

[54] ELECTRICAL IMPULSE COUNTER WITH SHOCKPROOFING MECHANISM

3,619,577 11/1971 Hoffman 235/92 C
3,677,468 7/1972 LaPointe et al. 235/117 R

[75] Inventor: John Hayward Cook, Sawbridgeworth, England

Primary Examiner—Richard B. Wilkinson
Assistant Examiner—U. Weldon
Attorney—Joseph F. Brisebois et al.

[73] Assignee: English Numbering Machines Limited, London, England

[22] Filed: Apr. 17, 1972

[57] ABSTRACT

[21] Appl. No.: 244,458

A counting instrument comprising a counting wheel, a spring urged drive member and a ratchet and pawl arrangement operatively connecting the counting wheel and drive member, the arrangement being such that in a cycle of operations, the drive member moves forwards against the spring means from a rest position and back to the rest position to index the count wheel by one step, the instrument including an inertia member which is coupled to the drive member by a coupling means such that the inertia of the inertia member arising out of the instrument receiving shock loading tending to move the drive member forwards from the rest position is transmitted to the drive member to restrain the drive member from moving from the rest position.

[30] Foreign Application Priority Data

June 2, 1971 Great Britain 18597/71

[52] U.S. Cl. 235/91 A, 235/92 C

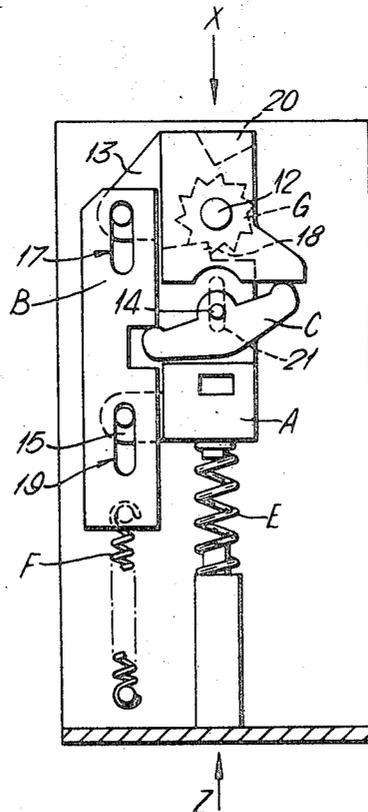
[51] Int. Cl. G06m 1/00

[58] Field of Search 235/91 R, 91 A, 91 PR, 235/92 R, 92 B, 92 WT, 92 AE, 92 C, 92 CE, 117

[56] References Cited
UNITED STATES PATENTS

3,470,361 9/1969 Wallar 235/91 A

9 Claims, 4 Drawing Figures



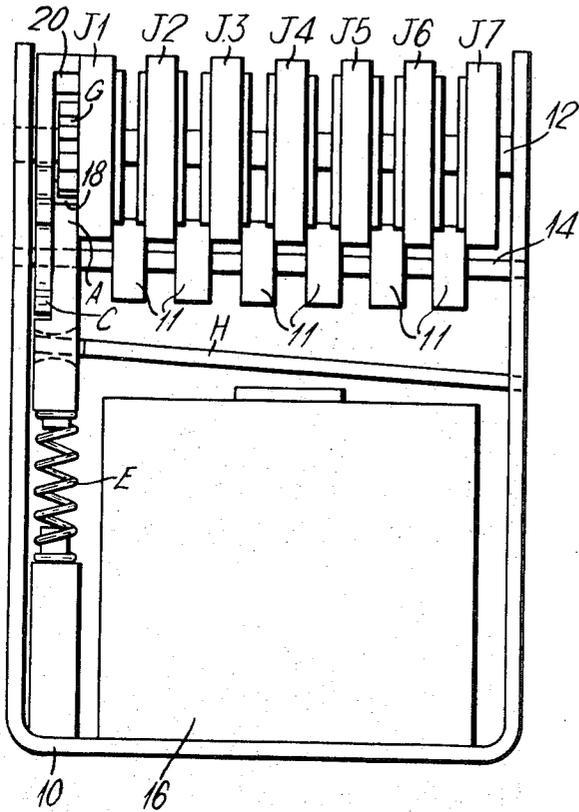


Fig. 1.

