Feb. 6, 1951 H. N. BLISS 2,540,808

COUNTING MECHANISM

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Fig. 1

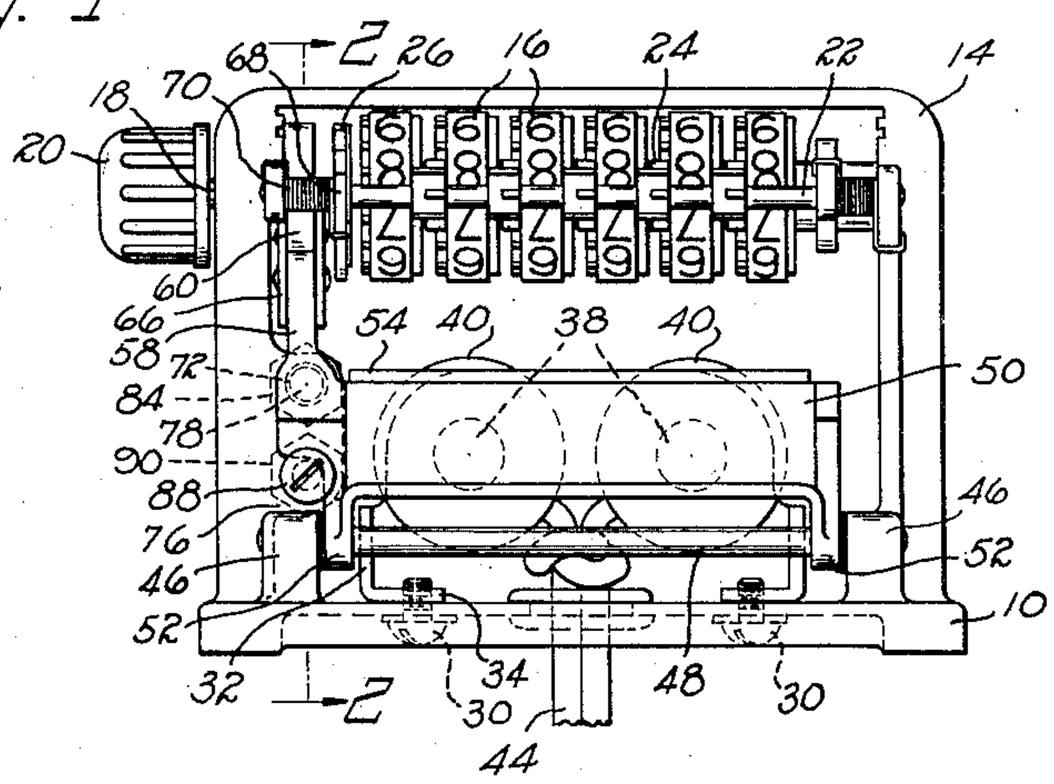


Fig. 2

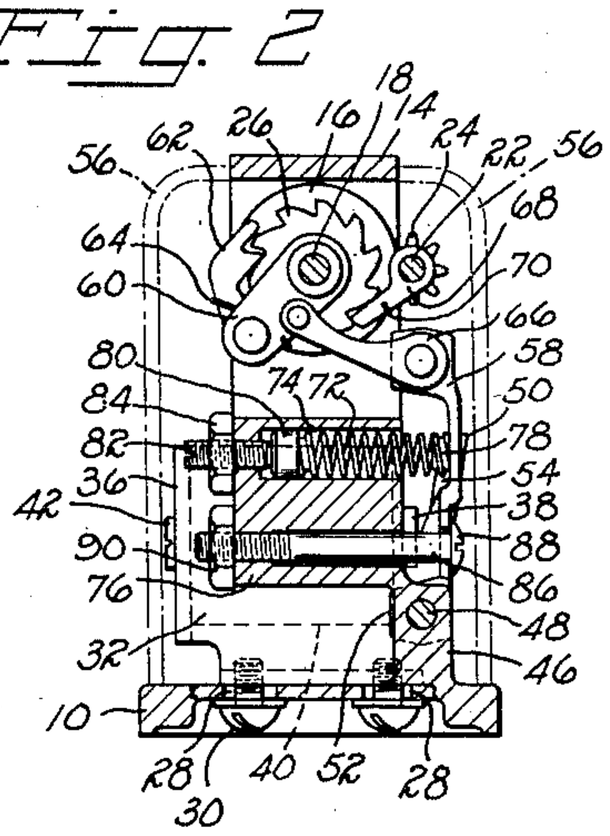
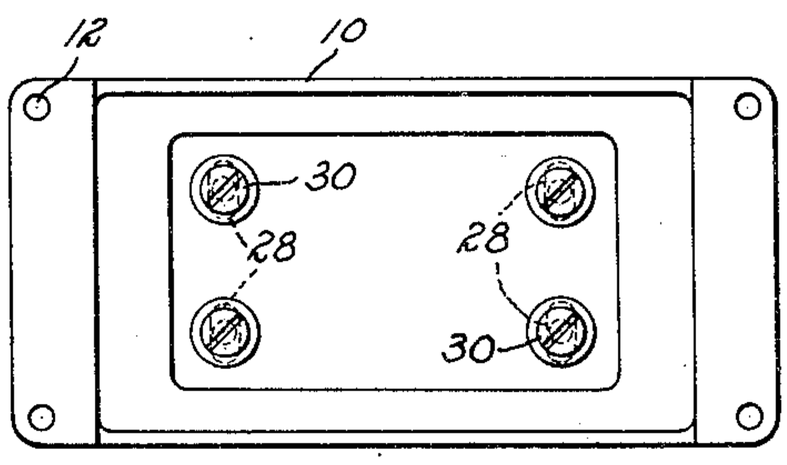


