Oct. 4, 1966 R. W. CRIPE ET AL 3,277,284

SYSTEM FOR COUNTING ONLY PROPERLY TIMED EVENTS

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FIG. 1.

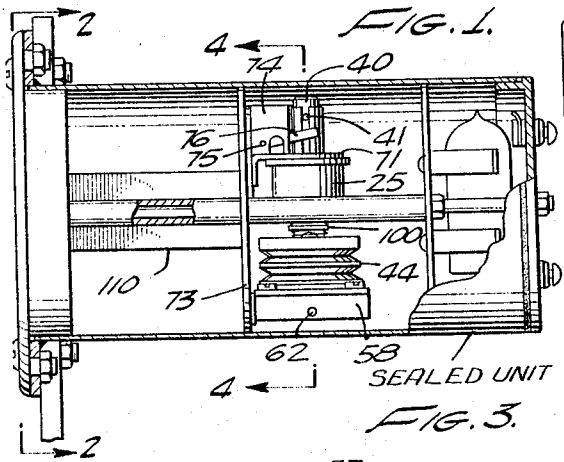


FIG. 2.

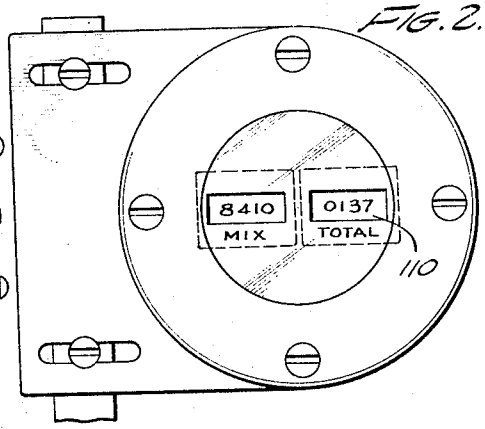


FIG. 3.