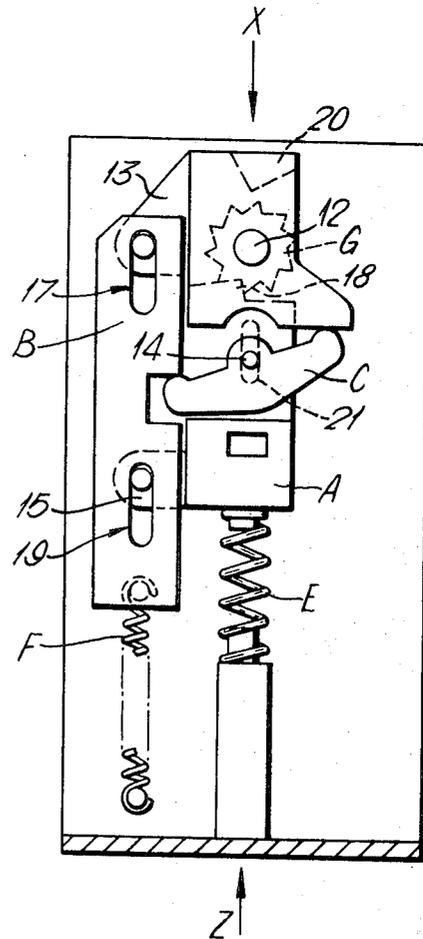


Fig. 2.

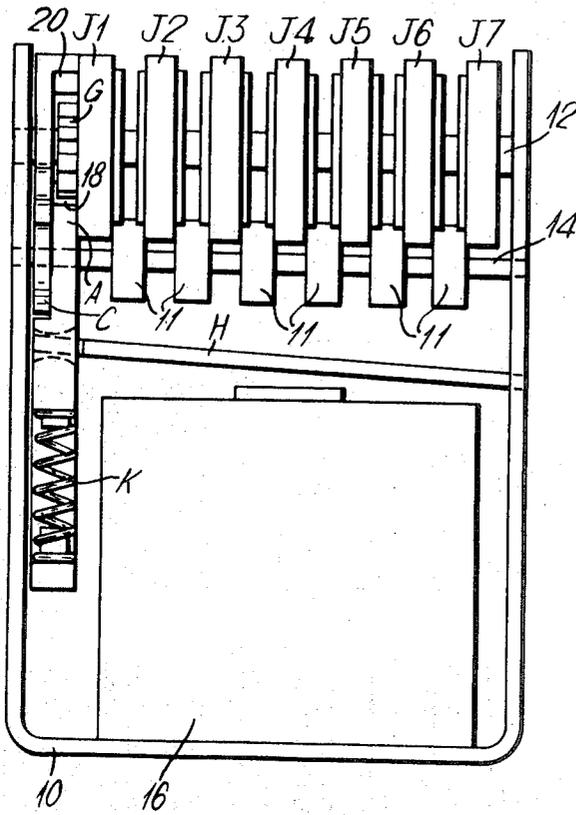
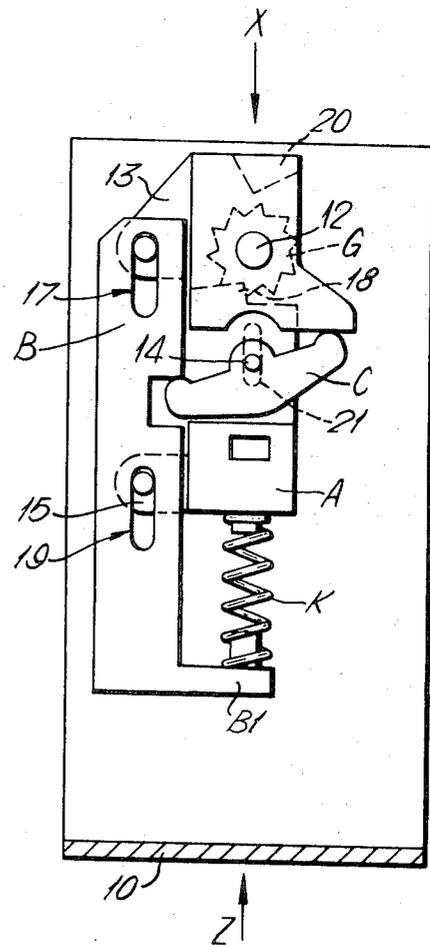


