

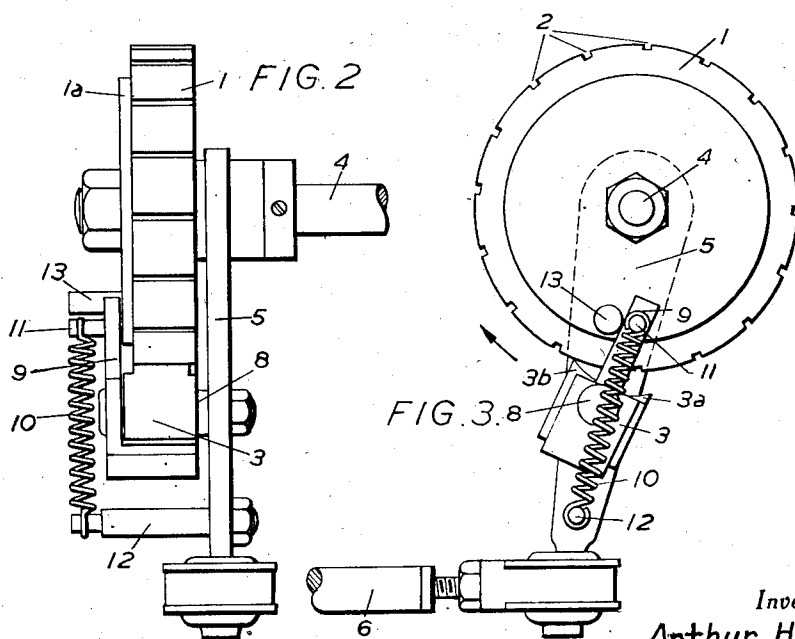
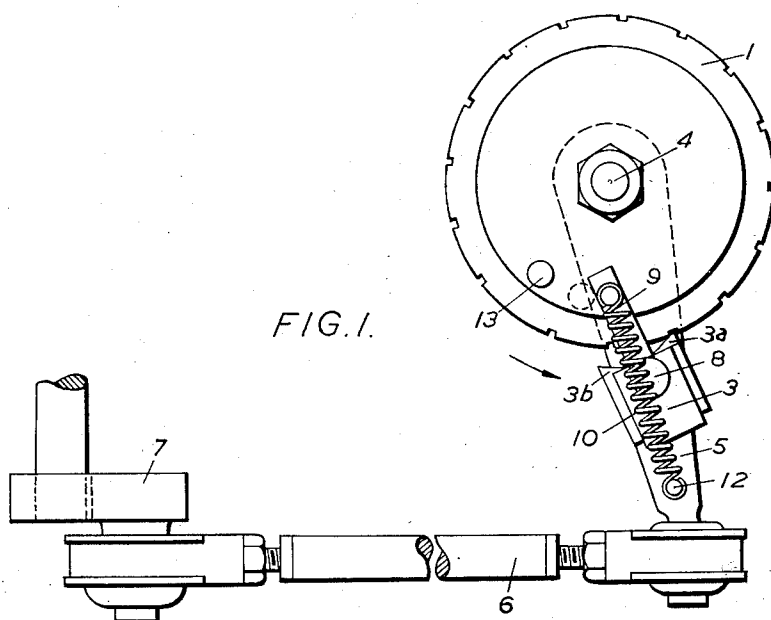
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A. HOARE
RATCHET GEARING