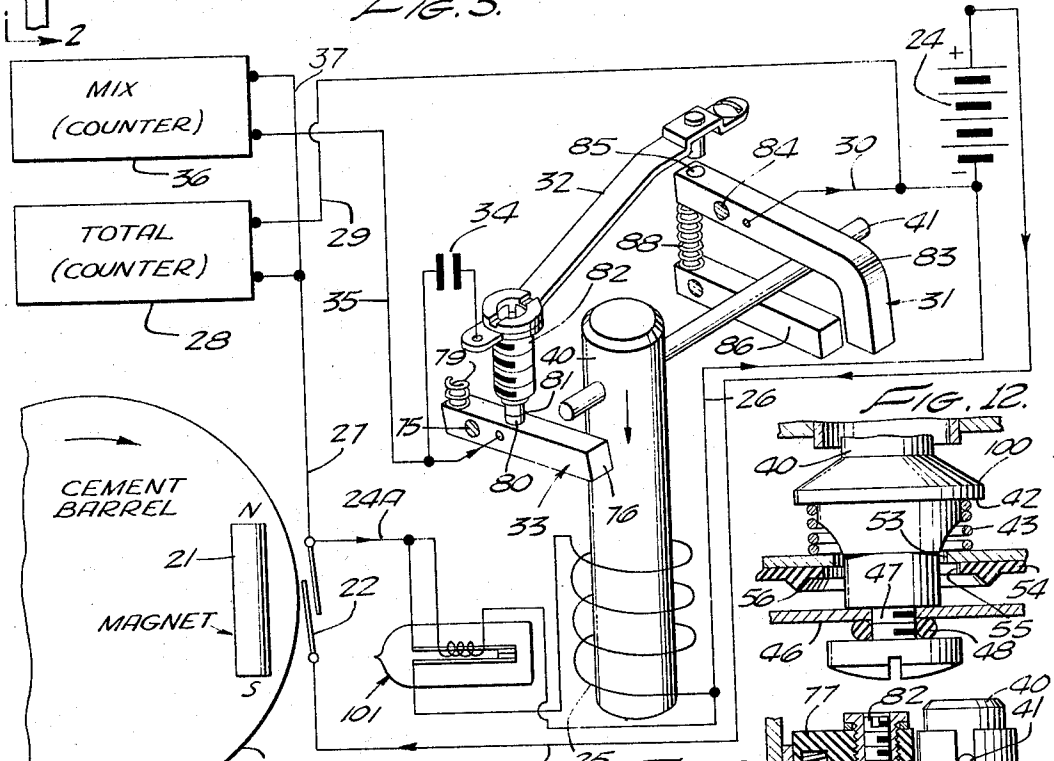


FIG. 12.

FIG. 9.

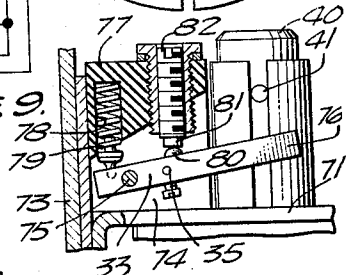


FIG. 10.

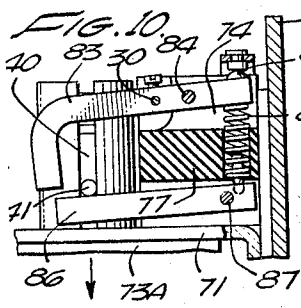
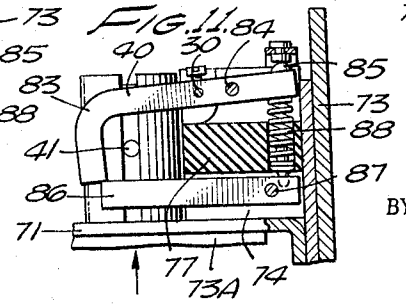


FIG. 11.



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FIG. 4.

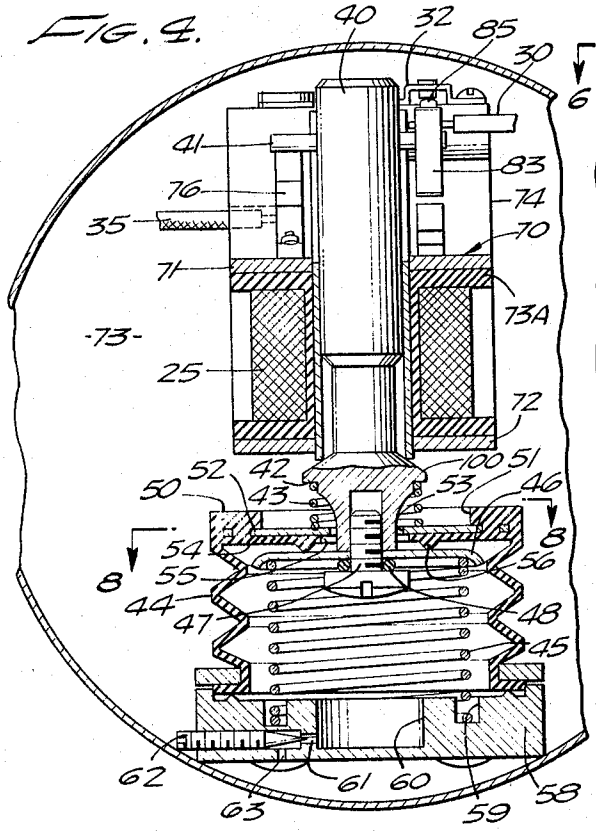


FIG. 5.

