

[54] **COUNTING DEVICE**

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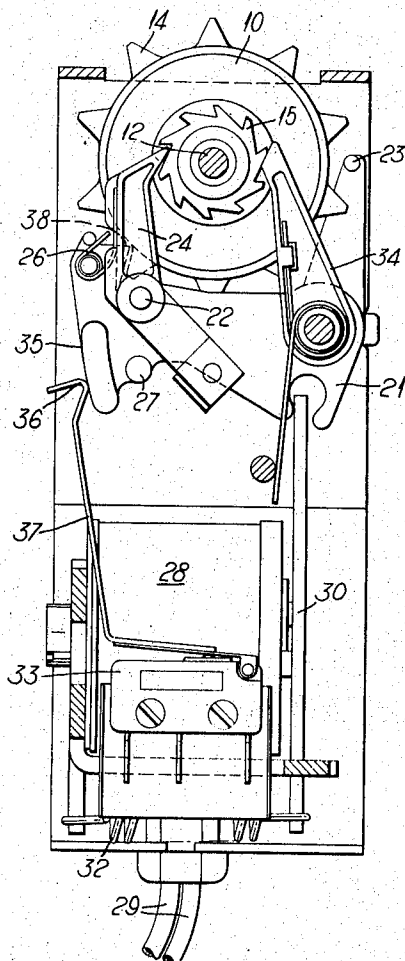
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[51] Int. Cl. .... **G06c 27/00, G06c 23/00**  
[58] Field of Search ..... **235/1 C, 132 R**

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[57] **ABSTRACT**

The invention relates to an electro-mechanical preselection counter having a ratchet stepping mechanism. A novel mounting of the drive pawls holds them clear of the ratchets for the digit wheels when not actually driving these wheels. This allows the digit wheels to be freely rotated in either direction for presetting.

**6 Claims, 5 Drawing Figures**



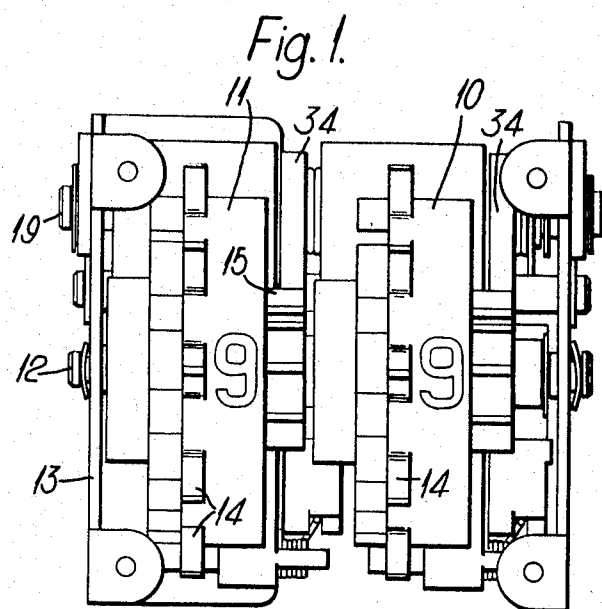


Fig. 2.

