

Aug. 29, 1961

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2,998,187

ELECTRO-MAGNETIC COUNTERS

Filed June 22, 1956

4 Sheets-Sheet 1

FIG. 1

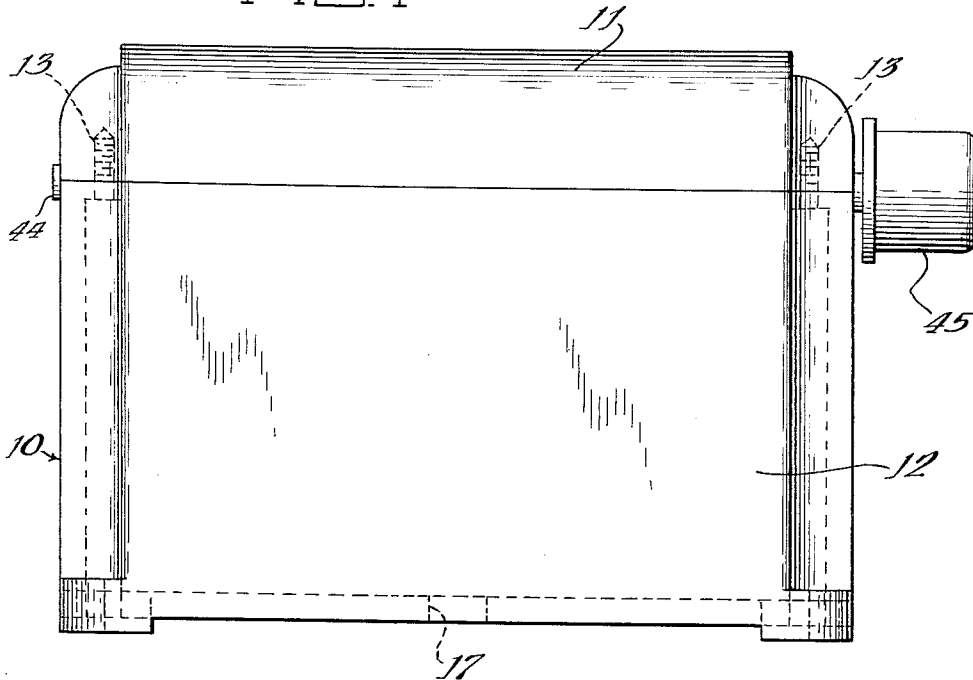
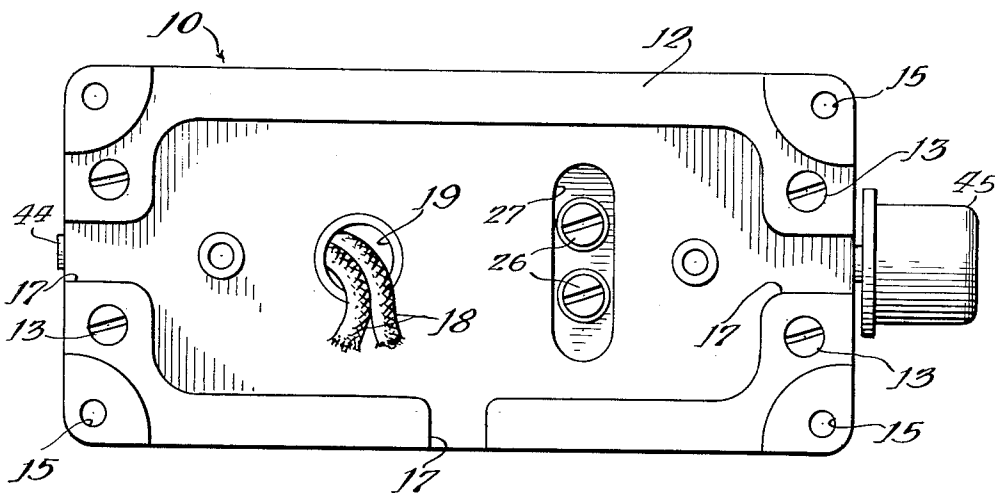


