable motion due to recoil brings into play inertia forces which have a vital effect upon the motion of recoiling parts of the gun proper and upon the feeding and ejection of cartridges therefrom. Unless the conditions of casualty testing substantially duplicate the conditions of field shooting, most of the time and expense devoted to casualty shooting is wasted.

The major object of this invention is the production of a shooting rest which is not subject to fatigue and which simulates quite accurately the other reactions of an average human shooter. As a result of the achievement of this objective,

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casualty shooters are relieved of the physical beating they have taken heretofore and their judgment of gun performance is not clouded by fatigue. Further, the gun operates under standardized conditions duplicating those of field use, facilitating the control of factory operations and the detection of any functional difficulties before the guns get into the hands of the sporting public.

In arriving at this invention, it was discovered that these objectives could be realized by flexibly supporting the gun from fore-end and breech stock as in normal use and opposing recoil thereof by a combination of three factors. These factors are:

First: The resilient force opposing compression of an elastic block which may be looked upon as analogous to the clothing and fleshy part of the human shoulder and permits approximately the same initial movement of the gun.

Second: A constant purely frictional force opposing movement of the elastic block relative to its supporting means. This force appears to be somewhat analogous to the muscular resistance of a human shooter to displacement of his shoulder relative to the heavy portion of his body.

Third: The inertia force opposing movement of a movably supported composite mass including the gun, the elastic block, and the supports therefor, which may be looked upon as analogous to the inertia of the torso of the human shooter and has a short movement built up more gradually than the shoulder movement.

To complete the analogy, spring and electrically operated solenoid means are provided and arranged to restore the mechanism to its initial position after a time delay sufficient to permit functioning of the gun mechanism.

The exact nature of the invention, as well as other objects and advantages thereof, will become apparent from consideration of the following specification referring to the attached drawings, in which:

Fig. 1 is a side elevational view partially in section, showing my improved shooting rest. A firearm in testing position is shown in dotted lines and the safety shields provided for the protection of the operator have been removed.

Fig. 2 is a rear elevational view, certain unimportant structural members having been broken away for clarity in illustration of major working components.

Fig. 3 is a block type wiring diagram.

Referring to the drawings by characters of reference, it will be seen that a main frame 1 is provided with a pivotal support 2 on which

there is mounted a rocker 3 provided in its upper portion with guideways 4, in which there is received a slide 5. The slide supports a saddle 6 in which the buttstock of a gun may be received in contact with a resilient padding 7. From inspection of the drawing it will be noted that the greater portion of the mass of the rocker assembly is concentrated in the region behind the saddle 6 and resilient pad 7. During the swinging movement of the rocker about the pivotal support 2, this greater portion of the mass follows an arcuate path and the whole movement may be considered to be analogous to the rocking of the torso of a shooter about his hip joints. Preferably, to maintain the analogy to the human shooter, the radius of this arcuate path is greater than about twelve inches, and in the example shown in the drawing is substantially twenty inches. An extension 8 from the frame mounts fore-end support springs 9 which are engaged with a cradle 10 in which the fore-end of a gun may be received and resiliently retained by the squeezing action of the cradle liner. A pair of links 11 connect the cradle to the slide 5, constraining these elements to move together in recoil.

A pair of light coil springs 12 are received on telescoping struts 13 and act between the frame 1 and the rocker 3 to urge a block 14a on the rocker into a position against a resilient stop 14. To prevent any jarring action in the counter-recoil movement, a pair of cylindrical members 15 are mounted on the frame 1 and pass through elongated holes 16 in a plate 17 secured to the rocker. Each of the members 15 supports a light coil spring 18, acting to oppose the counterrecoil movement and bearing at one end on the frame and, at the other end, upon a friction ring 19 provided with a conical wedging surface engaging a friction piece 20 which has a similar engagement with a second friction ring 21 in contact with the plate 17. It will be seen that these springs oppose the springs 12 and the balance of the forces of the springs should be so adjusted that the rocker will always return readily to its position against the resilient stop 14.

As previously noted, the slide 5 is supported on the rocker 3 in guideways 4, but the freedom of movement of the slide is restricted by a friction brake arrangement. This brake comprises a friction plate 22 attached to the slide and received between opposed friction shoes 23 faced with brake lining or other suitable material. The friction shoes are adjustably loaded as a result of their engagement between springs 24 and an adjusting screw 25, both secured to the rocker 3. This friction device applies a substantially constant resistance to movement of the slide relative to the rocker and may be pre-set at any desired value.