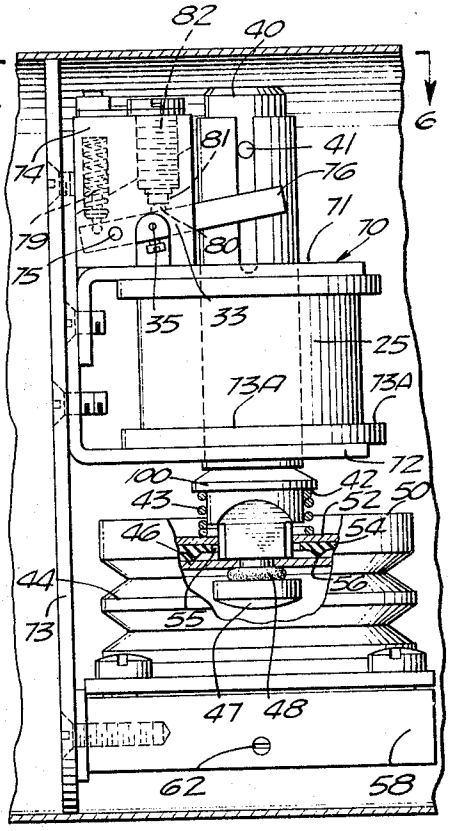


FIG. 7.

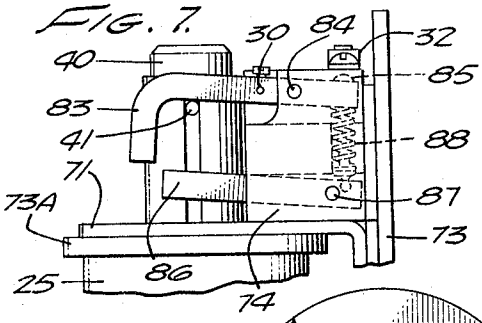
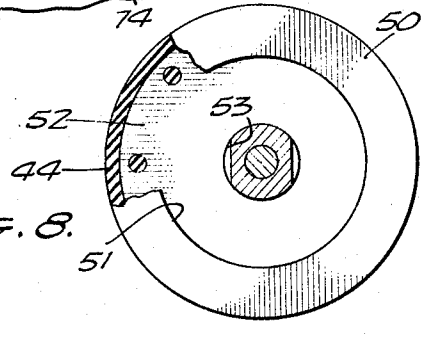


FIG. 8.



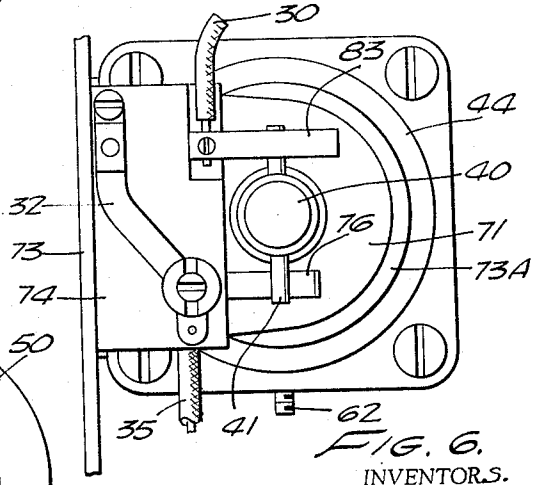


FIG. 6.

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SYSTEM FOR COUNTING ONLY PROPERLY TIMED EVENTS

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Filed July 2, 1962, Ser. No. 206,902
17 Claims. (Cl. 235—92)

This invention relates to a counter and though having general application for counting any time coincidence of events, it is particularly designed for counting the revolutions of a concrete mixer. When mixtures of cement, gravel and water are prepared by either stationary or transit mixers, if there are variations in power, the barrel will rotate at indiscriminate speeds. If the barrel rotates too fast, centrifugal force will throw the mixture and particularly the heavy constituents out against the wall of the mixer giving an inconsistent mix. Also, if the barrel rotates to slowly, the mixture will remain at the bottom, again resulting in an unsatisfactory mix. Increasingly, specifications are being written in building codes and in highway handbooks and the like specifying rigid requirements for cement mixing and requiring a certain number of revolutions of the mixer within a given range of speeds.