FIG. 2



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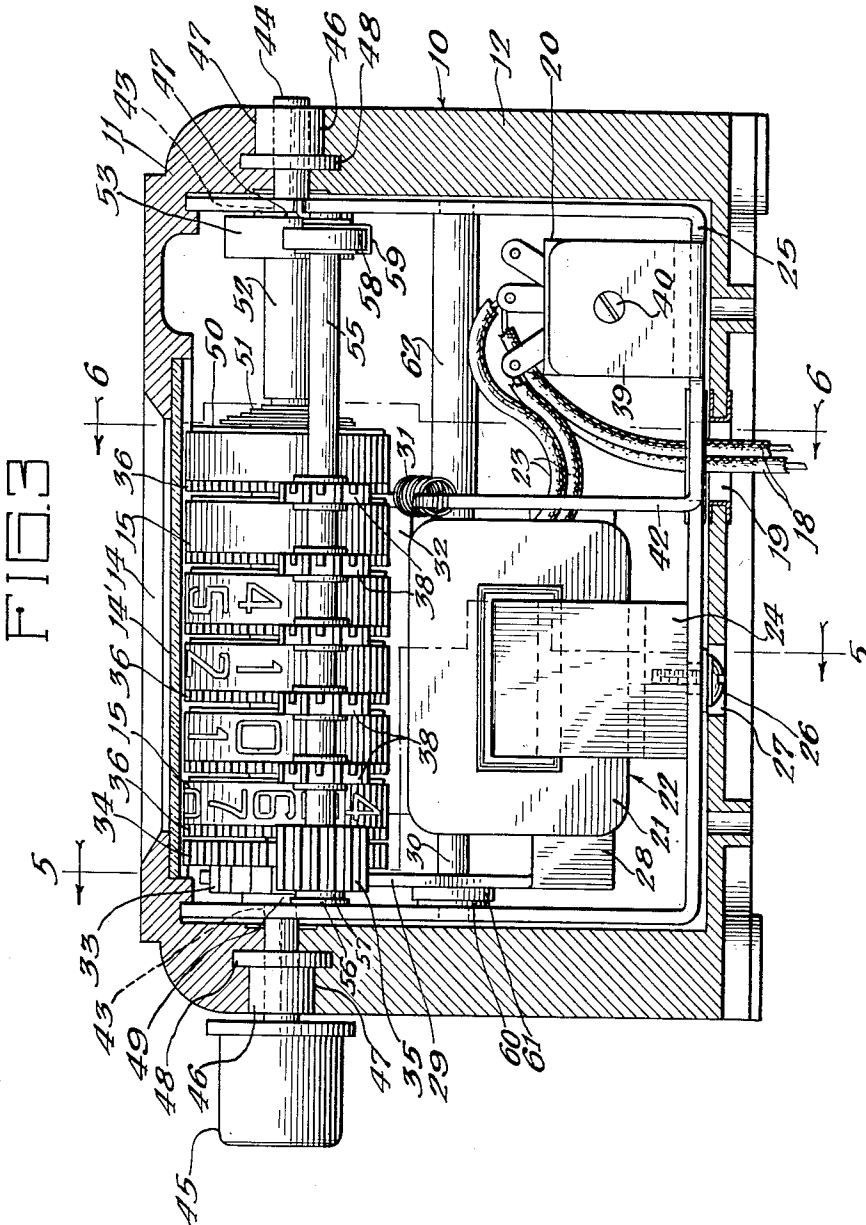
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4 Sheets-Sheet 2



