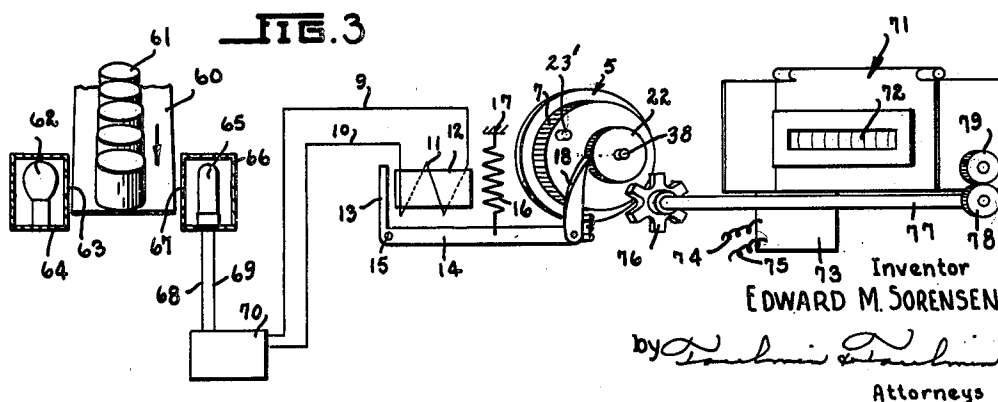
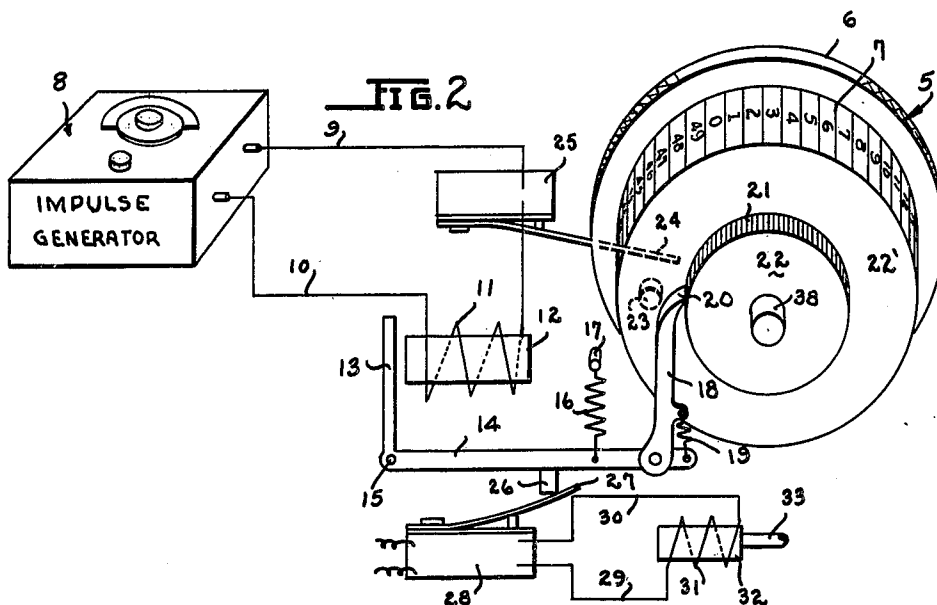
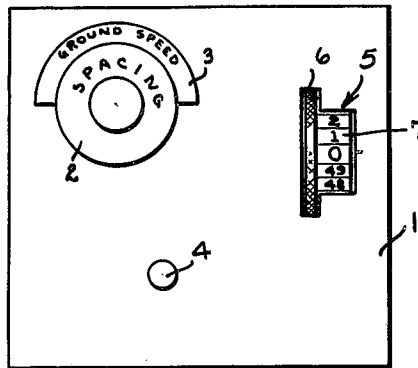


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Aug. 31, 1943.