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2 SHEETS—SHEET 1



Inventor
Arthur Hoare
By
Emery, Holcombe & Blair
Attorney

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2 SHEETS—SHEET 2

FIG. 4

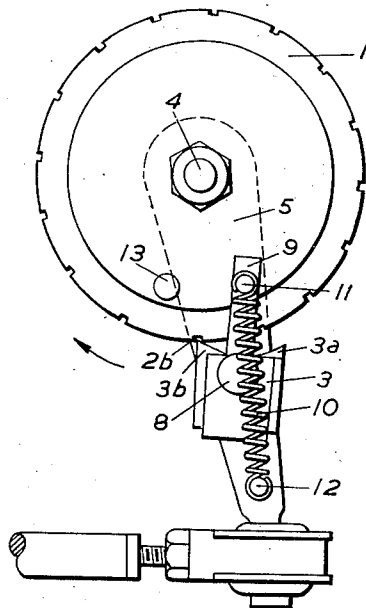


FIG. 5

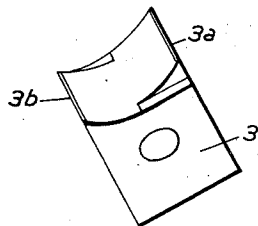
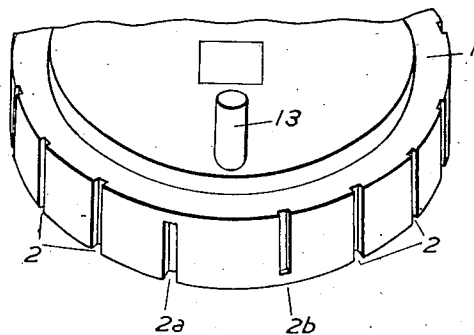


FIG. 6



Inventor
Arthur Hoare
By
Emery, Holcomb & Blair
Attorney

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RATCHET GEARING

Arthur Hoare, Carisbrooke, Isle of Wight, England, assignor to J. Samuel White & Company Limited, West Cowes, Isle of Wight, England, a British company

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This invention relates to ratchet gearing of the reversing type, that is to say of the type in which one or more pawl devices mounted on a reciprocating or oscillating operating member co-operate with one or more ratchet wheels and are associated with mechanism by which the ratchet wheel can be caused to be driven in one direction or the other according to the position of the pawl device or devices.

The object of the present invention is to provide an improved reversing ratchet gear including means whereby the direction of rotation imparted to the ratchet wheel will be reversed automatically after it has travelled through a predetermined angle of rotation in each direction.

Automatic reversing ratchet gear according to the present invention comprises a double sided pawl or ratchet device (that is to say ratchet device having on its opposite sides parts which, when brought into engagement with the ratchet wheel, will drive it respectively in opposite directions) urged into whichever of its two operative positions it occupies at any moment by a spring toggle mechanism, and one or more abutments connected to the ratchet wheel and arranged so as to act directly or indirectly on the pawl to throw it over from one of its operative positions to the other and thus reverse the direction of operation of the ratchet mechanism when the ratchet wheel reaches a predetermined angular position in each direction of rotation.

In the simplest arrangement a single abutment is provided on the ratchet wheel in the path of which abutment an appropriate part of the toggle operated pawl lies so that the pawl will be thrown over from one operative position to the other each time the abutment reaches a given angular position in its travel in each direction. Alternatively, however, two abutments might be provided on or connected to the ratchet wheel angularly spaced from one another about the axis of the ratchet wheel and adapted respectively to engage opposite sides of the appropriate part of the pawl so as to throw it over from one operative position to the other each time the ratchet wheel and hence the appropriate abutment reaches a given angular position in either direction.

In any case the pawl and its spring toggle mechanism are conveniently mounted on an arm arranged to be oscillated freely about the axis of the ratchet wheel and thus to cause the ratchet wheel to move in steps, first in one direction and then, after automatic reversal, in the other direc-

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tion. In such a case the abutment or each abutment on the ratchet wheel may be in the form of a pin projecting from a face of the ratchet wheel and arranged so that, at the appropriate points in the rotation of the ratchet wheel, the pin will engage a finger rigid with or forming part of the pawl and connected by a tension spring to a point on the pawl support lying on the side of the pivotal axis of the pawl remote from the finger.

The teeth of the ratchet wheel may be formed by slots in the circumference of the wheel, the slot or slots in the vicinity of the point or points on the circumference of the wheel which are adjacent to the pawl when the gear is reversed being bridged at one end and thus off-set in the appropriate axial direction, while the noses on the pawl are correspondingly off-set but in different directions, so that in the event of the abutment or abutments failing the gear is prevented from over-running in either direction.

In some cases means may be provided by which the angle through which the ratchet wheel is rotated between each reversal can be adjusted, for example by providing abutments which are adjustable relatively to the ratchet wheel carrying them.

