Jan. 13, 1942. T. OBSZARNY 2,269,858

RATCHETING MECHANISM

Filed Oct. 21, 1940

Fig. 1

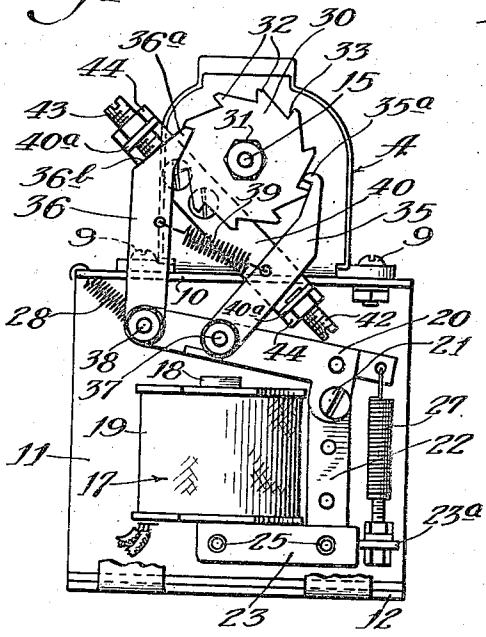


Fig. 2

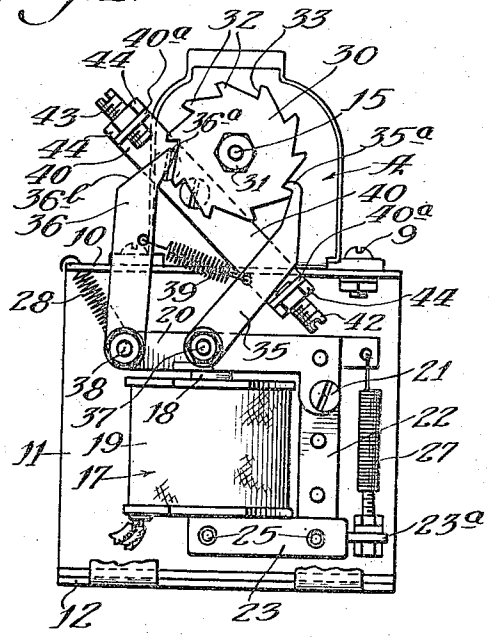
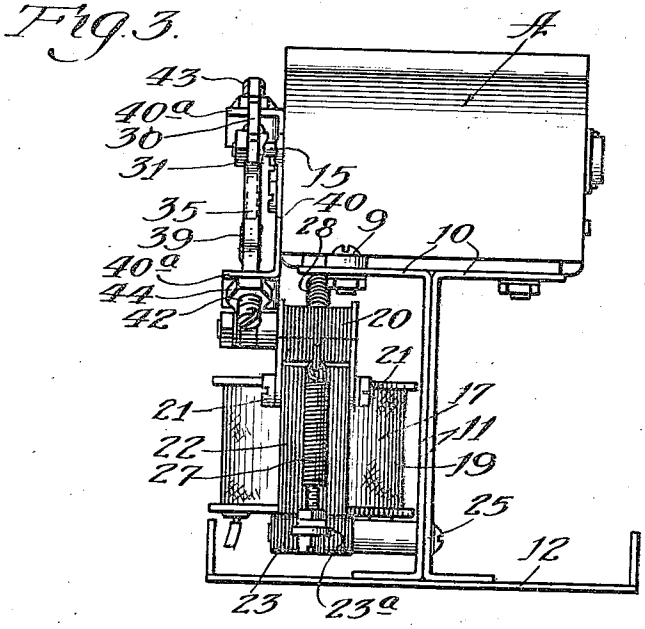


Fig. 3.



Inventor:
Theodore Obszarny,
By: Bair & Freeman
Attorneys

Patented Jan. 13, 1942 2,269,858

UNITED STATES PATENT OFFICE

2,269,858

RATCHETING MECHANISM

Thedore Obszarny, Chicago, Ill., assignor to Guardian Electric Manufacturing Co., Chicago, Ill., a corporation of Illinois

Application October 21, 1940, Serial No. 362,103

5 Claims. (Cl. 74—143)

This invention relates to ratcheting mechanism for controlling the rotative adjustment of a member in a step-by-step fashion.