Fig. 3



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COUNTING MECHANISM

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This invention relates to improvements in a counting mechanism and more particularly to a counting mechanism actuated by electromagnetic means.

It is an object of the invention to provide a compact and simplified electromagnetically actuated, general purpose counting mechanism including refinements in adjusting means therefor which insure accurate functioning of the feeding and holding pawls which coact with the ratchet wheel of the counter, whereby the oscillatory functions of the armature may be adjustably controlled in both directions of movement. It is an aim of this object to include additional means by which the electromagnet may be adjusted relative to the armature to insure precise actuation of the feeding and holding pawls. It is a further aim of this object to provide adjustable biasing means for moving the armature in one direction in order to prevent overloading the electromagnet.

Details of these objects and aims of the invention as well as other objects thereof are set forth in the following specification and illustrated in the drawing comprising a part thereof.

In the drawing:

Fig. 1 is a side elevation of a counting mechanism embodying the principles of the invention;

Fig. 2 is a sectional end elevation taken on the line 2—2 of Fig. 1;

Fig. 3 is a bottom plan view of the mechanism shown in Fig. 1.

Referring to the drawing, a substantially planar base 10 is provided with means such as a plurality of apertures 12 by which the same may be secured to any supporting surface of a device relative to which the counting mechanism could be used. An inverted U-shaped frame 14 is formed either integrally with the base 10 or said frame may be formed separately and connected at its ends to said base in any suitable manner. The frame 14 extends upward from the base and, as shown in Fig. 2, the frame 14 is of relatively narrow width; whereby the overall dimensions of the counting mechanism may be relatively small.

A series of numeral wheels 16 are mounted in the upper portion of the frame and disposed horizontally therein on a common shaft 18, the numeral wheels 16 being rotatable relative to the shaft. A manipulating knob 20 is secured to one projecting end of the shaft for the purpose of resetting the numeral wheels 16 when desired.

Another shaft 22 is supported at its ends by the frame 14, said shaft rotatably supporting a plurality of transfer gears 24, which are the conventional type utilized in counting mechanisms of this general nature. The functioning of the numeral wheels 16 and the transfer gears 24 does not comprise part of the present invention and a detailed description of their operation is, therefore, not believed necessary. It is considered sufficient for this disclosure to state that a ratchet wheel 26 is rotatably supported on shaft 18 and interengages the juxtaposed numeral wheel 16 for purposes of rotating said numeral wheel in one direction. The interconnection between the ratchet wheel 26 and the juxtaposed numeral wheel 16 is such that they can move as a unit in said one direction. Movement of said juxtaposed numeral wheel 16 will, at predetermined intervals, actuate the various transfer gears 24 and other numeral wheels 16 in accordance with well-known principles embodied in counting mechanisms of this nature.

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The base 10 is provided with a plurality of slots 28 extending transversely to base 10, the same receiving screws 30. Said screws engage a bracket 32 of suitable magnetic material. As seen from Fig. 1, the bracket has in-turned feet 34 which are directly engaged by the screws 30 to adjustably hold said feet against the upper surface of base 10. The bracket 32 also has a vertical plate portion 36 to which a plurality of electromagnetic cores 38 and surrounding coils 40 are secured by any suitable means, such as screws 42. The plate portion 36 is thus magnetically connected to the cores 38, whereby the unitary structure comprises a U-shaped core, the legs of which are surrounded by the coils 40. Leads 44 from the coils are connectible to a source of current.