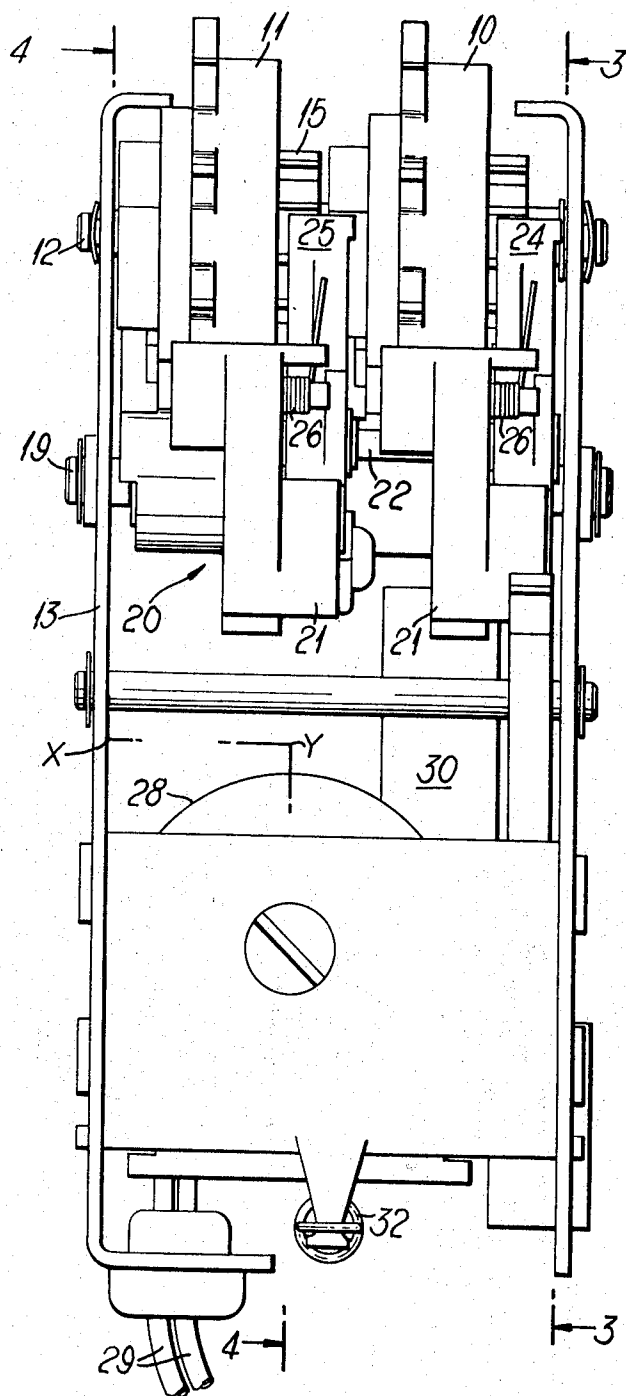


Fig. 3.

