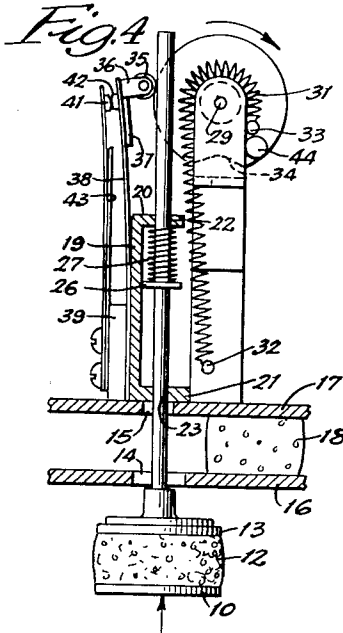
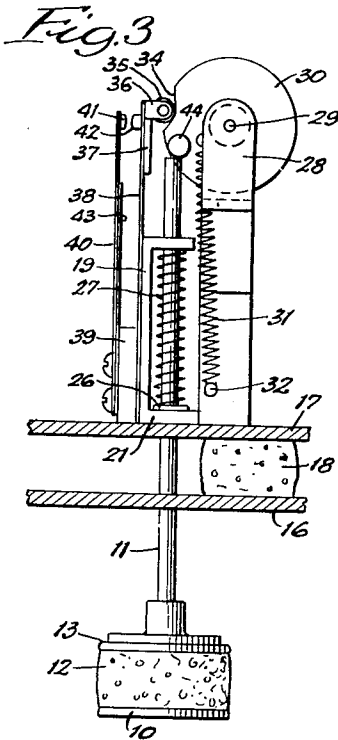
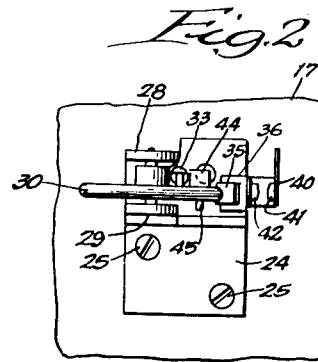
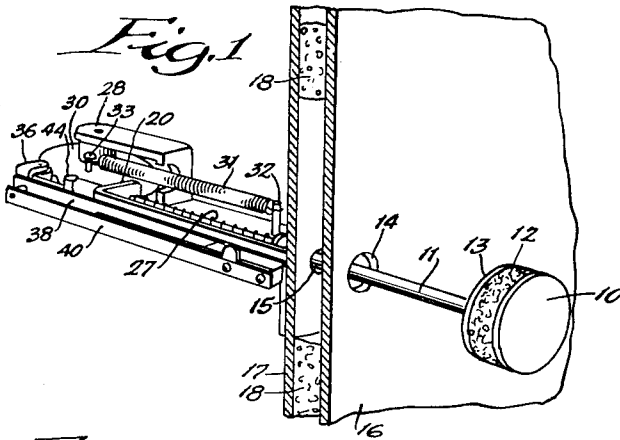


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W. A. TRATSCH
IMPACT SWITCH DEVICE

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2,733,310

IMPACT SWITCH DEVICE

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This invention relates to an over-running switch wherein the period of contact in response to an actuating force is greatly increased over and above that which would normally be available from such force so as to provide for the generation or the formation of a signal which would otherwise not be recorded.

The improvement herein can best be described in operation in a specific application but it will be understood that the over-running signal device embodying features of this invention will have numerous applications other than that hereinafter described. In a shooting gallery in which missiles or other pellets are directed at high velocity toward a target, the target very often is mounted on the end of a push rod which is resiliently urged toward its normal extended position by spring members or the like. When a hit is made and the target is struck by a missile traveling at high speed, the impact causes the push rod almost instantaneously to be displaced to its rearward position of adjustment and the spring member causes the push rod to rebound almost as quickly for return to its extended position. As a result, the push rod is displaced from its normal position only for a small fraction of a second which generally is insufficient time to record a signal or registering the hit by a switch adapted to be operated during displacement of the push rod.

It is an object of this invention to produce an over-running signal device of the type described which, in response to impact, functions to increase the effect thereof for a time to enable sufficient contact to be made for positive generation of a signal.

It is another object of this invention to translate forces made available upon impact to greatly increase the effect thereof over and above that normally available in response to the applied force.

More specifically, it is an object of this invention to translate movement of an impacted member to give the effect of displacement thereof for a greater length of time than that of actual displacement so as to prolong the reaction thereto while the members return to normal position, and it is a related object to provide a switch means operated in response to such translated forces to provide a contact for a period of time sufficient to signal the impact.

These and other objects and advantages of this invention will hereinafter appear and for purposes of illustration, but not of limitation, an embodiment of the invention is shown in the accompanying drawing in which:

Figure 1 is a perspective elevational view in section of a signal device embodying features of this invention;

Figure 2 is an elevational view taken from the far end of the device shown in Figure 1;

Figure 3 is a top plan view of the device shown in Figure 1 in its normal position, and

Figure 4 is a top plan view of the device shown in Figure 1 in its operated position.