Either the base 10 or the frame 14 is provided with a plurality of projections 46 having longitudinally aligned apertures which receive the ends of a shaft 48 that is parallel to the plane of base 10. A plate-like armature 50 is pivotally supported adjacent its lower edge on the shaft 48. The armature 50 extends across the faces of the cores 38 of the electromagnets as well as between said cores as is clearly shown in Fig. 1. Preferably, the armature 50 is provided with a plurality of trunnions 52 which have bearing apertures receiving the shaft 48. If desired, the armature 50 may be formed by casting or otherwise from any suitable magnetic or non-magnetic material. In the event it is formed from non-magnetic material, a magnetic plate 54 is secured thereto for direct magnetic attraction by the cores 38 of the electromagnets.

It will be noted that the electromagnets are mounted side by side above the base 10 and ex-

tend transversely thereto. Also, for further compactness, the electromagnets are disposed immediately below the series of numeral wheels 16, and the armature is capable of limited oscillatory movement in feeding and non-feeding directions. From Fig. 2, it will be seen that the armature 50 is disposed very closely to one edge plane of the frame 14, and the armature is thus considered to be movable at least substantially within the space enclosed by the frame 14. Preferably, the open sides of the frame 14 are closed by suitable covers 56 shown in dotted lines in Fig. 2 to protect the mechanism within said frame. These covers may be secured to the frame 14 in any suitable manner.

Extending upward from and rigidly fixed to the armature 50 is an arm 58. Rotatable on the shaft 18 is a pawl arm 60 to which one end of a feeding pawl 62 is pivotally connected. The pawl 62 engages the teeth of ratchet wheel 26 as is clearly shown in Fig. 2. Said pawl is also biased into engagement with said teeth of the ratchet wheel by a suitable spring 64. The pawl arm 60 and arm 58 on the armature 50 are pivotally interconected by one or more links 66. Thus, the feeding pawl 62 and armature 50 are interconnected, and the feeding pawl is moved in feeding and non-feeding directions by the corresponding oscillatory movements in opposite directions of the armature 50. To prevent movement of the ratchet wheel 26 in non-feeding direction, an holding pawl 68 is provided which is pivotally supported on the shaft 22 that also supports the transfer gears 24. A suitable spring 70 normally biases the holding pawl 68 into engagement with the teeth of the ratchet wheel 26.

When the electromagnets are energized, the armature 50 will be moved in feeding direction toward the juxtaposed ends of the cores 38, and such movement will advance the ratchet wheel 26 and the juxtaposed numeral wheel 16 a distance of one tooth on the ratchet wheel. The adjustable support for the electromagnet comprising the slots 28 and screws 30 will permit varying the position of the electromagnet relative to the armature so that the armature may precisely move the feeding pawl 62 one full advancing stroke and permit the holding pawl 68 to drop into engagement with an holding face of one of the teeth of the ratchet wheel 26 before the armature 50 and feeding pawl 62 are moved in reverse or non-feeding direction. By using such an arrangement, it is not necessary to control dimensions of the feeding components precisely, especially when cost is a factor, and the above-described adjustable positioning of the electromagnet relative to the armature will nevertheless insure accurate and precise functioning of the feeding and holding pawls. For example, were no adjustment of the electromagnets permitted relative to the armature, it is possible that, unless dimensions were controlled within close limits, the armature could, for example, engage the core faces of the magnets before the feeding pawl 62 had advanced the ratchet wheel a full stroke or the holding pawl had moved into engagement with the above-described holding face of one of the teeth of the ratchet wheel 26. The provision of the adjustment described permits assembly in such a way as to prevent such a malfunction of the device.

Movement of the armature 50 as well as the feeding pawl 62 in non-feeding direction is effected by biasing means comprising an helical spring 72 which is disposed in a suitable socket

74 formed in a boss or projection 76 extending inward from the inner face of one of the legs of U-shaped frame 14, as is clearly shown in Fig. 1. One end of the spring 72 preferably engages a lug 78 formed on the armature 50 so as to accurately position the spring relative to the armature. The other end of the spring 72 is engaged by a plunger 80 which is slidably disposed within socket 74. The position of the plunger 80 is variably controlled by a set screw 82 threaded into the projection 76 so as to engage the plunger 80. A lock nut 84 secures the set screw 82 in any desired setting. In view of this arrangement, the biasing force of spring 72 may be adjusted to exert sufficient force to move the armature 50 and the feeding pawl 62 in non-feeding direction; but when the armature and feeding pawl are moved by the magnet in feeding direction, no overload will be placed upon the magnet due to any excess force exerted by spring 72.