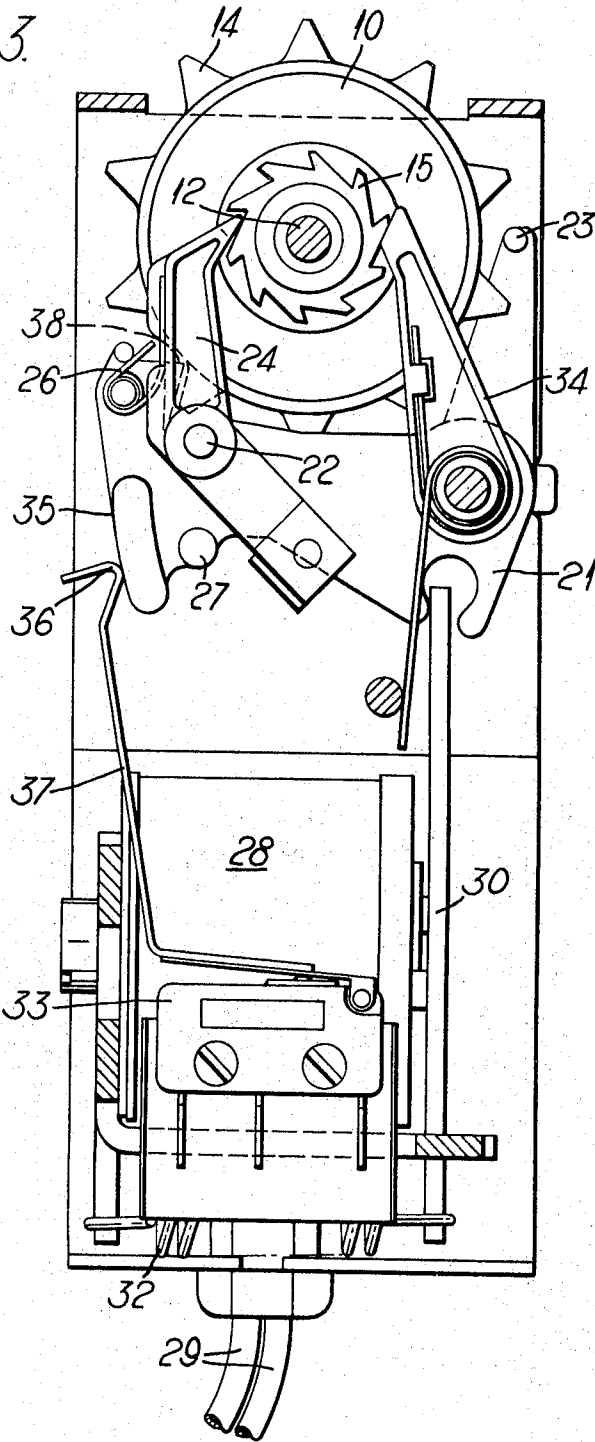


Fig. 4.

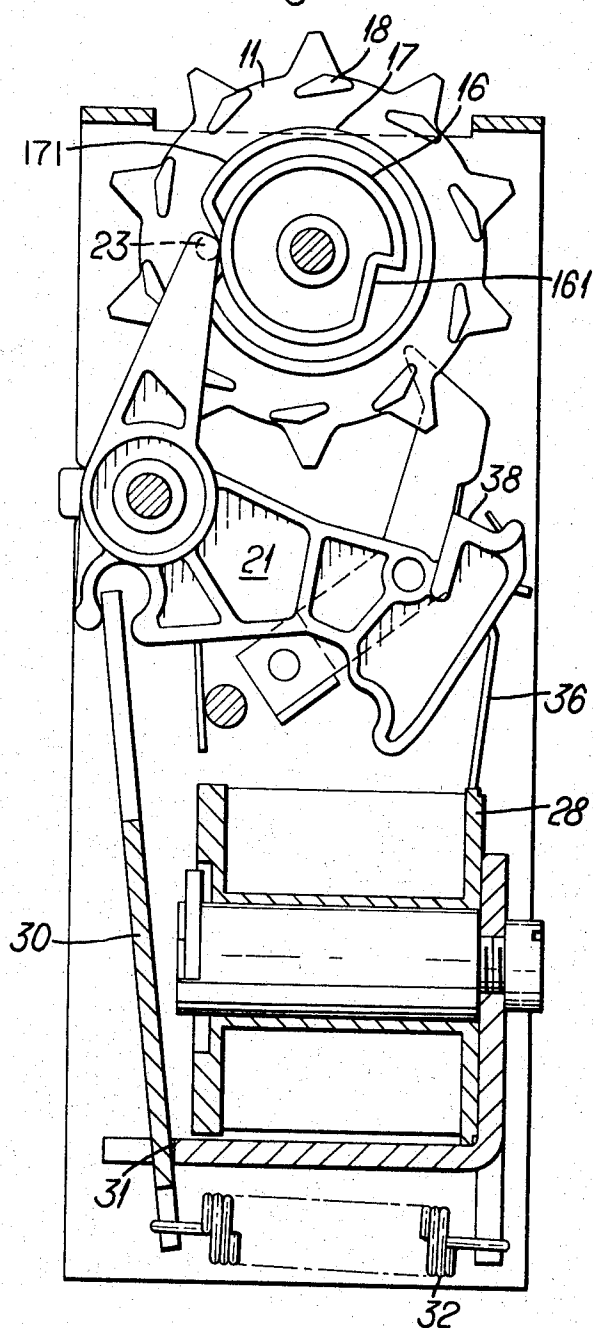
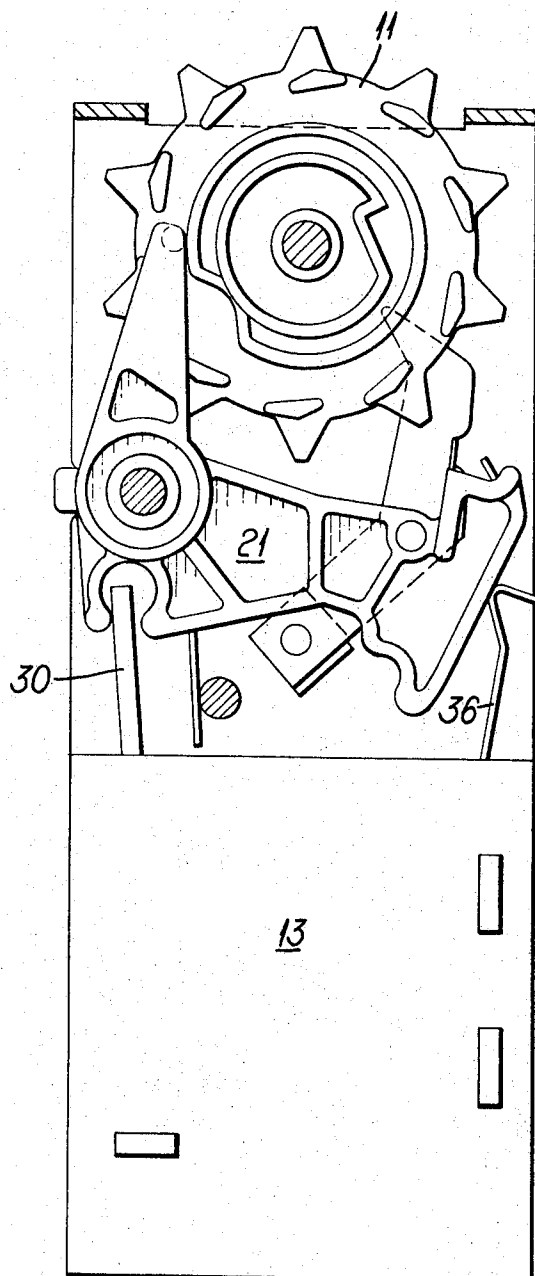