As shown in the drawings, the disc 10 formed of metal or other material capable of resisting disintegration upon

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being impacted by a missile traveling at high speed, is mounted on the end of a push rod 11 shiftable endwise between its normal extended position, illustrated in Figure 3, and its retracted position, illustrated in Figure

4. It is preferred to mount the disc plate 10 on the end of the push rod 11 with a cushioning member 12 which separates the disc 10 from a cap 13 to absorb some of the impact. The rod 11 extends through aligned openings 14 and 15 in spaced outer and inner walls 16 and 17, respectively, having a cushioning material 18 therebetween further to absorb the shock as transmitted from the cap 13 on the push rod when actuated to retracted position. The push rod is supported for longitudinal movement by a supporting bracket 19 having depending flanges 20 and 21 provided with openings 22 and 23 which are aligned with each other and with openings 14 and 15 and through which the push rod 11 slidably extends. The bracket 19 is secured to a flanged plate 24 fixed as by screws 25 to the rear wall 17. A stop in the form of a disc or pin is fixed to an intermediate portion of the push rod 11 positioned between the flanges 20 and 21 to determine the extended or normal position of adjustment upon abutment against the inner wall of the flange 21. The push rod is resiliently urged towards its extended or normal position by a coil spring 27 through which the push rod 11 extends and which has one end bearing against the inner face of the rear flange 20 while the other end bears against the stop 26.

A yoke 28 extending rearwardly from the end of the bracket 24 has aligned openings in the end portion thereof for rotatably mounting a shaft 29 having a disc wheel 30 fixed to an intermediate portion thereof and preferably closely adjacent one of the legs of the yoke for free rotational movement. The disc wheel 30 is constantly urged for rotational movement in the counterclockwise direction, when viewed in Figures 3 and 4, by a coil spring 31 anchored at one end onto a stub 32 extending laterally from a forward portion of the bracket 24 while the other end of the spring is anchored onto a pin 33 which is offset from the center of the disc wheel 30.

The disc wheel is formed with a groove 34 or cutout in a peripheral portion thereof in position to receive a following member such as a cam or roller 35 mounted for free rotational movement between free depending arms 36 on the end of a bracket 37 fixed to the underside of a switch arm 38. The switch arm 38 is separated by an insulating member 39 from a second switch arm 40 extending in spaced parallel relation with the first. Contact points 41 on the end of arm 40 and 42 on the end of arm 38 remain separated when the arm 38 and 40 extend in their normal spaced apart relation but point 42 is adapted to contact point 41 when arm 38 is deflected outwardly in the direction of arm 40 upon rotational movement of the disc wheel 30 to displace the follower 35 from the cutout 34 and onto the periphery of the disc wheel 30. An auxiliary arm 43 extends in contacting relation with the underside of switch arm 40 but is separate therefrom to impart greater resiliency and supports the arm 40 in its normal position.

Fixed to extend laterally from an outer portion of the disc wheel and offset from the center is a stub shaft 44 which is adapted to lie in the path of the end of the push rod 11 when the disc plate is in its normal position with the follower 35 seated within the groove of cutout 34. The stub shaft is preferably in alignment with the end of the push rod 11 when the latter is in its normal position of adjustment so that the end of the push rod will function as a stop upon engagement by the stub shaft to position the disc wheel in its starting position of adjustment with the follower 35 in the groove 34. It is preferred to have the stub shaft aligned with the lower portion of the push rod 11 so that the push rod will

remain in contact with the stub shaft for a greater length of time as the stud shaft rises during initial rotation of the disc wheel and then falls from the path thereof as the disc wheel is rotated further about its center.

In operation, the disc wheel 30 is normally positioned with the follower 35 seated within the groove 34 and with the stub shaft 44 adjacent the end and in the path of the push rod 11 while the latter is in its normal extended position. When the disc plate 10 is struck by a missile traveling at high velocity, the push rod is displaced rearwardly at high speed until the cap 13 engages the front wall 16 to prevent further displacement thereof. The jarring impact imparted to the push rod is transmitted directly to the disc wheel through the stub shaft 44. As a result, the disc wheel receives a moment of inertia which causes it to turn beyond the point of actual displacement by the push rod 11 for added rotation of an amount limited upon engagement of a stop pin 45, extending laterally from the disc wheel 30 and one of the adjacent arms of the yoke 28. Such arresting movement is adapted to be effected before the disc wheel turns through an angle of 360°. As the disc wheel is rotated from its normal position, the follower 35 is cammed upwardly from the groove 34 onto the periphery of the wheel and conjointly causes deflection of the switch arm 38 to an extent to make contact between the points 42 and 41 of the switch arms to impart a signal.

While the spring 27 functions to effect almost immediate return of the push rod 11 even before the disc wheel is stopped in its rotational movement in the displaced direction, the points 41 and 42 remain in contact until the disc wheel has completed its rotation in one direction and is returned by spring 31 to its normal position of adjustment which permits the follower 35 once again to enter the groove 34 and permits the switch arms 38 and 40 to return to their normal spaced relation.