More particularly, this invention is directed to improvements in ratcheting mechanisms of the type wherein a reciprocable driving member actuates ratchet pawl means in a manner so that during one direction of movement of the driving member, said pawl means is caused to rotate the ratchet wheel, and in turn the member to be controlled, a stepped amount, and during movement of said driving member in the other direction, said pawl means is adapted to rotate said ratchet wheel, and member to be controlled, a further stepped amount in the same direction.

One of the primary objects of this invention is to provide an improved ratcheting mechanism of the character indicated which is constructed in a manner to obtain relatively uniform and exact stepping action of the ratchet wheel upon each complete cycle of actuation of the driving member.

Another object is to provide an improved ratcheting mechanism characterized by the provision of two separate pawls adapted to be actuated in sequence and engageable respectively with opposite peripheral portions of the ratchet wheel, incident to reciprocable movement of the driving member, for stepping the ratchet wheel a predetermined amount.

A further object resides in the provision of an improved ratcheting mechanism of the character indicated which is of relatively simple and durable construction, positive in operation, and capable of economical manufacture.

Other objects and advantages of this invention will be apparent from the following description taken in connection with the accompanying drawing in which—

Figure 1 is a front elevational view of the ratcheting mechanism embodying the present invention shown in association with a counting device;

Figure 2 is a view similar to Figure 1 but showing the ratcheting mechanism in another position of adjustment;

Figure 3 is an end elevational view of the ratcheting mechanism, in association with a counting device.

In the drawing I have shown, merely for purposes of illustration, my novel ratcheting mechanism in association with a counting device which is indicated generally at A, secured by bolts 9, upon a shelf 10, which is formed of a pair of angular extensions of a pair of upwardly disposed support brackets 11, which are rigidly attached, as by welding, at their lower ends to a stamped sheet metal base 12.

It is to be understood that the counting device A is of a conventional construction including a series of inter-connected numbered discs or wheels adapted to be adjusted by a main control shaft, designated at 15, one end of which protrudes a short distance beyond the housing of the counting device A.

The motivating means for actuating the counting device is herein shown in the form of an electro-magnet, and more specifically in the nature of a relay 17 having a vertically disposed core 18, the upper end of which protrudes beyond the coil 19 as seen in the drawing. Said relay includes a reciprocable armature 20 pivotally mounted at one end at 21 to the upright leg 22 of the field piece 23. For purposes of this invention said armature 20 may be considered as a reciprocable driving member, capable of actuation by any suitable mechanical means. For convenience in assembly of the entire device, the relay is firmly secured to the upright supports 11 by means of screws 25, connected to said field piece 23.

The armature 20 is yieldingly urged in an upward direction, away from the core 18, by means of a coil spring 27, connected to the end of the armature beyond the pivot connection 21, the other end of the spring being connected to a lug 23a constituting an extension of the field piece. To further assist in moving the armature away from the core of the coil when the latter is de-energized, a coil spring 28 is connected at one end of the forward or free end of the armature and its other end is connected to the supporting frame 10.

Referring now more specifically to the ratcheting mechanism embodying the present invention, said mechanism includes a ratchet wheel 30 rigidly mounted on the extension of the shaft 15 and is firmly held in fixed position thereon by a nut 31. The ratchet wheel, as may be seen in the drawing, is formed with a multiplicity of teeth 32, having operating faces 33 which are relatively flat and slightly undercut. Cooperating with the teeth of said ratchet wheel, is a primary pawl 35 and a secondary pawl 36, said pawls being pivotally connected respectively at their lower ends, at 37 and 38 to the edge of the outer end of the armature 20, with their pivot axes spaced apart a substantial distance, as seen in the drawing. The operating or free end of the primary pawl 35 is formed with a hooked

nose 35a, while the operating end of the secondary pawl 36 is formed with an angularly tapered abutment nose 36a, formed to fit the contour of the teeth of the ratchet wheel. The operating ends of the respective pawls are positioned for engaging substantially diametrically opposite portions of the periphery of the ratchet wheel, and said pawls are yieldingly urged toward each other for engagement with the teeth of the ratchet wheel by means of a coil spring 39, the opposite ends of which are connected respectively to said primary and secondary pawls.