Fig. 5.



## COUNTING DEVICE

This invention relates to mechanical counters.

Counters are known in which digit wheels are manually set to a desired number, after which input pulses count down the displayed number until zero is reached at which point an output is actuated.

In most such known counters, the digit wheels may be rotated only in one direction for setting, which is obviously inconvenient. A counter has also been proposed in which the digit wheels may be set in either direction, but the digit wheels for successive orders are coupled so that, for example, rotation of the units wheel from "0" to "9" causes indexing of the tens wheel.

An object of the present invention is to overcome or mitigate the above disadvantages.

According to the present invention there is provided a counter including a support, a digit wheel supported by the support for stepwise rotation, a ratchet wheel drivingly connected with the digit wheels, and a pawl for driving the ratchet wheel in response to input signals, the pawl being mounted so that when not driving the ratchet wheel it is not in contact with the ratchet wheel.

Preferably the pawl is pivotally mounted on a drive member and is normally biased against a stop on the drive member, the drive member being pivotally mounted on the support and arranged to be driven by a solenoid armature.

Preferably also, the digit wheel has a cam surface, and including a follower for the cam surface coupled to a switching device, the cam surface having a portion which, when a predetermined portion of the digit wheel is displayed operates the switching device by means of the follower.

The follower may be part of the drive member.

The digit wheel may have circumferential projections to facilitate manual positioning, the drive member having a shoulder arranged to engage one of said projections as the pawl reaches the limit of its driving stroke.