In Witness Whereof:
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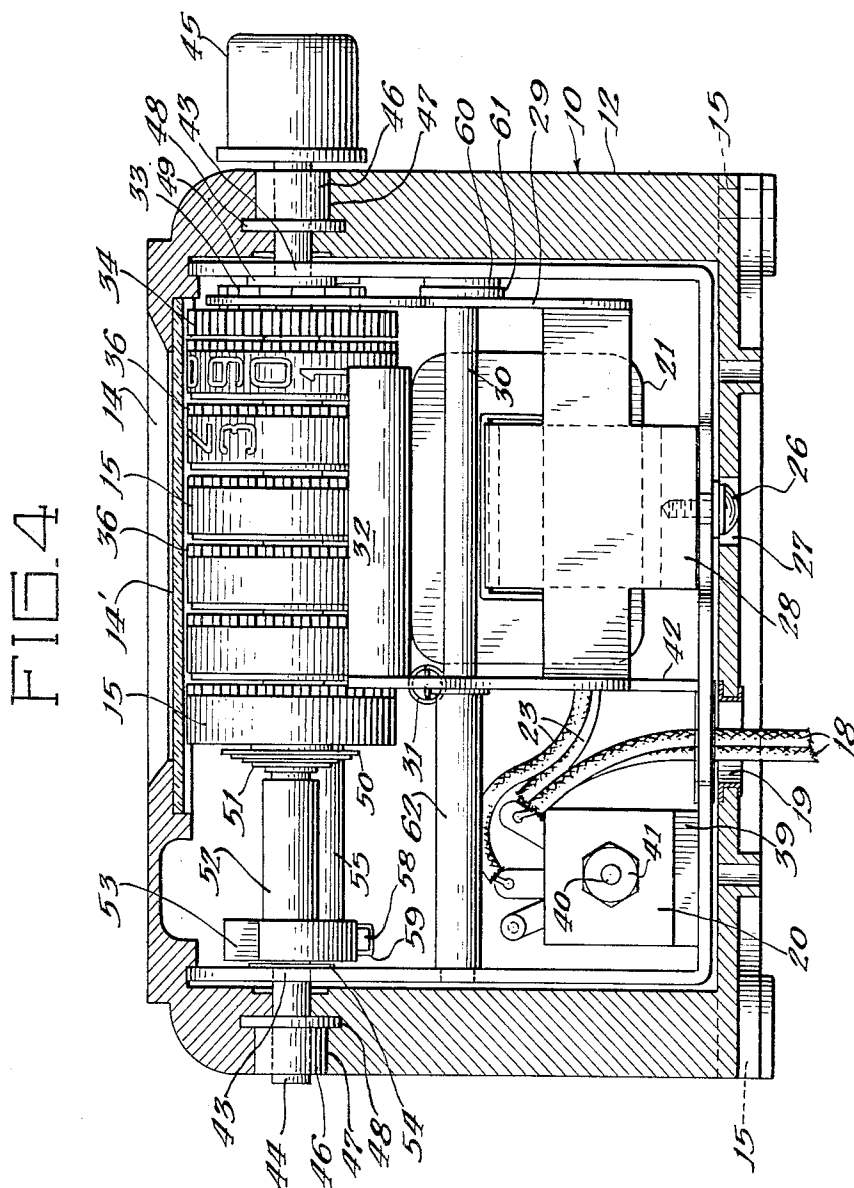
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ELECTRO-MAGNETIC COUNTERS

4 Sheets-Sheet 4



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2,998,187

ELECTRO-MAGNETIC COUNTERS

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Filed June 22, 1956, Ser. No. 593,266
2 Claims. (Cl. 235-92)

My invention relates to electro-magnetic counters of the type including a series of progressively operated numeral wheels which are used to count units by means of electrical impulses.

One of the objects of my invention is to provide an electro-magnet for use in electro-magnetic counters which is of such form that it provides the shortest path for formation of magnetic lines of force when it is energized.

Another object of my invention is to provide an electro-magnet for use in electro-magnetic counters which is of such composition that it provides for the rapid decay of magnetic lines of force when the power thereto is cut off.

A further object of my invention is to provide in an electro-magnetic counter operated by alternating current, a rectifier and the counting mechanism all within one compact housing.

Yet another object of my invention is to provide a housing for a counter of the above-described type of such shape that it will allow the counter to be mounted upon a surface without the necessity of drilling holes in the mounting surface to accommodate lead wires which conduct the electricity to said counter.

Still another object of my invention is to provide in an electro-magnetic counter of the type having a series of progressively operated numeral wheels, a power train of such type as to reduce breakage of the Geneva teeth on the numeral wheels.

Other objects and advantages will be apparent from the following description of a preferred embodiment thereof taken in connection with the accompanying drawings, in which:

FIG. 1 is an assembly view, in side elevation, of an electro-magnetic counter in which my invention is embodied;

FIG. 2 is a bottom plan view of the device;

FIG. 3 is a longitudinal sectional view of the counter taken substantially on the section line 3-3 in FIG. 5, showing certain parts in elevation, as viewed in the direction indicated by the arrows on said section line;

FIG. 4 is a similar view taken substantially on the section line 4-4 in FIG. 6, looking in the direction indicated by the arrows on said section line;

FIG. 5 is a cross-sectional view of the counter taken substantially on the section line 5-5 in FIG. 3, looking in the direction indicated by the arrows on said section line; and

FIG. 6 is a cross-sectional view taken substantially on the section line 6-6 in FIG. 3 and looking in the direction indicated by the arrows on said section line.

As thus illustrated, the mechanism of my invention is enclosed in a housing, shown generally at 10, consisting of a top portion 11 affixed to a body portion 12 by fastening means such as screws 13. A window 14 is located in the top portion 11 so that digits on a series of numeral wheels 15 are viewable through said window 14, which is covered with a glass 14'. At each corner of the housing 10 are holes 15 to accommodate fastening means (not shown), for securing the device to a mounting surface (not shown). Each side of the bottom of the body portion 12 is provided with an indentation 17 to allow lead wires 18 to be passed there-through so that no holes need be drilled in the mount-

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ing surface to accommodate them when mounting the device. After passing through the indentations 17 the leads 18 then pass through a hole 19 located in the bottom of body portion 12 and thence to a full wave bridge type rectifier 20, so wired that pulsing is accomplished on the input side thereof, thus requiring only two wires instead of the customary four and simplifying the wiring of the rectifier 20.