It is a primary object of this invention to provide a counter which will indicate the number of rotations of the mixer which have been imparted to the mix and are within the given or specified range of rotating speed. Thus, it is a prime object of this invention to record each revolution of the mixer which is at the proper mixing speed and to disregard any revolutions which would involve speeds either too slow or too fast.

The Uniform Building Code as adopted by numerous States and the Federal Government requires in accordance with Section 90–1.60B as follows:

"MIXING: The number of revolutions of the drum or blades at mixing speed will be not less than 70, nor more than 100 revolutions, after all ingredients have been charged into the drum. All rotation after 100 revolutions, to a maximum of 250 revolutions, shall be at agitating speed of 2 to 6 r.p.m. unless tempering water is added.

"MIXING SPEED: Mixing speed for the revolving-drum type of truck mixer shall be not less than 4 r.p.m. of the drum nor greater than a speed resulting in a peripheral velocity of the drum of 225 feet per minute at its largest diameter.

"AGITATOR SPEED: Agitating speed for the revolving-drum type mixer shall be not less than 2 r.p.m. nor more than 6 r.p.m. of the drum."

These and other objects, features and advantages will be apparent from the annexed specification in which:

FIGURE 1 is a side elevation of the counter with portions of the cover broken away for clarity of illustration;

FIGURE 2 is an end view taken along the line 2—2 of FIGURE 1;

FIGURE 3 is an enlarged perspective elevation of the upper switching mechanism combined with a wiring diagram;

FIGURE 4 is a section taken along the line 4—4 of FIGURE 1;

FIGURE 5 is an enlarged fragmentary side elevation of the mechanism;

FIGURE 6 is a top view taken along the line 6—6 of FIGURE 5;

FIGURE 7 is an enlarged side view of one of the upper switch elements;

FIGURE 8 is a section taken along the line 8—8 of FIGURE 4;

FIGURE 9 is an enlarged side view of the other of the upper switch elements;

FIGURE 10 is a view similar to FIGURE 7 with one of the upper switch elements in closed position;

FIGURE 11 is a view similar to FIGURE 10 showing that switch element in intermediate position;

FIGURE 12 is an enlarged side view partly in section of a portion of the mechanism adjacent the upper end of the bellows.

Referring now more particularly to the drawings, numeral 20 represents the barrel or dum of the cement mixer on which is mounted a permanent magnet 21. Within operating range, but not in contact with the drum or magnet 21 is a reed type switch 22 adapted to be closed on each passage of magnet 21. From the reed switch 22 an electrical conduit 23 leads to one pole of the battery 24 which may be the battery of the truck on which the concrete mixer is mounted. From the switch 22 another electrical conduit 24A leads to the coil 25 of a solenoid and conduit 26 leads from the coil 25 to the other pole of the battery 24. Also from the switch 22 conduit 27 leads to one connection of a total counter 28 and the conduit 29 leads from the other pole of total counter to the battery as indicated. Another conduit 30 is connected to the battery and to switch 31 which, through bar 32, communicates with a switch 33. Condenser 34 is connected to switch 33 and also to a conduit 35 also connected to switch 33 and to one connection of a mix counter 36. The other connection of mix counter is connected by conduit 37 to battery 24 through conduit 27, switch 22 and conduit 23.

Referring now more particularly to FIGURE 4, solenoid is provided with a plunger 40 at the top of which is connected a rod 41 having ends extending outwardly in two directions. The rod 40 has an enlarged portion 100 which portion 100 is reduced to provide a shoulder 42 to seat one end of a coil spring 43. A rubber bellows 44 is provided in which is mounted a coil spring 45 on the upper end of which is mounted a cap 46. A screw 47 passes through a hole in the cap 46 and is threaded in the end of the rod 40 and secures the cap 46 to the rod as indicated. An O ring 48 seals the screw to prevent exhaust of the air in the bellows from around the screw. The bellows 44 includes a top 50 which is thickened and provided with an annular recess 51 which receives the edges of the disc 52 against which the lower end of the spring 43 bears. The disc 52 is provided with an opening 53 which is larger than the shank of the rod 40 and the bellows 44 includes an inwardly extending portion 54 which also has an opening 55 which is larger than the shank of the rod 40 and the member 54 has a generally V-shaped annular downwardly extending extension 56 which in closed position seats and seals upon the cap 46. A base 58 is provided having an annular groove 59 in which seats the lower end of the coil spring 45 and a central cup 60. The passage 61 communicates with a needle valve 62 throttling an air passage 63 which communicates through the needle valve 62 to the cup 60.