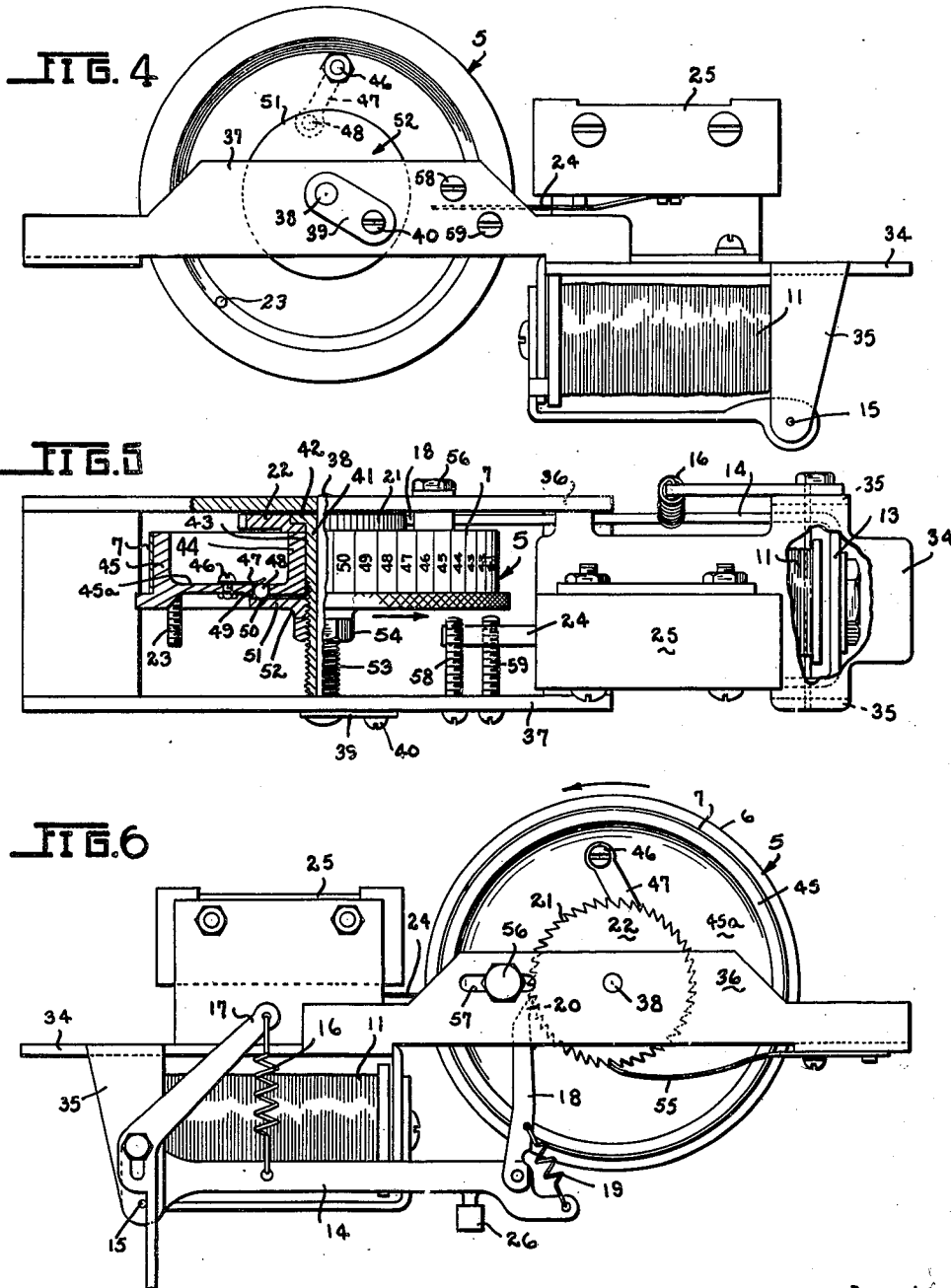
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2,328,304

COUNTER

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UNITED STATES PATENT OFFICE

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COUNTER

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2 Claims. (Cl. 235—132)

This invention relates to counter mechanism, and which is particularly adaptable as a counter in connection with bomb release controls.

It is the object of the invention to provide a control for obtaining the release at timed intervals of a predetermined number of bombs at a predetermined rate. This is particularly useful during train bombing.

The instant invention is particularly directed to counter mechanism and the regulation and control thereof, and is of general utility in addition to being particularly adaptable to bombing control mechanism.

It is another object of the invention to provide an impulse generator, a counter which can be pre-set to count a given number of impulses and then bring the mechanism to rest; and additionally a control mechanism controlled by the counter, such as a bomb release control, a conveyor control, or any other mechanism.

One of the primary features of this invention as to its mechanism of execution, is to provide an indicating counter wheel of minimum weight, and so designed and operated that the weight thereof will have the minimum of inertia effect upon the operation of the mechanism. For instance, with the arrangement of this invention, it is possible to accurately have forty actuations and therefore forty releases per second. While this is not a limitation of the operation of the invention, yet it is indicative of its accomplishments and possibilities. As the speeds of aircraft increase, the accuracy and frequency of release per second, in order to give a given bomb spacing, must increase.

In the drawings:

Figure 1 is a plan view of the front of a control panel having the ground speed, spacing, counter and circuit-closing control mechanisms on its face.