The rectifier 20 rectifies the current supplied thereto which, for example, may be 115 volt, 60 cycle alternating current. The current so rectified is carried to a coil 21 of an electro-magnet 22 by means of wires 23. The rectifier 20, by rectifying the alternating current supplied thereto, eliminates hum that is encountered in counters of this type which do not rectify the alternating current.

The coil 21, which, for example, may consist of 9,700 turns of number 38 wire and have a resistance of 1,480 ohms at 20° C., is wound around one arm of a U-shaped core 24 of the electro-magnet 22. The core 24 is composed of electrolytic powdered iron, which allows for the rapid decay of magnetic lines of force when the magnet 22 is deenergized. Being U-shaped, the core 24 provides a shorter path for formation of magnetic lines of force than cores of T-shaped design commonly used in such counters.

The magnet 22 is fastened to a U-shaped frame 25 upon which the mechanism of the device is assembled, by two screws 26 which are fastened through the underside of the frame 25 and screw into the arm of the core 24 which is bare. An oblong slot 27 in the bottom of the body portion 12 of the housing accommodates the heads of the screws 26, thus allowing the frame 25 to rest evenly within the housing 10.

An armature 28 of magnetic material integrated with a pawl 29 is suspended from a shaft 30 across the open end of the core 24. A return spring 31 keeps the armature 28 away from the magnet 22, except when the magnet is energized. When the magnet 22 is energized, the armature 28 is pulled to the open end of the core 24 by magnetic lines of force and upon de-energization of the magnet 22, the armature 28 is pulled away therefrom by the return spring 31. The armature 28, should it become magnetized, will not stick to the core 24 since it is clad with a thin coating of a non-magnetic material such as copper. A counterweight 32 is attached to the armature 28.

The pawl 29, since it is integrated with the armature 28, moves when the armature 28 is pulled to and away from the magnet 22. The pawl 29 acts upon a ratchet gear 33 and causes it to rotate. A drive gear 34 is integrated with the ratchet gear 33 and is in mesh with a pinion gear 35. The pinion gear 35 is also in mesh with a reset gear 36 of the numeral wheel 15 of the lowest power. One numeral wheel 15 causes the next to rotate by means of a standard Geneva mechanism, consisting of Geneva teeth 37 on each numeral wheel 15 which mesh with a pinion gear 38 once during each revolution of the numeral wheel 15. The pinion gear 38 is in mesh with the reset gear 36 of the numeral wheel 15 of the next highest power, and so, when the Geneva teeth 37 turn the pinion gear 38, the numeral wheel 15 of the next highest power is turned so that the next digit thereon is aligned under the window 14.

The power train, by virtue of the number of gears through which the power delivered by the pawl 29 must travel before it reaches the numeral wheels 15, reduces the striking force of the pawl 29 before it reaches the numeral wheels 15, thus preventing breakage of the Geneva teeth 37. It is also apparent that a pinion gear 35, geared differently than that illustrated in the drawings, can be placed in the power train to cause the

counter to register halves, fifths or any other desired fraction, rather than units, as is illustrated.

The entire mechanism above described and the rectifier 20 are assembled upon the U-shaped frame 25. A portion of the center of such frame is bent up to form a post 39 to which the rectifier 20 is attached by means such as a screw 40, to which a nut 41 is affixed. Another portion is also bent up to form a post 42 upon which one end of the armature return spring 31 is attached.

Two holes 43 are provided at either end of the frame 25 to allow a slotted shaft 44, which is knurled at one end to accommodate a reset knob 45, to pass therethrough. The slotted shaft 44 extends beyond either arm of the frame 25 and thence through sleeve bearings 46 of the oilless type located in bearing recesses 47 formed in the top 11 and body portion 12 of the housing 10. The outside configuration of the bearings 46 conform to the shape of the bearing recesses 47, thus, since the bearings 46 have a flange 48 at one end, they are prevented from slipping out of the device. The knurled end of the shaft 44 extends beyond the end of the bearing 46 and said reset knob 45 is affixed thereon. By turning the knob 45 in a clockwise direction, the numeral wheels 15 may be reset at zero after a counting sequence, in a manner which will later appear.