Movement of the armature 50 in non-feeding direction is adjustably limited by a stop screw 86, the head 88 of which is partially engaged by a portion of armature 50 as is clearly seen in Figs. 1 and 2. The threaded end of the screw 86 engages a partially threaded aperture formed in projection 76, and a lock nut 90 maintains the screw 86 in any desired setting. Such adjustability of said stop screw will permit setting the same so that there will be a minimum amount of lost motion between the feeding pawl 62 and the tooth of the ratchet wheel 26 to be engaged thereby each time the feeding pawl is moved in feeding direction by the armature 50.

While the invention has been illustrated and described in its preferred embodiment and has included certain details, it should be understood that the invention is not to be limited to the precise details herein illustrated and described since the same may be carried out in other ways, falling within the scope of the invention as claimed.

I claim as my invention:

1. A counter mechanism comprising in combination, a base, a numeral wheel and ratchet wheel connected for simultaneous rotatable movement relative to said base about an axis parallel thereto, an armature extending generally vertically relative to said base and pivotally mounted at one end adjacent said base for oscillatory movement of the other end of the armature in feeding and non-feeding directions relative to said ratchet wheel, a feeding pawl carried by said armature and movable therewith in feeding direction to engage and rotate said ratchet wheel in one direction, an electromagnet supported between said base and numeral wheel and arranged when energized to move said armature in feeding direction the core of said electromagnet being substantially parallel to said base, a bracket adjustably secured to said base and supporting said electromagnet for adjustable positioning in the direction of its core relative to said armature, means biasing said armature in non-feeding direction, and a stop adjustably mounted for engagement by said armature to limit the movement thereof in non-feeding direction.

2. A counter mechanism comprising in combination, a base having a slot therein, a numeral wheel and ratchet wheel connected for simultaneous rotatable movement relative to said base about an axis parallel thereto, an armature extending generally vertically relative to said base and pivotally mounted at one end

adjacent said base for oscillatory movement of the other end thereof in feeding and non-feeding directions relative to said ratchet wheel, a feeding pawl carried by said other end of said armature and movable therewith in feeding direction to engage and rotate said ratchet wheel in one direction, an electromagnet supported between said base and numeral wheel and arranged when energized to move said armature in feeding direction, the core of said electromagnet being substantially parallel to said base, a bracket supporting said electromagnet, a screw disposed within said slot in said base and engaging said bracket to render said electromagnet adjustable on said base relative to said armature, means biasing said armature in non-feeding direction, and means engageable by said armature to limit the movement thereof in non-feeding direction.

3. A counter mechanism comprising in combination, a base, a pair of arms connected to and extending perpendicularly to said base, a numeral wheel and ratchet wheel connected for simultaneous rotatable movement relative to said base, a shaft rotatably supporting said wheels and extending between said arms and parallel to said base, an armature pivotally mounted for oscillatory movement in feeding and non-feeding directions relative to said ratchet wheel, a feeding pawl carried by said armature and movable therewith in feeding direction to engage and rotate said ratchet wheel in one direction, an electromagnet supported on said base between said wheels and base, the core of said electromagnet being parallel to said base and arranged when energized to move said armature in feeding direction, means supporting said electromagnet for adjustable positioning in the direction of its core relative to said armature, means supported by one of said arms and biasing said armature in non-feeding direction, a screw adjustably carried by said one arm and associated with said biasing means so as to be operable to vary the force exerted thereby against said armature, and a stop screw adjustably supported by one of said arms and engageable by said armature to

limit the movement thereof in non-feeding direction.

4. A counter mechanism comprising in combination, a base, an inverted U-shaped frame connected at its ends to said base and extending substantially vertically therefrom, a series of numeral wheels rotatably mounted on a shaft in the portion of said frame remote from said base and disposed substantially parallel to said base, a ratchet wheel associated with one of said wheels and operable to rotate it, a pair of electromagnets mounted side by side on said base between said numeral wheels and said base, the cores of said electromagnets being substantially parallel to said base, a rectangular plate-like armature pivoted adjacent one edge for limited oscillatory movement about an axis adjacent said base and substantially within the space enclosed by said frame, said armature extending across one end of each of the cores of said magnets, and a pawl carried by the free end of said armature and engageable with said ratchet wheel.

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