Preferably, the counter includes a second digit wheel drivingly connected to a second ratchet wheel, a second pawl and second driving member similar to said pawl and said driving member, the two driving members being joined by a connecting piece for simultaneous pivotal movement, and a further cam surface on said digit wheel arranged to permit the second pawl to engage the second ratchet wheel once only for each revolution of said digit wheel and to prevent such engagement at other times.

An embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is an end view of a counter embodying the invention;

FIG. 2 is a plan view corresponding to FIG. 1;

FIG. 3 is a sectional view taken along the line 3—3 of FIG. 2;

FIG. 4 is a sectional view, the upper half of which is taken along the line 4-X, while the lower half is taken along the line Y-4 of FIG. 2; and

The lower half of FIG. 5 is a side view of the counter taken from the left of FIG. 2, while its upper half is taken in the same plane as the upper half of FIG. 4, but shows the pawl 24 and pin 23 in a different position.

A units wheel 10 and a tens wheel 11 are rotatably mounted on a common shaft 12 supported in a frame 13. The digit wheels 10, 11 are provided with projections 14 to facilitate manual rotation. The digit wheels, 10, 11 are identical and each includes an integral ratchet wheel 15, a first cam surface 16, a second cam surface 17, and a series of ten axial projections 18, all of whose functions will be explained below.

A drive assembly shaft 19 is mounted in the frame 13 and carries a drive assembly designated generally as 20. The drive assembly 20 comprises two identical drive members 21 having the general shape of a bell-crank pivoted about the shaft 19. The lower arm of each drive member 21 has a bore which receives a rod 22 joining together the two drive members 21 for movement in unison. Each upper arm carries at its end distant from the shaft 19 a pin 23 which normally rests on the associated first cam surface 16. The rod 22 also acts as a pivotal mounting for pawls 24, 25 associated with the digit wheels 10, 11 respectively, each of the pawls being biased by a spring 26 against a stop 27 on the appropriate drive member. It will be noted that in this position the pawls 24, 25 are completely free of the ratchet wheels 15.

A coil 28, on receiving an input pulse via leads 29, is arranged to attract an armature plate 30, which pivots about point 31 (FIG. 4) and is normally biased away from the coil 28 by a spring 32. The armature plate 30 engages a recess in the drive member 21 associated with the units wheel 10.

In operation, the digit wheels 10, 11 are manually preset to a number equal to a desired number of occurrences. Input pulses representing these cause the displayed digit to be counted down; when zero is reached, a microswitch 33 (FIG. 3) is actuated to provide an output signal which may be used, for example, to stop a machine. Since the pawls 24, 25 are normally held free of the ratchet wheels 15, the digit wheels 10, 11 may be rotated in either direction for presetting. It should also be noted that the digit wheels may be preset independently of each other, since there is no mechanical interconnection. A spring-biased detent pawl 34 is provided for each wheel to give positive presetting.

After presetting, each pulse received by the coil 28 attracts the armature plate 30 which thus causes the entire drive assembly 20 to pivot about its shaft 19. This in turn moves the pawls 24, 25 forward towards their respective ratchet wheels 15. The pawl 24 (associated with the units wheel 10) engages its ratchet and drives the units wheel 10 through 1/10 revolution. FIG. 3 illustrates this driving action. The pawl 25, however, must drive the tens wheel 11 only in response to every tenth input. Thus the pawl 25 is driven onto the cam surface 16 of the units wheel 10, which normally maintains it free of the ratchet wheel. Once in each complete revolution of the units wheel 10, the pawl 25 is allowed to engage the ratchet wheel of the tens wheel 11 by means of a reduced portion 161 on the cam surface 16 onto which it is driven; this feature allows decade changing while maintaining the independence of the digit wheels for presetting.

