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J. W. ALLEN
STEP-BY-STEP MECHANISM
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Fig. 1

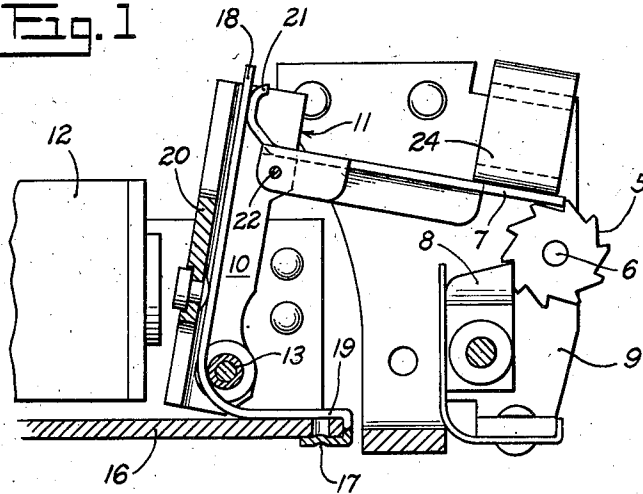


Fig. 2

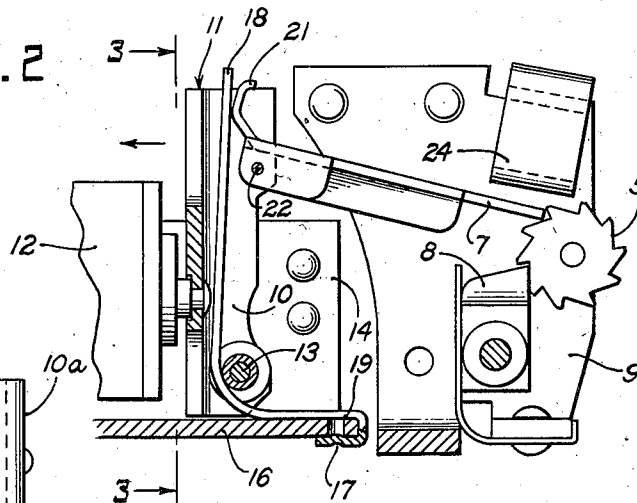
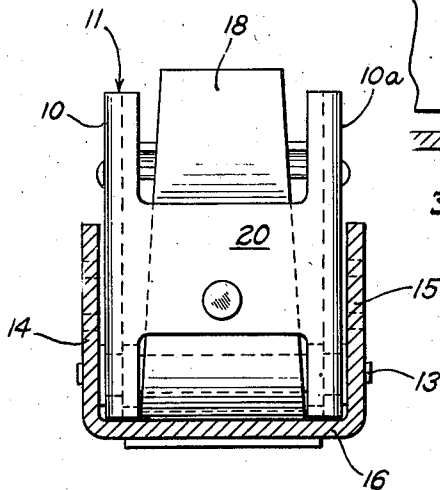


Fig. 3



INVENTOR.
Joseph W. Allen
BY *Martin J. Linnegan*
ATTORNEY.

UNITED STATES PATENT OFFICE

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STEP-BY-STEP MECHANISM

Joseph W. Allen, East Orange, N. J., assignor to
Bendix Aviation Corporation, South Bend, Ind.,
a corporation of Delaware

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3 Claims. (Cl. 74-142)

This invention relates to step-by-step mechanisms, and particularly to those of the ratchet type.

Objects of the invention are to provide improved means for causing step-by-step motion of a ratchet wheel, for maintaining operative relationship between the ratchet wheel and its actuator, and for preventing undesired movement of the wheel in either direction.

These and other objects of the invention will become apparent from inspection of the following specification when read with reference to the accompanying drawing wherein is illustrated the preferred embodiment of the invention. It is to be expressly understood, however, that the drawing is for the purpose of illustration only, and is not designed as a definition of the limits of the invention, reference being had to the appended claims for this purpose.

In the drawing,

Fig. 1 is a view in elevation (with certain parts broken away to improve clarity) of a device embodying the invention;

Fig. 2 is a similar view, but showing a different stage in the cycle of operation; and

Fig. 3 is a view along the line 3-3 of Fig. 2.

In the drawing, reference character 5 designates a ratchet wheel secured to a shaft 6 constituting a driving shaft for actuation of any associated mechanism (not shown), the wheel having teeth successively engaged by a pair of pawls 7 and 8, the latter being pivotally mounted in a supporting bracket 9, and the former being an arm of the armature assembly 11 of an electromagnet 12. As shown, the armature assembly is pivoted on a rock-shaft 13 journaled in bearings 14 and 15 (Fig. 3) of the frame 16 which supports the electromagnet 12.

A flat strip 18 of resilient metal, having one leg 19 thereof turned under and dented for fixation to a recess in the frame 16 (as indicated at 17) and the other leg thereof extending upwardly adjacent the cross-plate 20 of the armature assembly, tends to hold the pawl 7 in the position indicated in Fig. 1, and to yieldably oppose movement thereof to the opposite extreme of its range of movement (Fig. 2), in response to passage of current through electromagnet 12. The strip 18 is curved to bear upon the portion of the rock-shaft 13 intermediate the brackets 14 and 15, and is initially stressed so as to exert a constantly acting pressure upon a rigid lever arm 21 having a fixed relationship to the pawl 7, as by being positively fixed thereto, or (as shown) integral therewith, so as to swing with said pawl about

the pivot bearing shaft 22 which journals the said pawl in side plates 10 and 10a of the armature assembly 11.