Figure 2 is a diagrammatic view showing the dial face of Figure 1 so far as that portion is concerned other than the counter, an impulse generator, a counter setter and control mechanism and release control mechanism. This arrangement is particularly adaptable to bomb release controls.

Figure 3 is a diagrammatic view of another adaptation of this invention in connection with the conveyor and mechanisms carried thereby to be counted.

Figure 4 is a side elevation of the counter mechanism.

Figure 5 is a top plan view thereof, partially in section.

Figure 6 is a side elevation of the counter mechanism from the reverse side of that shown in Figure 4.

Referring to the drawings in detail, 1 is a panel on which is mounted a spacing control dial 2, a ground speed dial 3, a switch closing button to initiate the operation, designated 4, and the counter drum of this invention, generally designated 5, consisting of a knurled wheel 6 and an indicating dial 7 on which are mounted suitable indications, which in this instance run from zero to 49.

An impulse generator of any desired type is housed within the box, as at 8. Leads 9 and 10 from this generator are connected through a solenoid coil 11, having a core 12 which is actuated to move the arm 13 of a bellcrank which is formed of the arms 13 and 14 and is pivoted at 15. This bellcrank is moved by the spring 16 anchored at 17. On the end of the bellcrank is a spring-actuated pawl 18, moved by a spring 19 connected to the pawl and to the end of the bellcrank lever 14. The nose 20 of the pawl 18 engages with a series of ratchet teeth 21 on a drum 22 of the counter. On the drum 5 of this counter, on the opposite side face from side face 22, is mounted a stud 23 which engages with the finger 24 that actuates a microswitch 25 connected in circuit with the leads 9, 10 and the coil 11 for breaking the circuit. The bellcrank lever 14 is provided with a finger 26 engaging the switch arm 27 for actuating a microswitch 28. This switch controls the leads 29 and 30, which are connected by a solenoid coil 31 having a core 32 connected to a finger 33 that, in turn, actuates the bomb release control, or any other equivalent mechanism.

Counter mechanism construction and operation

Specifically referring to Figures 2, 4, 5 and 6, the mechanism is as follows: The framework upon which this mechanism is mounted consists of a plate 34, having spaced depending ears 35 which act as a pivotal support for the pivot 15 of the bellcrank having the arms 13 and 14. This plate 34 is provided with a pair of spaced arms designated 36 and 37. These arms carry the indicating counter wheel mechanism in the following manner: The supporting axle 38 is mounted in the respective side arms 36 and 37. It is prevented from turning by a plate 39 integral with one end of the shaft 38, which engages with an attaching screw 40 on the arm 37. This prevents rotation of the shaft 38; it also serves to retain it in position.

Mounted on this axle 38 is a partially threaded sleeve 41, terminating in an enlarged head 42. Mounted on this head 42 is the ratchet 22. The sleeve 41 has a smooth portion 43, on which freely rotates the hub 44 of the drum 5 that carries the indications 7. This drum is made minimum weight so as to avoid any material inertia effect during the operation of the device. It is therefore constructed of the hub 44, the rim portion 45 and an interconnecting thin web 45a. This web is provided with a small stud 46 and a spring finger 47, which engages with a ball 48 operating in an opening 49 through the web 45a. This ball is pressed into a series of recesses 50 carried in the flange 51 of a member that has a hub 52 threaded upon the threads 53 of the sleeve 41. This is locked in position by the lock-nut 54.

Therefore, in operation (see Figure 6) you set the drum by moving it to the desired number of operations to take place. You do this by moving it in the direction of the arrow in Figure 6, or in the direction of the arrow as indicated in Figure 5. When you do this the ball 48 clicks at each movement of the ball over an aperture 50 in the flange 51. When the apparatus operates after being so set, this ball acts as the interconnecting means between the actuating ratchet 22 being moved by the pawl 18, which is in turn connected to the hub 42 and sleeve 41, connected to the hub 52 and flange 51 that engages with the ball 48. In this manner the drum 5 turns with the actuating mechanism the number of steps for which it has been set, until the stud 23 actuates the switch lever 24, opening the microswitch 25 and bringing the mechanism to rest. A spring detent 55 is used in order to prevent backward movement of the ratchet 22 during its actuation. In order to adjust the stroke of the pawl 18, the side member 36 carries an adjustable stud 56 movable in the slot 57 in the side arm 36. This stud is arranged to engage the nose 20 of the pawl 18 to limit the extension of its upward stroke, and therefore limit the movement of the ratchet 22 under the impulse of the pawl 18.