The details of construction may vary considerably but the following description is given by way of example as one specific embodiment of the invention, and with reference to the accompanying drawings in which,

Figure 1 is a front view of a self-reversing ratchet gear,

Figure 2 is a side elevation of the ratchet gear shown in Figure 1,

Figures 3 and 4 are front views of the same ratchet gear in different positions during operation,

Figure 5 is an enlarged perspective view of a double-sided pawl used in the same ratchet gear, and

Figure 6 is an enlarged perspective view of a ratchet wheel used in the same gear.

The ratchet gear comprises a ratchet wheel 1 having a cylindrical circumferential edge formed with a series of spaced square-sided axial slots 2 constituting in effect ratchet teeth capable of being engaged by a suitable pawl 3 to drive the ratchet wheel in either direction.

Freely pivoted about the same shaft 4 which carries the ratchet wheel is the inner end of an arm 5 the outer end of which is arranged to be given a continuous reciprocating movement, for example by a connecting rod 6 coupled to a

crankshaft 7 so that the arm 5 as a whole is caused to oscillate back and forth through a predetermined angle about the axis 4 of the ratchet wheel. Pivotaly mounted on the arm 5 by means of a pin 8 is a double sided pawl 3, that is to say a pawl having two noses 3a, 3b, respectively on its opposite sides so formed that when one nose is brought into engagement with the rim of the ratchet wheel 1 it will engage the slots 2 and drive the ratchet wheel step by step in one direction while, when the other nose is brought into engagement with the rim of the ratchet wheel, it will engage the slots and drive the ratchet wheel in the opposite direction.

The double sided pawl 3 is formed integral with or rigidly connected to a finger 4 which extends therefrom in a general direction towards the axis of the ratchet wheel so as to extend inwards over a part of one face 1a of the ratchet wheel. A tension spring 10 connects a pin 11 secured at a point adjacent to the end of this finger to a pin 12 on the arm 5 carrying the ratchet wheel situated on the side of the pivotal axis 8 of the pawl remote from the finger 9, the arrangement being such that, if the pawl 3 is rocked in one direction the tension spring 10 will lie to one side of the pivotal axis 8 of the pawl and thus maintain one nose of the pawl in engagement with the ratchet wheel while, if the pawl is rocked in the other direction, the longitudinal axis of the spring will pass over the pivotal axis of the pawl and lie to the other side of that axis so as to maintain the other nose of the pawl in engagement with the ratchet wheel. It will thus be seen that the spring 10 constitutes spring toggle mechanism acting on the pawl 3 so as to urge it into whichever of its two operative positions it occupies at any moment.

Projecting from the face 1a of the ratchet wheel 1 over which the finger 9 on the pawl lies is an abutment 13 in the form of a pin or stud so disposed that the finger 9 lies in its path. Referring to Figure 1 of the drawings it will be seen that as the ratchet wheel is rotated step by step in the direction of the arrow by the action of the nose 3a of the pawl thereon by reason of the oscillation of the arm 5 carrying the pawl, the abutment pin 13 will when it reaches the angular position shown in dotted lines, engage the finger 9 on the pawl 3 and thus cause the pawl to be rocked about its pivot 8 in such a manner as to throw it over its dead-centre position and thus bring the other nose 3b of the pawl into engagement with the ratchet wheel 1 as seen in Figure 3. The ratchet wheel will therefore be reversed and step-by-step movement will be imparted to it in the reverse direction of the arrow in Figures 3 and 4. In Figure 3 the pawl has been thrown over but the nose 3b has not yet engaged a slot on the ratchet wheel, and the connecting rod 6 is in its extreme left hand position. In Figure 4 which represents a phase in the sequence of movements of the mechanism shortly after that shown in Figure 3, the connecting rod 6 and the arm 5 have moved across to the right and the nose 3b of the pawl has engaged the slot 2b on the ratchet wheel, after which step-by-step rotation proceeds in the direction of the arrow in this figure, until its rotation brings the abutment pin 13 into engagement with the other side of the finger 9 on the pawl whereupon the pawl will be thrown over again and the direction of rotation of the ratchet wheel will thus again be reversed, and so on.