The armature, including the cross-plate 20, is of suitable magnetic material, while the resilient strip (leaf spring) 18 is of non-magnetic material, so that energization of the winding of the electromagnet 12 attracts only the armature, to cause its movement from its position indicated in Fig. 1 to that indicated in Fig. 2; the leaf spring 18 meanwhile lagging behind, due to its pre-set bias and its non-magnetic material, and moving leftward (as viewed in Figs. 1 and 2) only to the extent required by the pressure of the lever arm 21 thereupon, as the said lever arm (with pawl 7) is carried leftward by reason of the pivotal connection with the armature as indicated at 22. During this leftward movement, the pressure of the spring 18 upon the lever arm 21 not only yieldably resists the movement of the armature and pawl 7 to the left, but also exerts a turning moment upon the said lever arm 21 about its fulcrum 22, wherefore the pawl 7 is continuously urged downward with respect to the teeth of the ratchet wheel 5, thereby precluding the possibility of a "miss" in the next succeeding ratcheting action, such as might be produced if the pawl 7 were allowed to escape from actual contact with the said teeth during its backward movement.

Thus, the spring 18 has the two-fold function of, first, exerting pressure continuously during the backward movement of the pawl to hold said pawl in engagement with the teeth of the ratchet wheel, and secondly, constituting the force and agency by which the pawl is caused to move forward again (to rotate the ratchet wheel another step) immediately following, and in response to, cessation of current flow in the winding of the electromagnet 12.

It should be noted that the second pawl 8 functions to prevent reverse rotation of the ratchet wheel 5, while the block 24 (depending from the upward portion of the bracket 9) serves as a limiting stop for the pawl 7 in its forward travel, thereby preventing over-travel, and a resultant possible over-rotation of the ratchet wheel. A flat resilient strip extends along one side of pawl 8, as shown, and yields sufficiently to permit outward movement of pawl 8 as the ratchet wheel is rotated, step by step, by pawl 7.

What I claim is:

1. The combination, with a rock-shaft, of an electromagnet having an armature pivotally mounted thereon, a ratchet actuator pivotally

mounted on said armature, at a point on said armature that is remote from said rock-shaft, and resilient means flexed about said rock-shaft to urge said ratchet actuator into ratchet engaging position, and to yieldably oppose movement of said armature upon passage of current through said electromagnet.

2. The combination, with a rock-shaft, of an electromagnet having an armature pivotally mounted thereon, a ratchet actuator pivotally mounted on said armature, at a point on said armature that is remote from said rock-shaft, an arm extending rigidly from said ratchet actuator, in a direction substantially perpendicular to the surface of said ratchet actuator, and resilient means flexed about said rock-shaft to engage said rigidly extending arm and thereby urge said ratchet actuator into ratchet engaging position, and to yieldably oppose movement of said armature upon passage of current through said electromagnet.

3. The combination, with a rock-shaft, of an electromagnet having an armature pivotally mounted thereon, a ratchet actuator pivotally mounted on said armature, at a point on said armature that is remote from said rock-shaft, resilient means flexed about said rock-shaft to urge said ratchet actuator into ratchet engaging position, and to yieldably oppose movement of said armature upon passage of current through said electromagnet, and means having a surface disposed in substantial parallelism with the surface of said ratchet actuator to limit the travel of said ratchet actuator in the ratchet actuating direction.

4. The combination, with a rock-shaft, of an electromagnet having an armature pivotally mounted thereon, a ratchet actuator pivotally mounted on said armature, at a point on said armature that is remote from said rock-shaft, an arm extending rigidly from said ratchet actuator, in a direction substantially perpendicular to the surface of said ratchet actuator, resilient means flexed about said rock-shaft to engage said rigidly extending arm and thereby urge said ratchet actuator into ratchet engaging position, and to yieldably oppose movement of said armature upon passage of current through said electromagnet, and means having a surface disposed in substantial parallelism with the surface of said ratchet actuator to limit the travel of said ratchet actuator in the ratchet actuating direction.

5. The combination, with a rock-shaft, of an electromagnet having an armature pivotally mounted thereon, a work performing element pivotally mounted on said armature, at a point on

said armature that is remote from said rock-shaft, an arm extending rigidly from said work performing element, in a direction substantially perpendicular to the surface of said work performing element, and resilient means flexed about said rock-shaft to engage said rigidly extending arm and thereby urge said work performing element into work performing position, and to yieldingly oppose movement of said armature upon passage of current through said electromagnet.

6. The combination, with a rock-shaft, of an electromagnet having an armature pivotally mounted thereon, a work performing element pivotally mounted on said armature, at a point on said armature that is remote from said rock-shaft, resilient means flexed about said rock-shaft to urge said work performing element into work performing position, and to yieldably oppose movement of said armature upon passage of current through said electromagnet, and means having a surface disposed in substantial parallelism with the surface of said work performing element to limit the travel of said work performing element in the work performing direction.

7. The combination, with a rock-shaft, of an electromagnet having an armature pivotally mounted thereon, a work performing element pivotally mounted on said armature, at a point on said armature that is remote from said rock-shaft, an arm extending rigidly from said work performing element, in a direction substantially perpendicular to the surface of said work performing element, resilient means flexed about said rock-shaft to engage said rigidly extending arm and thereby urge said work performing element into work performing position, and to yieldably oppose movement of said armature upon passage of current through said electromagnet, and means having a surface disposed in substantial parallelism with the surface of said work performing element to limit the travel of said work performing element in the work performing direction.

8. The combination, with a rock-shaft, of an element pivotally mounted thereon, a ratchet actuator pivotally mounted on said element, at a point on said element that is remote from said rock-shaft, resilient means flexed about said rock-shaft to urge said ratchet actuator into ratchet engaging position, and to yieldably oppose movement of said element in a direction opposite to that in which said ratchet actuator is moved by said resilient means.

JOSEPH W. ALLEN.