A cable 26 is attached to the slide and extends over a pulley 27 to the core 28 of a solenoid 29, which has the function of returning the slide to its forward position on the rocker in engagement with the pads 36 at the desired time. A second solenoid 30 is mounted on the frame 1 with its core 31 positioned to engage and lift the core 28 and slack the cable 26, thus permitting operation of the slide under the sole resistance applied by the friction shoes. As will be more fully explained in a succeeding paragraph, these solenoids are under the control of a normally open switch 32 mounted on the rocker and engageable with a cam 33 on the slide. As the slide recoils, an electrical delay circuit is initiated by the closing of switch 32 and, at a suitable time, actuates solenoid 29 to return the slide and then actuates solenoid 30 to slack the cable when the switch 32 has been again opened by return of the slide. The cable slacking solenoid 30 is mounted on the main frame but the core 28 of the solenoid 29 is, in the absence of current, free to slide in the solenoid and neither solenoid applies any resistance to the initial movement of either slide or rocker under the influence of the firing of a gun.

Referring specifically to Fig. 3, it will be seen that the normally open slide switch 32 is connected to an adjustable time delay relay 34. This time delay relay may be of any convenient normally open circuit type which can be arranged to close the circuit at a suitable adjustable interval after the closing of the switch 32. A General Electric vacuum-tube time delay relay, type CR7504–A3, has been found satisfactory and the range of available delay time should extend from about 100 milliseconds to one second. In view of the relatively low current handling capacity of such time delay relays, it is preferable to interpose a power relay 35 to actually distribute the power to the solenoids. This relay should be provided with a set of normally open contacts for the solenoid 29 and a set of normally closed contacts for the solenoid 30.

In operation, the recoil of the slide relative to the rocker moves the cam 33, resulting in closing the circuit through switch 32. The closing of this switch initiates the operation of the time delay relay which, after the desired interval, closes its circuit controlling the power relay. The operation of the power relay sends current through the normally open contacts to the solenoid 29 and by opening the normally closed contacts releases the solenoid 30. Energizing solenoid 29 causes the core 28 to be drawn in, and through the cable the slide is returned to normal position on the rocker. As the slide reaches its normal position, the cam 33 opens switch 32, the relays drop out, and solenoid 30 is energized through the normally closed contacts of power relay 35 to pick up the core 28 of solenoid 29 and slack off the cable 26. With an autoloading shotgun, for example, the time delay relay is set for a delay of about 300 milliseconds, which is ample to insure that the autoloading mechanism has functioned and will not be disturbed by the return movement. With a manually actuated gun, a period of one-half to one second is desirable to permit manual operation of the gun mechanism.

A study of time displacement curves taken during the firing of typical autoloading shotguns by typical shooters reveals that the movement of the gun during about the first 12 milliseconds is virtually all utilized in compressing the flesh of the human shooter or the analogous pad on the present mechanism. The shoulder or analogous shoulder slide of the present machine commences to move at about 12 milliseconds and at about 20 milliseconds reaches the same rate of displacement as the gun. During the above functioning, the body or the analogous rocker of this invention is slowly accelerated by the pull of the muscles resisting shoulder displacement or the frictional resistance to movement of the slide, although actual movement is slight during the first 20 to 25 milliseconds. The rocker accelerates and friction causes a relative deceleration of the slide so that the two members reach a substantially equal rate in about 50 milliseconds. It is at this

time that the recoiling barrel of the shotgun returns to its normal position in the gun mechanism and it seems probable that the transfer of the momentum of the barrel to the slide has influenced the movement of the slide. For about the next forty milliseconds the rocker, slide, and gun continue to move rearwardly at a fairly constant rate and another coincidence is noted in that deceleration commences at substantially the time the breech bolt of the gun picks up a shell from the carrier to chamber it in the barrel. The breech bolt does not close completely until about 150 milliseconds has elapsed, at which time the rocker has come to rest and started to return to its normal position. By about 300 milliseconds, the rocker has usually returned to its normal position and for an autoloading gun the time delay relay should function at about this time, to return the slide to its normal position. For a manually actuated gun the delay time may advantageously be enough greater to permit operation of the action, 700 milliseconds to one second being usually sufficient.