Due to the shape of the operating ends and the separate pivotal mountings of the respective primary and secondary pawls, it will now be apparent that upon the downward movement of the armature 20, incident to energization of the relay, the primary pawl is caused to function and its hooked operating nose 35a is brought into engagement with the face 33 of a cooperating tooth of the ratchet wheel, and thereby rotates the ratchet wheel and shaft 15 a stepped amount. When the relay is de-energized, the armature thus being free to move to its upward position under influence of springs 27 and 28, imparts motion to the secondary pawl 36 in a manner to cause its operating end or nose 36a to engage the face 33 of a cooperating tooth of the ratchet wheel and thereby rotate the latter a stepped amount in the same direction as caused by the primary pawl 35. Thus during a complete cycle of motion of the armature the primary and secondary pawls are sequentially actuated to step the ratchet wheel 30 and its shaft 15.

It will be noted that upon the downward movement of the armature, during which time the primary check pawl functions to rotate the ratchet wheel, the operating nose 36a of the secondary check pawl is caused to cam over a tooth of said ratchet wheel until it assumes a position as seen in Figure 2 of the drawing. And similarly, upon upward movement of the armature, during which time the secondary check pawl becomes operative to move the ratchet wheel a stepped amount, the operating nose portion 35a of the primary pawl cams over a tooth of the ratchet wheel, and by this means the ratchet wheel is caused to be stepped or rotated one complete tooth during each complete cycle of reciprocable operation of the armature. In other words, the ratchet wheel is caused to be rotated an amount equivalent to the angular distance between two adjacent teeth incident to each complete downward and upward cycle of movement of the armature.

Mounted on the end of the housing of the counting mechanism A, beneath the ratchet wheel 30, is an angularly disposed bracket 40, the ends of which are bent outwardly to form extensions 40a in which are threaded adjustable screws 42 and 43, the screw 42 being disposed adjacent the outer angularly disposed edge of the primary check pawl 35, while screw 43 is positioned for cooperative engagement with the angularly disposed edge 36b of the secondary check pawl 36. Said screws 42 and 43 are adapted to be secured in a desired fixed position of adjustment by lock nuts 44 and serve as stop means for limiting movement of the respective ratchet pawls.

It will be apparent that during the downward movement of the armature, during which time the primary pawl 35 rotates the ratchet wheel, such motion of the armature may be extremely rapid, tending to cause the ratchet wheel to "overrun" and thereby cause improper adjustment of shaft 15 and mechanism controlled thereby. Such overrunning cannot take place because, as may be seen in Figure 2 of the drawing, the inclined back edge of the tooth would tend to cam against the operating nose 35a of the primary pawl, and urge it away from the ratchet wheel and would, therefore, move said pawl in abutting relation against the end of the stop screw 42 and cause a temporary binding action on the ratchet wheel.

The stop screw 43 functions to limit the upward motion of the secondary check pawl and thereby positively limits movement of said ratchet wheel so as to arrest the same at a relatively exact or predetermined stepped position of adjustment. This positive arresting of said wheel is accomplished, due to the fact the operating nose 36a of the secondary pawl is formed to fit the contour of the tooth of the ratchet wheel, and when said pawl arrives at its upward limit of movement, as determined by its abutment against the end of the stop screw 43, said ratchet wheel cannot be rotated further in normal operating direction due to the binding action of the surface of the tooth against the pawl and the latter against the screw 43 as may be seen in Figure 1. It will now be apparent that by virtue of the adjustment provided by screw 43, it is possible to obtain extremely fine, relatively exact, uniform step-by-step actuation of the ratchet wheel and its shaft 15.

By virtue of the ratchet mechanism described, operation of the driving member, which in the construction illustrated is the armature 20, the ratchet wheel 30 is positively stepped a predetermined amount during each operation of said driving member. In certain prior constructions an escapement type pawl action is employed, and it often happens that when the driving member, which might be an armature of an electro-magnet, does not move through its complete stroke, the escapement type pawl may happen to rest upon the outer edge or end of the tooth of the ratchet wheel and thereby permits the ratchet wheel to remain in a partially stepped position of adjustment. This disadvantage cannot possibly result in the construction above described.

A further and important advantage resulting from utilizing separate pawls which are sequentially brought into operation, that is, one during the downward movement of the driving member and the other during the upward movement of the driving member, is that it permits the use of an electro-magnet of considerably smaller size, having a shorter stroke and thereby requiring less power than would be required if a single pawl were employed for effecting the stepping action of the ratchet wheel.