A bracket 70 comprising two L-shaped members 71 and 72 is affixed to a side wall 73 by screws as indicated which bracket mounts the coil 25 and insulation 73A of the solenoid and on this bracket, particularly on the L-shaped member 71 thereof, there is mounted a box-like structure 74 in which by means of a pivot pin 75 there is pivotally mounted a switch arm 76. An insulating block 77 is mounted in the box 74. Block 77 has a recess 78 in which is mounted a coil spring 79, the lower end of which bears upon the end of switch arm 76. Switch arm 76 carries a contact 80 adapted to engage a contact 81 carried by a screw 82 mounted in the insulating block 77. Switch arm 76 is so disposed so that the end opposite coil spring 79 can be engaged by the outwardly

extending end of the rod 41 so as to depress that end of the switch arm against the force of the spring 79 when the solenoid is energized.

Referring now more particularly to FIGURES 7, 10 and 11, the switch 31 is illustrated. The switch 31 is disposed upon the opposite side of rod 40 from the switch 33 and includes a switch arm 83 pivotally mounted as at 84 on the box 74. The switch arm 83 carries a contact 85 and a shaft 86 is pivoted as at 87 on the box 74 and between the arms 83 and 86 bearing against each of said arms is a coil spring 88. Both switch arm 83 and the shaft 86 are arranged to be engaged by the other end of the rod 41.

The operation of the above-identified device is as follows: Assuming the drum 20 to be rotated, passage of the magnet 21 by the reed switch 22 causes said switch to close. The closing of the switch 22 will complete the circuit to the total counter 28 and cause it to register one rotation of the drum. It will also energize the solenoid causing the plunger 40 to be depressed against the force of spring 43 and spring 45. As spring 43 is compressed, cap 46 will be disengaged from sealing member 56, as indicated in FIGURE 12, and the bellows 44 will be compressed discharging air, as shown by the arrows in FIGURE 12. However, at the end of the stroke of the plunger 40, spring 45 will cause the cap to reengage sealing member 56 and air will enter through needle valve 62, metered as controlled by said needle valve and the bellows will gradually expand. Switches 31 and 33 are so oriented with respect to the ends of the rod 41 that at the initial energizing of the solenoid one end of the rod 41 will engage the arm 76 and open switch 33. Rod 41 will, however, be disengaged from switch arm 83 and will engage arm 86 causing switch 31 to be closed. At a point midway in its travel as the bellows 44 causes it (the plunger 40) to travel upward, switch 33 will close under the force of spring 79. This will result in a condition in which both switches 31 and 33 are closed, thus energizing mix counter 36 if reed switch 22 is closed. Further travel of the plunger 40 will cause the other end of rod 41 to contact switch arm 83 unlatching arm 86 from arm 83 whereupon arm 86 pivots and opens switch 31.

By reason of the above-described mechanism, if drum 20 is rotating too fast switch 33 will remain open, as there will be insufficient time to permit the bellows to function to close switch 33 before the solenoid is again energized. On the contrary, in the event the drum 20 is rotating too slowly, plunger 40 will have time to travel upwardly to the point where rod 41 engages arm 83 and opens switch 31 before the reed switch 22 is again closed by the magnets 21. Thus, the circuit to the counter 36 will still be open and a count corresponding to the slow revolution will not be entered. It will be appreciated that the device is timed by the action of the bellows 44 regulated by needle valve 62.