Each of the cam surfaces 17 also has a reduced portion 171 which is so positioned that it is opposite the corresponding pin 23 when the associated digit wheel displays zero. Thus when both digit wheels 10, 11 display numbers other than zero, the drive assembly 20 assumes the position shown in FIG. 5. This position is

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also assumed when one only of the wheels displays zero, since the two drive members 21 move in unison. However, when both are driven to display zero and the armature plate 30 is released, the drive assembly 20 moves back through a greater angle until the pins 23 engage the reduced portions 171, as shown in FIG. 4. This increased movement moves a contact surface 35 (best seen in FIG. 3) on the drive member 20 clear of a follower 36 formed in the end of a sprung micro-switch arm 37 which thus moves to actuate the micro-switch 33.

The pins 23 have a second function. Owing to the employment of a kicker type drive and the fact that the pawls clear the ratchets after driving, there is a tendency for the digit wheels to overrun. The detent pawls 34, of course, help to prevent this, but are assisted in two ways. The pins 23 during the driving stroke rise and fall through axial projections 18. If the digit wheel overruns, one of the projections 18 meets the pin 23 as it falls. However, the main security against overrun is the provision of a shoulder 38 on each of the drive members 21. As each drive member 21 reaches the limit of its driving stroke, its shoulder 38 is in such a position that one of the finger projections 14 on the corresponding digit wheel butts against it, providing a positive lock.

It will be apparent that many modifications are possible. For example, the invention may be applied to a counter having only one (units) digit wheel. Three digit wheels may also be used, in which case a tie bar is provided linking the pawls for the tens and hundreds wheels to prevent repeated indexing of the hundreds wheel when the tens wheel displays "9."

A further modification provides the choice of operating a device controlled by the counter either in a counting-down manner as described above or continuously. This may be done by modifying the embodiment described by removing the pawl driving the digit wheel 10. In this case the digit wheel 10 and the associated cam surface 16 constitute means which may be selectively positioned to prevent the pawl from engaging the digit wheel 11. Thus when the digit wheel 10 is placed to display "9," the other digit wheel 11 acts as a units wheel; when wheel 10 is placed in any other position, the pawl is maintained clear of the ratchet on the digit wheel 11 and the device operates continuously.

I claim:

1. A counter including a support, a digital wheel mounted in the support for stepwise rotation and hav-

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ing circumferential projections to facilitate manual positioning, a ratchet wheel drivingly connected with the digit wheel, a drive member pivotally mounted in the support and arranged to be driven by a solenoid armature, a pawl pivotally mounted on the drive member and normally biased against a stop on the drive member to be free of the ratchet wheel, operation of the solenoid causing the drive member to pivot thus bringing the pawl into driving engagement with the ratchet wheel to move through a driving stroke, and a shoulder on the drive member which at the end of the driving stroke of the pawl abuts one of said circumferential projections to prevent over-running of the digit wheel.

2. A counter as claimed in claim 1, including a second digit wheel drivingly connected to a second ratchet wheel, a second pawl and second driving member similar to said pawl and said driving member, the two driving members being jointed by a connecting piece for simultaneous pivotal movement, and a further cam surface on said first-mentioned digit wheel arranged to permit the second pawl to engage the second ratchet wheel once only for each revolution of said digit wheel and to prevent such engagement at other times.

3. A counter as claimed in claim 1, in which the digit wheel has a cam surface, and including a follower for the cam surface coupled to a switching device, the cam surface having a portion which, when a predetermined portion of the digit wheel is displayed, operates the switching device by means of the follower.

4. A counter as claimed in claim 3, in which the follower is part of the drive member.

5. A counter as claimed in claim 3, including means arranged to be selectively positioned to prevent the pawl from engaging the ratchet wheel thereby disabling the switching device.

6. A counter as claimed in claim 4, in which the follower comprises an arm mounted on the drive member and a pin mounted on said arm distant from said drive member, the pin cooperating with said cam surface, and in which the digit wheel carries axial projections arranged in a ring on one side thereof between which the pin passes as the drive member pivots, whereby overrunning of the digit wheel is inhibited.

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