As a precaution against the ratchet gear over-running in the event, for instance, of the abutment pin 13 becoming detached or broken, the two slots 2a, 2b in the ratchet wheel which lie respectively adjacent to the abutment pin 13 do not extend completely across the rim of the ratchet wheel but are somewhat offset from one another as best seen in Figure 6 in a direction parallel to the axis of the ratchet wheel so that one slot may be regarded as lying adjacent to one side of the rim while the other slot lies adjacent to the other side of the rim, while the two noses 3a, 3b, of the pawl 3 are similarly offset from one another as best seen in Figure 5 so that should the ratchet wheel be rotated beyond its normal maximum angle in one direction or the other the appropriate nose of the pawl will be prevented from engaging the next slot in the ratchet wheel by reason of engagement of the nose with the unslotted part of the ratchet wheel rim. In other words, if the wheel over-runs its normal travel in either direction the operative nose of the pawl will be caused by an unslotted section of the ratchet wheel rim to ride over the slot to which it then comes adjacent.

In an alternative arrangement there might be a gap in the series of slots 2 adjacent to the abutment pin 13 and the dimensions of the parts might be such that a nose of the pawl would come into engagement with such unslotted part of the rim if, but only if, the ratchet wheel should over-run its normal movement in either direction.

What I claim as my invention and desire to secure by Letters Patent is:

1. An automatic reversing ratchet mechanism comprising a ratchet wheel, a double sided pawl co-operating with the wheel, a spring toggle mechanism which urges the pawl into whichever of its two operative positions it occupies, and at least one abutment connected to the ratchet wheel which acts on the pawl to throw it over from one operative position to the other, and reverse the direction of operation of the ratchet mechanism when the ratchet wheel reaches a predetermined angular position in each direction of rotation, the ratchet wheel having teeth formed by slots in the circumference of the wheel, the slots in the vicinity of each reversal point on the wheel which is adjacent to the pawl when the ratchet wheel is reversed being off-set in opposite axial directions on either side of the reversal point, and the pawl having noses which are correspondingly off-set in the opposite direction respectively to prevent the ratchet wheel from over-running in the event of a failure of the reversal mechanism.

2. An automatic reversing ratchet mechanism comprising a ratchet wheel, an arm mounted to oscillate freely about the axis of the ratchet wheel, a double sided pawl pivotally mounted on said arm and cooperating with the wheel and having a finger lying adjacent to one face of the wheel, a toggle spring which is connected to a point on said finger and to a point on said arm on the side of the pawl axis remote from the finger to urge the pawl into whichever of its two operative positions it occupies, and an abutment projecting from one face of the ratchet wheel which acts on the pawl finger to throw the pawl over from one operative position to the other, and reverse the direction of operation of the ratchet mechanism when the ratchet wheel reaches a predetermined angular position in each direction of rotation,

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the ratchet wheel having teeth formed by slots which, in the vicinity of each reversal point on the wheel which is adjacent to the pawl when the ratchet wheel is reversed are off-set in opposite axial directions on either side of the reversal point, while the pawl has noses which are correspondingly off-set in the opposite direction respectively to prevent the ratchet wheel from over-running in the event of a failure of the reversal mechanism.

3. An automatic reversing ratchet mechanism comprising a ratchet wheel, a double sided pawl co-operating with the wheel, a spring toggle mechanism which urges the pawl into whichever of its two operative positions it occupies, and at least one abutment connected to the ratchet wheel which acts on the pawl to throw it over from one operative position to the other, and reverse the direction of operation of the ratchet mechanism when the ratchet wheel reaches a predetermined angular position in each direction

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of rotation, the ratchet wheel having teeth formed by slots in the circumference of the wheel, the slots in the vicinity of each reversal point on the wheel which is adjacent to the pawl when the ratchet wheel is reversed being at least partly bridged over at opposite ends on either side of the reversal point, and the pawl having noses which are correspondingly off-set in the opposite direction respectively to prevent the ratchet wheel from over-running in the event of a failure of the reversal mechanism.

ARTHUR HOARE.

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