It is only when both switch 31 and 33 are both simultaneously closed the current will be fed to the mix counter 36 when switch 22 is actuated by the passage of the magnets 21 and thus it will be appreciated that the device above-described will only count in the mix counter rotations of the drum 20 which are at a rate of speed for which the needle valve 62 is set to permit expansion of the bellows 44. Therefore, the mix counter 36 will reject all rotations of the bowl 20 which are either too fast or too slow. However, total counter 28 will count every revolution of the bowl 20 and therefore the dial 110 will give an indication not only of the total count of the revolutions of the bowl 20, but also of the count of the number of rotations within the prescribed speeds.

Conduit 24 has incorporated therein a time delay relay 101 which in the event the reed switch 22 is held closed longer than five seconds the heater in said relay will cause the contacts in the relay to open the circuit to the solenoid, thus avoiding overheating and burning out of the solenoid coil which would occur in the absence of said time delay relay in the event the bowl 20 stopped with the magnet 21 within operating range of the reed switch 22.

While there has been described what is at present considered a preferred embodiment of the present invention, it will be appreciated by those skilled in the art that various changes and modifications can be made therein without departing from the essence of the invention and it is intended to cover herein all such changes and modifications as come within the true spirit and scope of the appended claims.

We claim:

1. In a counter, sensing means for sensing each occurrence of an event of a series of events to be counted; means responsive to said sensing means and operative to establish a first condition and to set in operation a time delay means operative to establish a second condition and means operative only when both of said conditions are established to register said event.

2. In a counter adapted to register each of a series of events which occurs within a given time interval the combination of: a first switch adapted to close upon the occurrence of the event; a second switch and a third switch; a solenoid energized upon closing of said first switch; means driven by said solenoid and adapted to close said second switch on energization of said solenoid; a source of electrical energy connected to said second switch through said third switch; a time delay device associated with said second switch and said third switch and said solenoid; means driven by said solenoid and adapted to open said third switch on operation of said time delay device and a counter connected to said source through said second and third switches whereby said counter is energized only when both said second and third switches are closed.

3. A counter as set forth in claim 2 in which said time delay device is a bellows, said bellows being connected to said solenoid and arranged to be exhausted on energization of said solenoid; a spring biasing said bellows toward extended position and an adjustable valve controlling admission of air into said bellows.

4. A counter as set forth in claim 2 the first switch is a reed switch and the event is the passage of a magnet by said reed switch.

5. A counter as set forth in claim 3 the first switch is a reed switch and the event is the passage of a magnet by said reed switch.

6. A counter as set forth in claim 2 including a second counter connected to said source and said first switch to count the total number of events despite the lack of simultaneous closing of said second and third switches.

7. A counter as set forth in claim 3 including a second counter connected to said source and said first switch to count the total number of events despite the lack of simultaneous closing of said second and third switches.

8. A counter as set forth in claim 2 in which the event is one rotation of a cement mixer bowl.

9. A counter as set forth in claim 3 in which the event is one rotation of a cement mixer bowl.

10. In a counter adapted to register each of a series of events which occurs within a given time interval the combination of: a first switch adapted to close upon the occurrence of the event; a second switch and a third switch; a solenoid energized upon closing of said first switch; means driven by said solenoid and adapted to close said second switch on energization of said solenoid; a source of electrical energy connected to said second switch through said third switch; a time delay device associated with said second switch and said third switch and said solenoid; means driven by said solenoid and adapted to open said third switch on operation of said time delay device and a counter connected to said source through said second and third switches whereby said counter is energized only when both said second and third switches

are closed, said time delay device comprising a bellows, said bellows being connected to said solenoid and arranged to be exhausted on energization of said solenoid, a spring biasing said bellows toward extended position and an adjustable valve controlling admission of air into said bellows; said first switch comprising a reed switch and the event counted is one rotation of a cement mixer bowl having a magnet mounted therein passing an operative relation of said reed switch.