Mounted on the side arm 37 is a pair of spaced studs 58 and 59 which project on either side of the switch arm 24 so as to limit its movement in either direction. This is useful in that if you are moving the drum 5 clockwise, in Figure 4, the actuating stud 23' will come to rest against the switch arm 24. Likewise it provides a stop at the limit of the drum 5, an almost 360-degree turn of the wheel being made possible by the particular location of the switch arm 24. After the manual setting of the device and when electrical operation is taking place, the switch arm 24 serves as a limiting means for the stud 23'. The stud 23' strikes the switch arm 24 to break contact of the switch 25.

Conveyor application

As a typical commercial application of the principles of this invention, Figure 3 illustrates the application of the idea for controlling various types of mechanism, such as a conveyor belt 60 on which a series of conveyed articles is mounted. As these articles interrupt a light beam from the light 62, through the aperture 63 and the box 64, they interrupt the effect of the light upon a photoelectric cell 65 and a box 66 into which light enters through the opening 67. This cell is connected by the leads 68 and 69 to an amplifier 70, which is in turn, connected to

the leads 9 and 10 of the counter mechanism as described in connection with Figure 2.

In the event it is desired to have a larger number of articles counted than is possible by the counter heretofore described, there is added a typical counter of the Veeder-Root type designated diagrammatically at 71, which has an indicating dial 72 and is provided with a limit switch 73, which in turn is connected by the leads 74 and 75 to the driving mechanism for the belt 60. This Veeder-Root counter is actuated through a star wheel 76, shaft 77 and gears 78 and 79 by the stud 23'. The star wheel 76 is actuated through an angular distance represented by one notch on the wheel every time the stud 23' strikes the wheel and engages the respective notches. The counter 71 is therefore actuated through a predetermined distance for each notch movement of the star wheel and can add up by any counting increments desired, depending on the type of counter.

A novel feature of the arrangement is that you can set the counter drum 5 to any fraction of its indication, such as 26 steps, and you can set the Veeder-Root counter to, for instance 500 steps or articles, and the number over 500, i. e. 26, will be first run off on the counter and thereafter the 500 will be run off on the Veeder-Root mechanism so that when the 526th of the articles 61 has caused the 526th impulse, the conveyor will be brought to rest, or some other operation will be controlled or initiated. It is apparent that if the counter 71 were moved in the clockwise direction (Fig. 4) through twenty-six spaces, the counter would have to be moved in the opposite direction through these twenty-six spaces until the stud 23' would contact the star wheel 76. Thus the Veeder-Root counter 71 would not be operated at all until the counter 71 had been returned to its initial position and therefore had moved in the opposite direction by means of the pawl 18 from the direction in which it had been moved to the pre-set position. After the stud 23' has engaged one of the notches of the star wheel 76, no further engagement would be caused until the stud 23' had made a full 360-degree movement, at which time the star wheel would be given an additional movement. These segmental movements of the star wheel may be added or accumulated at the Veeder-Root counter until perhaps as many as 500 revolutions of the counter 71 are indicated at the counter 71. There is a mechanical connection (not shown), of well known type, between the indicating element of the counter 71 and the switch 73, and this connection may be so controlled that when the counter 71 has reached a predetermined number, for example 500, the switch 73 will automatically be opened. If the counter 71 had been pre-set to the number 26, and assuming that the counter 71 were adjusted to open the circuit 73 when the counter 71 indicated 500 movements, then the limit switch 73 would be opened actually when the counter 71 had moved through its twenty-six spaces and in addition had made as many complete revolutions as would have caused the counter 71 to indicate the number 500. For instance, a light may be lit, a filling mechanism started, or any other numerous visual electrical, mechanical or pneumatic operation initiated.

It will be understood that I desire to comprehend within my invention such modifications as come within the scope of the claims and the invention.

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

1. In combination, an impulse generator, a combined counter and control device including a movable member, an electromagnet periodically energized by said generator, mechanism actuated by said electromagnet including an armature for operating said member, means including a stud on said member for rendering the impulse generator inoperative at a predetermined point in the travel of said member, and means secured to said armature for controlling an exterior control circuit in accordance with the impulses delivered by said generator.

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2. In combination, an impulse generator, a combined counter and control device including a movable member, an electromagnet periodically energized by said generator, a bellcrank and actuating pawl moved by said electromagnet at each impulse and adapted to rotate said member, means including a stud secured to said member for rendering the impulse generator inoperative at a predetermined point in the travel of said member, and means secured to said bellcrank for controlling an exterior control circuit in accordance with the periodic movement of said lever caused by the impulse energy of said generator.

EDWARD M. SORENSEN.