Positioned upon the slotted shaft 44 between the arms of the frame 25 is a washer 49, which positions the ratchet gear 33 so that it is aligned with the pawl 29. The drive gear 34, which is integrated with the ratchet gear 33, is also positioned upon said shaft 44, as are a series of numeral wheels 15 which have a protrusion (not shown) in their bore which fits into the slot in the shaft 44 and maintains them thereon in proper alignment. A washer 50 is positioned upon said shaft 44 next to the numeral wheel 15 of the highest power. A serpentine spring 51 is also positioned upon said shaft, as are a sleeve 52, a reset cam 53 and a washer 54.

The numeral wheels 15, when properly placed upon the shaft 44, with the protrusions in their bores fitted into the slot of the shaft 44, they are then aligned thereon with similar numerals all on a common plane. The protrusions of the numeral wheels 15 are yieldable, so that as the wheels 15 are turned individually clockwise, as in a normal counting sequence, the protrusions leave the slot. After a counting sequence is concluded, the reset knob 45 may be turned in a clockwise direction, causing the shaft 44 to do the same. As the slot in the shaft 44 reaches the protrusion on the numeral wheel 15, the protrusion fits into the slot, realigning the numeral wheel 15 on the shaft 44. The numeral wheels 15 locked upon the shaft 44 are then rotated back to zero.

The reset cam 53 is positioned upon the shaft 44 and prevents the shaft from being turned in a counterclockwise direction, since a zero reset pawl 58, which is suspended from a fixed shaft 55 is caused to ride upon the face of the zero reset cam 53 by a spring 59. The configuration of the zero reset cam 53 is such that when the wheels 15 are set at zero the cam is locked by the pawl 58, thus preventing the shaft 44 from being turned in a counterclockwise direction by the reset knob 45.

The sleeve 52, the spring 51 and the washer 50 act together to hold the numeral wheels in proper proximity upon the shaft 44.

Upon the fixed shaft 55, positioned below and to one side of the shaft 44, are mounted two washers 56 and 57, the pinion gear 35 and pinion gears 38. The washers 56 and 57 serve to properly align the pinion gear 35 upon the shaft 55, so that it will remain in mesh with the drive gear 34 and the reset gear 36.

The shaft 30 is positioned substantially below the above-mentioned shafts 44 and 55 on the arms of the frame 25. Positioned upon this shaft 30 are two washers 60 and 61 and a sleeve 62, which hold the pawl 29

and the armature 28 in proper position on the said shaft 30.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, for it will be apparent that various changes may be made in the form, construction and arrangement of parts without departing from the spirit and scope of the invention.

I claim:

1. In a high speed counter, a casing, a reset shaft rotatably mounted on said casing, a first reset drive gear on said reset shaft, a series of coaxial rotary numeral wheels of successively higher order rotatable about said shaft, a ratchet wheel, a second drive gear rigidly connected to said ratchet wheel, said ratchet wheel and said drive gear being rotatably mounted on said reset shaft, a Geneva drive mechanism between each of said numeral wheels, an operating pinion which is rotatably mounted with respect to said casing and meshing with said first reset drive gear and said second drive gear, a pawl co-operable with said ratchet wheel for driving the same and said operating pinion, a pivot shaft on said casing and extending parallel to said reset shaft, said pawl being pivoted on said pivot shaft, a U-shaped magnet core having a pair of spaced open ends, a coil wound on said core, an armature plate bridging said open ends and extending generally perpendicular to the axes of said reset shaft and said pivot shaft in the energized position of said armature plate, an arm connecting said armature to said pawl and being pivoted on said pivot shaft, said pivot shaft being positioned between said core and said reset shaft, a counterweight mounted on said arm between said pivot shaft and said reset shaft, and a layer of non-magnetic material on that side of said armature plate which would otherwise contact said spaced ends.

2. In a high speed counter, a casing, a reset shaft rotatably mounted on said casing, a first reset drive gear on said reset shaft, a series of coaxial rotary numeral wheels of successively higher order rotatable about said shaft, a ratchet wheel, a second drive gear rigidly connected to said ratchet wheel, said ratchet wheel and said drive gear being rotatably mounted on said reset shaft, a Geneva drive mechanism between each of said numeral wheels, an operating pinion which is rotatably mounted with respect to said casing and meshing with said first reset drive gear and said second drive gear, a pawl co-operable with said ratchet wheel for driving the same and said operating pinion, a pivot shaft on said casing and extending parallel to said reset shaft, said pawl being pivoted on said pivot shaft, a U-shaped magnet core having a pair of spaced open ends, a coil wound on said core, an armature plate bridging said open ends and extending generally perpendicular to the axes of said reset shaft and said pivot shaft in the energized position of said armature plate, and an arm connecting said armature to said pawl and being pivoted on said pivot shaft, said pivot shaft being positioned between said core and said reset shaft.

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