Although I have herein shown and described a preferred embodiment of my invention, manifestly it is capable of modification and rearrangement of parts without departing from the spirit and scope thereof. It is to be understood that the disclosure of my novel ratcheting mechanism in association with a counting device is merely for purpose of illustration and it will be apparent that said ratcheting mechanism is capable of wide application to various devices where it is desired to obtain step-by-step adjustment of a member to be controlled. I do not, therefore, wish to be understood as limiting this invention to the precise form herein disclosed, excepting as I may be so limited by the appended claims.

I claim as my invention:

1. In a step-by-step ratcheting mechanism, the combination of a member to be controlled and rotated in step-by-step fashion, a toothed ratchet wheel fixedly connected to said member, a reciprocable driving member, and primary and secondary ratchet pawls pivotally connected to said driving member and having their operating ends positioned in operative relation to and adjacent opposite peripheral portions of said wheel, the operating ends of said pawls and the teeth of the ratchet wheel being formed so that during one direction of movement of the driving member the primary pawl moves the ratchet wheel through a portion of the angular range of a single tooth, and during the opposite direction of movement of said driving member, the secondary pawl moves the ratchet wheel through the balance of the angular range of said single tooth.

2. In a step-by-step ratcheting mechanism, the combination of a member to be controlled and rotated in step-by-step fashion, a toothed ratchet wheel fixedly connected to said member, a reciprocable driving member, and separate primary and secondary ratchet pawls, pivotally connected at spaced apart axes to said driving member and having their operating ends positioned in operative relation to and adjacent opposite peripheral portions of said wheel, the operating ends of said pawls and the teeth of the ratchet wheel being formed so that during one direction of movement of the driving member the primary pawl moves the ratchet wheel through a portion of the angular range of a single tooth, and during the opposite direction of movement of said driving member, the secondary pawl moves the ratchet wheel through the balance of the angular range of said single tooth.

3. In a step-by-step ratcheting mechanism, the combination of a member to be controlled and rotated in step-by-step fashion, a toothed ratchet wheel fixedly connected to said member, a reciprocable driving member, separate primary and secondary ratchet pawls, pivotally connected at spaced apart axes to said driving member and having their operating ends positioned in operative relation to and adjacent opposite peripheral portions of said wheel, the operating ends of said pawls and the teeth of the ratchet wheel being formed so that during one direction of movement of the driving member the primary pawl moves the ratchet wheel through a portion of the angular range of a single tooth, and during the opposite direction of movement of said driving member the secondary pawl moves the ratchet wheel through the balance of the angular range of said single tooth, and stop means positioned in cooperating relation to the primary pawl to preclude overrun of said ratchet wheel incident to stepping movement by said primary pawl.

4. In a step-by-step ratcheting mechanism, the combination of a member to be controlled and rotated in step-by-step fashion, a toothed ratchet wheel fixedly connected to said member, a reciprocable driving member, separate primary and secondary ratchet pawls, pivotally connected at spaced apart axes to said driving member and having their operating ends positioned in operative relation to and adjacent opposite peripheral portions of said wheel, the operating ends of said pawls and the teeth of the ratchet wheel being formed so that during one direction of movement of the driving member the primary pawl moves the ratchet wheel through a portion of the angular range of a single tooth, and during the opposite direction of movement of said driving member the secondary pawl moves the ratchet wheel through the balance of the angular range of said single tooth, and stop means positioned to be engaged by said secondary pawl for limiting the stepping motion of said pawl and positively arresting said ratchet wheel at a predetermined stepped position of adjustment.

5. In a step-by-step ratcheting mechanism, the combination of a member to be controlled and rotated in step-by-step fashion, a toothed ratchet wheel fixedly connected to said member, a reciprocable driving member, separate primary and secondary ratchet pawls, pivotally connected at spaced apart axes to said driving member and having their operating ends positioned in operative relation to and adjacent opposite peripheral portions of said wheel, the operating ends of said pawls and the teeth of the ratchet wheel being formed so that during one direction of movement of the driving member the primary pawl moves the ratchet wheel through a portion of the angular range of a single tooth, and during the opposite direction of movement of said driving member the secondary pawl moves the ratchet wheel through the balance of the angular range of said single tooth, stop means positioned in cooperating relation to the primary pawl to preclude overrun of said ratchet wheel incident to stepping movement by said primary pawl, and separate stop means positioned to be engaged by said secondary pawl during stepping movement by said secondary pawl for limiting the stepping motion of said pawl and positively arresting said ratchet wheel at a predetermined stepped position of adjustment.

THEODORE OBSZARNY.