Fig. 3.

Fig. 4.



ELECTRICAL IMPULSE COUNTER WITH SHOCKPROOFING MECHANISM

This invention relates to counting instruments of the type wherein a counting means such as a counting wheel is indexed or stepped by a ratchet and panel arrangement which is actuated by moving back and forth a drive member. The drive member in one drive cycle moves in one direction (hereinafter referred to as the forwards direction) and then in the reverse direction (hereinafter referred to as the backwards direction) and in so doing moves the counting wheel round by one step thereby increasing the count by the amount corresponding to one step of the counting wheel. Such instruments will be referred to hereinafter as "counting instruments of the type aforesaid."

Although they can be used in any application where a count is required, main applications of counting instruments of the type aforesaid are applications in gaming or amusement machines and vending machines.

Counting instruments of the type aforesaid are normally used for counting electrical pulses and the drive member is usually driven by the armature of an electromagnetic coil receiving the pulses. It will be appreciated however that the instrument can readily be adapted to count mechanical quantities such as shaft revolutions.

With counting instruments of the type aforesaid there exists the disadvantage that if the instrument is given an impact, accidental or otherwise, the drive member may be moved and may cause spurious indexing of the counting wheel.

This invention aims to provide a counting instrument of the type aforesaid wherein the aforesaid disadvantage may be obviated or mitigated.

According to this invention there is provided a counting instrument of the type aforesaid wherein the drive member is spring urged to a rest position which it occupies between cycles of operation, said instrument including an inertia member which can move in the forwards and backwards directions and which is coupled to the drive member by a means such that upon the instrument receiving an impact tending to move the drive member in the forwards direction, the mass of inertia member through said means acts to prevent such movement of the drive member.

Preferably, the inertia member is spring urged tending to move same in the forwards direction.

The mass of the drive member is preferably less than that of the inertia member.

Said means of connection preferably comprises a two armed lever which is pivotally mounted on a stationary part of the instrument and of which one arm is engaged by the drive member and the other arm is engaged by the inertia member such that if the instrument is given an impact tending to move the drive member in the backwards direction, the inertia member moves in the forwards direction and the coupling between the inertia member and drive member is broken.

Embodiments of the invention, as applied to counting instruments of the type aforesaid for counting electrical pulses, will now be described, by way of example, with reference to the accompanying drawings, wherein:

FIG. 1 shows a sectional side elevation of a counting instrument according to a first embodiment of the invention:

FIG. 2 shows a sectional end elevation of the instrument shown in FIG. 1.

FIG. 3 shows a sectional side elevation of a counting instrument according to a second embodiment of the invention: and

FIG. 4 shows a sectional end elevation of the instrument shown in FIG. 3.

In the drawings, parts of the instrument which are not in essence to this invention have been omitted in the interests of clarity.

The instrument shown in FIGS. 1 and 2 comprises a U-shaped chassis frame 10 between the limbs of which extend parallel, spaced shafts 12, 14. The shaft 12 serves to carry rotatably seven counting wheels J1-J7 respectively for counting units, tens, hundreds, tens of hundreds and so on. These wheels J1 and J7 are interconnected by known stepping devices 11 so that for one revolution of wheel J1, wheel J2 is index by one step; for one revolution of wheel J2, wheel J3 is indexed for one step and so on as the count increases to a maximum of 9,999,999. Wheel J1 is driven by electrical input pulses to an electrical coil 16 by the mechanism according to this invention.