11. In a counter adapted to register each of a series of events which occurs within a given time interval the combination of: a first switch adapted to close upon the occurrence of the event; a second switch and a third switch; a solenoid energized upon closing of said first switch; means driven by said solenoid and adapted to close said second switch on energization of said solenoid; a source of electrical energy connected to said second switch through said third switch; a time delay device associated with said second switch and said third switch and said solenoid; means driven by said solenoid and adapted to open said third switch on operation of said time delay device and a counter connected to said source through said second and third switches whereby said counter is energized only when both said second and third switches are closed, said time delay device comprising a bellows, said bellows being connected to said solenoid and arranged to be exhausted on energization of said solenoid, a spring biasing said bellows toward extended position and an adjustable valve controlling admission of air into said bellows; said first switch comprising a reed switch and the event counted is one rotation of a cement mixer bowl having a magnet mounted therein passing an operative relation of said reed switch, a second counter connected to said source and to said first switch to count the total number of events, despite the lack of simultaneous closing of said second and third switches.

12. In a counting system for registering those events in a series of events that occur within a given time interval and not registering events that occur in a time shorter than said interval, the combination of: a first switch which is closed by the occurrence of each event; a second switch and a third switch; a solenoid energized upon closing of said first switch; means driven in a first direction by said solenoid for operating said second and third switches upon energization of said solenoid; a source of electrical energy coupled to said second switch through said third switch; a time delay device associated with said driven means to drive said driven means in the opposite direction when said solenoid is de-energized and cause said driven means to sequentially operate said second and third switches; a counter coupled to said source through said second and third switches whereby said counter is energized only when both said second and third switches are closed, said second switch being prevented from closing by energization of said solenoid when said events occur in a time shorter than said given time interval.

13. In a counting system for registering those events in a series of events that occur within a given time interval and not registering events that occur in a time shorter than said interval, the combination of: a first normally open switch, said switch being closed by the occurrence of each event; a second switch, said second switch being normally closed; a third switch, said third switch being normally open; a solenoid energized upon closing of said first switch; means driven in a first direction by said solenoid for opening said second switch and closing said third switch; a time delay device associated with said driven means to drive said driven means in the opposite direction when said solenoid is de-energized and cause said driven means to sequentially close said second switch and open said third switch; a source of electrical energy; a counter; and means including said second and third switches for coupling said counter to said source, said counter being energized only when both said second and third switches are closed, said solenoid being energized to drive said driven means in the first direction before said driven means can be driven by said time delay device to close said second switch if said events occur in a time shorter than said given time interval.

14. The combination of claim **13** wherein said means for coupling said counter to said source further includes said first switch.

15. The combination of claim **13** wherein a second counter is coupled to said source through said first switch, said second counter registering the total number of events occurring.

16. In a counting system for registering those events in a series of events that occur within a given time interval and not registering events that occur in a time shorter or a time longer than said interval, the combination of: a first normally open switch which is closed by the occurrence of each event; a second switch, said second switch being normally closed; a third switch, said third switch being normally open; a solenoid energized upon closing of said first switch; means driven in a first direction by said solenoid for opening said second switch and closing said third switch; a time delay device associated with said driven means to drive said driven means in the opposite direction when said solenoid is de-energized and cause said driven means to sequentially close said second switch and open said third switch; a source of electrical energy; a counter; and means including said first, second and third switches for coupling said counter to said source, said counter being energized only when all of said switches are closed; said solenoid being energized to drive said driven means in the first direction before said driven means can be driven by said time delay device to close said second switch if said events occur in a time shorter than said given time interval; said driven means being driven by said time delay device to open said third switch before said first switch is again closed if said events occur in a time longer than said given time interval.

17. The combination of claim **16** wherein a second counter is coupled to said source through said first switch, said second counter registering the total number of events occurring.

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