For purposes of illustration, it may be noted that a device constructed in accordance with this invention to be utilized in testing 12-gauge autoloading shotguns has a total weight of parts supported from the rocker pivot of approximately 50 pounds. The rocker return spring may be overcome by the exertion of from 3 to 5 pounds of force. The friction shoes of this illustrative unit are set to allow the slide, which weighs 10 pounds or less, to move relative to the rocker when 16 to 18 pounds of force are exerted. Under operating conditions, the slide may be expected to be displaced on the rocker about two inches and the upper end of the rocker to be moved rearwardly about one and three-quarters inches, making a total displacement of the gun buttstock of about three and three-quarters inches. These displacements were obtained in time substantially the same as the illustrative times referred to in the preceding paragraph. When these displacements of the gun, as supported by this invention, are plotted against time and compared to a similar curve obtained from the typical human shoulder, they are found to be almost identical.

It will be seen that insofar as gun movement and timing are concerned, this invention provides a support closely approximating that of the human shoulder. Moreover, this device does not get tired and may be set to provide constant duplicable conditions at any time. Further, when it is found that a particular type of malfunction is occurring in field tests of a new product by certain individuals, the particular conditions can be readily set up and enough tests fired to determine and correct the trouble.

Although a specific form of my invention has been shown and discussed in considerable detail, I do not consider that my invention is limited to this particular embodiment. For an exact statement of the limitations upon the scope of my invention, reference may be made to the claims appearing herein.

I claim:

1. A shooting rest comprising a base; an inertia mass supported on said base for recoiling movement away from a normal position on said base; a member mounted on said mass and movable by recoil with respect to the mass along a path substantially coincident with the path of movement of said mass and away from a normal position on said mass; friction brake means engaged between the member and the mass resisting relative movement thereof; a resilient body engaged with said member; and means to flexibly support a gun for shooting with its buttstock in recoil force transmitting engagement only with the resilient body, whereby the force of recoil will be transmitted from the gun through said resilient body to said member and from said member through said friction brake means to said inertia mass.

2. A shooting rest as described in claim 1, including means to return said mass to said normal position after firing.

3. A shooting rest as described in claim 2, including means inoperative during departure of said member from normal position to return said member to normal position on said mass after firing.

4. A shooting rest as described in claim 3, said means to return the member comprising electrical solenoid means operated from an external source of power.

5. A shooting rest as described in claim 4, including a switch mounted on said mass; a switch operator on said member arranged to operate said switch when the member departs from said normal position; electrical time delay relay means actuated by said switch, said relay means being connected between said source of power and said solenoid to control the transmission of power to said solenoid, the time delay being such as to delay the application of power to said solenoid means until after the gun mechanism has completed functioning.

6. A shooting rest as described in claim 1, said mass being swingably mounted to move the portion thereof aligned with said resilient body in an arcuate path of radius greater than twelve inches.

7. A shooting rest as described in claim 6, including light spring means arranged to return said mass to normal position; relatively lighter spring means arranged to oppose said return; and friction brake means associated with said lighter spring means to regulate the rate of said return.

8. A shooting rest as described in claim 7, said member being mounted for rectilinear movement on said swingably mounted mass and provided with a friction plate movable with the member; and adjustable friction shoes mounted on said mass in engagement with said friction plate to frictionally oppose rectilinear movement of the member on said mass.

9. A shooting rest as described in claim 8, including a pull-in solenoid mounted on the mass; a core in said solenoid coupled to said member and pulled thereby partially out of said solenoid when said member departs from normal position on said mass, said core being pulled back into the solenoid to restore the member to normal position when the solenoid is energized.

10. A shooting rest as described in claim 9, said core being coupled to the member by a flexible cable, said rest including a second solenoid having a core arranged to return the core of said first solenoid from its energized position to a normal rest position and thereby slack said flexible cable.

11. A shooting rest as described in claim 10, including electrical control means actuated by departure of said member from normal position on said mass to energize said first solenoid for returning said member to normal position after the gun has fired and actuated by return of said

member to normal position on said mass to de-energize said first solenoid and energize said second solenoid to free said member from restraint by the core of the first solenoid after the member has been returned to normal position.

12. A shooting rest as described in claim 11, said electrical control means including a switch; an operator for said switch constructed and arranged to operate said switch in response to displacement of said member from normal position on said mass, and an adjustable time delay relay started in time delay operation by operation of said switch and arranged to energize said first solenoid to return said member and de-

energize said second solenoid to permit movement of the core of the first solenoid at a predetermined time after operation of said switch.

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