In the embodiment of FIGS. 1 and 2, the said mechanism comprises a reciprocable drive member A, an opposing inertia weight B mounted on lugs 13, 15 of member A for limited relative movement thereto by pin and slot connections 17, 19, a two arm lever C pivotally mounted on shaft 14, a compression spring E acting between member A and frame 10 and a tension spring F acting between weight B and frame 10.

The unit wheel J1 of the counter is integral with ratchet wheel G as shown in FIG. 1 and the member A has opposed pawl ledges 18, 20 which respectively engage wheel G as the member A is reciprocated in operation, to index wheel J1.

The mechanism is shown in a rest position in FIG. 1, the pawl ledge 18 of drive A being held against the ratchet wheel G by means of spring E. The inertia weight B is held against one arm of lever C, the other arm of which is in turn held against the drive member A, by spring F. For normal counting, energisation of the coil 16 causes armature H to drive the drive member A in the forwards direction (arrow X in FIG. 2) causing engagement of ledge 20 with ratchet wheel 19, causing indexing by one step of the unit wheel J1. The drive member A is slotted at 21 to enable this member to move in the forwards and backwards direction relative to a shaft 14, which passes through slot 21. Driving this forward movement of drive member A, opposing weight B is driven in the opposite direction by pivoting of lever C. De-energisation results in the drive member A moving in the backwards direction to its rest position in which ledge 18 again engages wheel G under the force of spring E and so completing in this embodiment 360° rotation indexing of unit wheel and increasing the count in the instrument by one. The opposing weight B is returned to its rest position by the tension in spring F. This sequence is repeated for each count pulse received.

If, however, the mechanism is subjected to a shock-load for example in the reverse direction ARROW Z in FIG. 2, both drive member A and opposing weight B tend to remain stationary or in effect to move in the forwards direction (ARROW X) relative to frame 10. However, weight B is of greater mass than member A and mass B and drive member A engage the lever arms

of lever C at equal moment distances from lever pivot shaft 14, and therefore the inertia force on lever C due to mass B is greater than that due to member A. The result is that lever C maintains its illustrated position in FIG. 1 preventing the ratchet wheel G from being spuriously operated. In a modified arrangement, mass B may be of less mass than drive member A if mass B engages lever C at a greater moment distance than does member A so that the inertia moment on lever C due to mass B is greater than that due to member A.

If the mechanism is subjected to a shock-load in the direction of ARROW X, both drive member A and opposing weight B will again tend to remain stationary or in effect tend to move in the backwards direction relative to the frame 10. Drive member A, however, is in its rest position with ledge 18 in firm engagement against ratchet wheel G, and cannot move relative to frame 10. Opposing weight B is free to and will move in a direction opposing arrow X relative to frame 10, but such relative movement will not interfere with drive member A, and lever C will simply pivot freely in a clockwise direction in FIG. 1 by an amount dependent upon the relative movement of mass B. Upon termination of the effect of the shock-loading, the mass B and arm C will return to the rest position of FIG. 1.

The counting instrument illustrated in FIGS. 3 and 4 is basically the same as that illustrated in FIGS. 1 and 2, except for a few modifications. Therefore, parts of the counting instrument of FIGS. 3 and 4 which are common to both embodiments have been given the same references as in FIGS. 1 and 2 and will not be described in detail.

The instrument of FIGS. 3 and 4 is modified in relation to that shown in FIGS. 1 and 2, in that the inertia mass B is provided with a transversely extending, supporting foot B1 and a single compression spring K acting between foot B1 and drive member A replaces springs E and F of the FIGS. 1 and 2 embodiment.