It will be evident from the description that the lapse of time of the displacement of the disc wheel from normal position to return responsive to the force reaction from striking the disc plate 10 will be considerably greater than the momentary displacement of the push rod in response to such impact. With the switch parts dependent in their operation on the disc wheel rather than the push rod, the time of contact to make the switch is extended to insure the recording of a signal for indicating a hit.

It will be apparent that the time delay or extending mechanism of the type described in connection with an electrical switch may be adapted also for use with other signalling devices that require longer time than is ordinarily available to record an impact of one type or another.

It will be understood that the concepts of this invention are applicable to other recording devices responsive to impact and that changes may be made in the details of construction, arrangement and operation without departing from the spirit of the invention, especially as defined in the following claims.

I claim:

1. In a signal device which is responsive to impact, a shaft shiftable longitudinally between extended and impacted positions of adjustment, means resiliently urging said shaft to return towards extended position, a member mounted for rotational movement from starting position to an operated position and having a recess in an edge portion thereof, means resiliently urging the member towards starting position, means fixed to a portion of said member offset from its axis of rotation and lying in the path of said shaft when in starting position for engagement to effect rotational movement of said member in the direction away from starting position, means for arresting movement of said member in the direction away from starting position before making a complete revolution, and means resiliently engaging an edge portion of the member and having a portion thereof

which seats within said recess when the member is in starting position and is displaced outwardly when said member is in other than in starting position.

2. In a signal device which is responsive to impact, an elongate shaft shiftable longitudinally between extended and impacted positions of adjustment, means resiliently urging said shaft towards starting position, a disc member mounted for rotational movement from starting position to an operated position and having a recess in an edge portion thereof, means resiliently urging said member towards starting position, means offset from the center of the disc member and lying in the path of the end of said shaft when in starting position for engagement to effect rotational movement of the disc member responsive to displacement of the shaft from starting position upon impact, means for arresting movement of said member when in operated position and a following member resiliently urged into said recess when the disc member is in starting position and which is displaced outwardly onto the periphery of said disc member when in other than in starting position.

3. A signal device which is responsive to impact comprising an elongate shaft shiftable longitudinally between extended and impacted positions of adjustment, spring means constantly urging said shaft towards starting position, a disc member mounted for rotational movement in a plane substantially parallel to the movement of said shaft for an amount less than one complete revolution and having a recess in an edge portion thereof, means resiliently urging said disc member towards starting position, an abutment offset from the center of said disc member and positioned to engage the end of the shaft when in starting position during turning movement in response to said resilient means whereby the disc member is stopped in starting position, and a switch arm resiliently urged to engage the periphery of said disc member and having a portion adapted to seat within the recess when said disc member is in starting position and which is displaced outwardly onto the periphery of the disc member to make the switch when in other than in starting position.

4. In a signal device responsive to impact, an elongate shaft shiftable longitudinally between extended and impacted positions of adjustment, means resiliently urging said shaft toward its normal extended position, a member mounted for rotational movement in a plane substantially parallel to the elongate shaft and having a recess in one edge portion thereof, a stop offset from one wall of said member by a distance to pass through the path of movement of said shaft and to abut the end thereof when in starting position, means resiliently urging said member for movement in a direction opposite the movement of the shaft from starting to impacted position until stopped in starting position by engagement between the abutment against the end of the shaft while in extended position, and switch arm means resiliently engaging the edge of the member for actuation out of and into said recess during movement of the rotatable member.

5. A signal device as claimed in claim 4 in which the switch arm means has a portion seated within the recess when the rotatable member is in starting position whereby the switch arm means is displaced outwardly throughout the period while the rotatable member is in other than in starting position.

6. A signal device as claimed in claim 4 which includes means for limiting movement of said member from starting position through an angle slightly less than 360 degrees.

7. In a signal device responsive to impact, an elongate shaft shiftable longitudinally between extended and impacted positions of adjustment, means resiliently urging said shaft towards its normal extended position, a member mounted for rotational movement in a plane substantially parallel to the elongate shaft between starting and rotated position, a stop offset from one wall of said

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member and lying in the path of movement of said shaft when said member is in starting position, means resiliently urging said member for rotational movement in the direction towards starting position, means for arresting movement of the member in starting position, switch arm means resiliently engaging the edge of said member, and means on the edge of the member for displacement of said switch arm means when the member is in other than in starting position.

8. In a signal device responsive to impact, an elongate shaft shiftable between extended and impacted positions of adjustment, means resiliently urging said shaft towards its normal extended position, a disc member mounted for rotational movement in a plane substantially parallel to the elongate shaft between starting and rotated positions, an extension offset from the center of

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rotation of said member and lying in the path of movement of said shaft when the latter is in starting position, means resiliently urging said member for rotational movement in the direction towards starting position, means for arresting movement of said member when in starting position, a switch operated arm shiftable between normal and operated positions of adjustment, and an operative connection between said switch arm and said member for displacement of the switch arm from normal to operated positions when the member is in other than in starting position.

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