The operation of the instrument of FIGS. 3 and 4, is basically the same as that described with reference to FIGS. 1 and 2. In normal counting, an electrical input pulse supplied to coil 16 results in downward movement of armature H and drive member A effecting indexing of wheel G. Downward movement of member A causes pivoting of lever C and hence upward movement of mass B. The drive member A and mass B move in opposite directions thereby compressing spring K. Removal of the electrical input signal releases armature H, and under the action of spring K the member A and mass B move in opposite directions back to the initial rest position shown in FIG. 4.

For shock loading on the instrument, for a shock load in the forwards direction (arrow X) again the member A cannot move relative to the ratchet wheel G because its ledge 18 formly engages such wheel, although the mass B may move in the backwards direction (arrow Z) relative to the frame 10 compressing spring K and harmlessly pivoting lever C. Upon termination of the shock loading mass B and lever C will return to the rest position.

For a shock load in the backwards direction (arrow Z), the mass B and drive member A will tend to move forwards (arrow X) relative to frame 10, but mass B is of greater inertia than member A and therefore exerts a greater inertia force in lever C than does member A, and therefore the lever C is maintained in the position shown, preventing the drive member A from moving

relative to ratchet wheel C, which could cause spurious operation of the instrument.

The arrangements described it will be appreciated are simple yet effective in rendering the mechanism shockproof which is highly desirable in counting mechanism of the type to which the invention relates, and another desirable feature of these mechanisms is that they are operative immediately any shock loading is received.

I claim:

1. A counting instrument having a counting means, a ratchet and pawl arrangement for stepping said counting means to increase the count of said counting means, a drive member which is mounted for forwards movement from a rest position and backwards movement to said rest position in a cycle of operations to actuate the ratchet and pawl arrangement, spring means urging said drive member to the rest position, an inertia member mounted for back and forth movement parallel to the drive member and a pivotally mounted two armed lever of which one arm is engaged by the inertia member and the other arm is engaged by the drive member so as to transmit the inertia force of the inertia member to the drive member to prevent the drive member from moving from its rest position when the instrument receives an impact or shock tending to move the drive member in the forwards direction.

2. A counting instrument according to claim 1, wherein the mass of the inertia member is greater than that of the drive member.

3. A counting instrument according to claim 10, including an inertia member loading spring which is additional to said spring means, and which acts to urge the inertia member in the forwards direction.

4. A counting instrument according to claim 3, wherein said inertia member loading spring is a tension spring acting between the inertia member and a stationary part of the instrument.

5. A counting instrument according to claim 1, wherein said spring means comprises a compression spring acting between the drive member and inertia member to urge the drive member to the rest position and the inertia member in the forwards direction.

6. A counting instrument according to claim 1, wherein the counting means is a counting wheel, and the ratchet and pawl arrangement comprises a ratchet wheel which is secured to the counting wheel and a pair of pawl ledges on the drive member which are located at opposite sides of the ratchet wheel to engage the ratchet wheel in turn as the drive member moves back and forth in a cycle of operations thereby to index the ratchet wheel and counting wheel by one step representing an increase of one in the count of the instrument.

7. A counting instrument according to claim 6, wherein one of said pawl ledges engages said ratchet wheel in the rest position of the drive member.

8. A counting instrument according to claim 1, wherein said counting means comprises several counting wheels and stepping devices connecting said wheels in a series so that for one revolution of any counter wheel except the last wheel in the series, the next counter wheel in the series is indexed by one step, and said ratchet and pawl arrangement comprises a ratchet wheel which is secured to the first counting wheel in the series and a pair of pawl ledges on the drive member which are located at opposite sides of the ratchet

5

wheel to engage the ratchet wheel in turn as the drive member moves back and forth in a cycle of operations thereby to index the ratchet wheel and first counting wheel by one step representing an increase by one in the count of the instrument.

6

9. A counting instrument according to claim 2, wherein the lever is arranged so that the points of engagement of said members are equally spaced from the pivot axis of the lever.

5

* * * * *

10

15

20

25

30

35

40

45

50

55

60

65