March 9, 1943. F. R. FORD 2,313,633

MECHANISM FOR PRODUCING STEP BY STEP MOTION

Filed Dec. 11, 1941 3 Sheets-Sheet 1

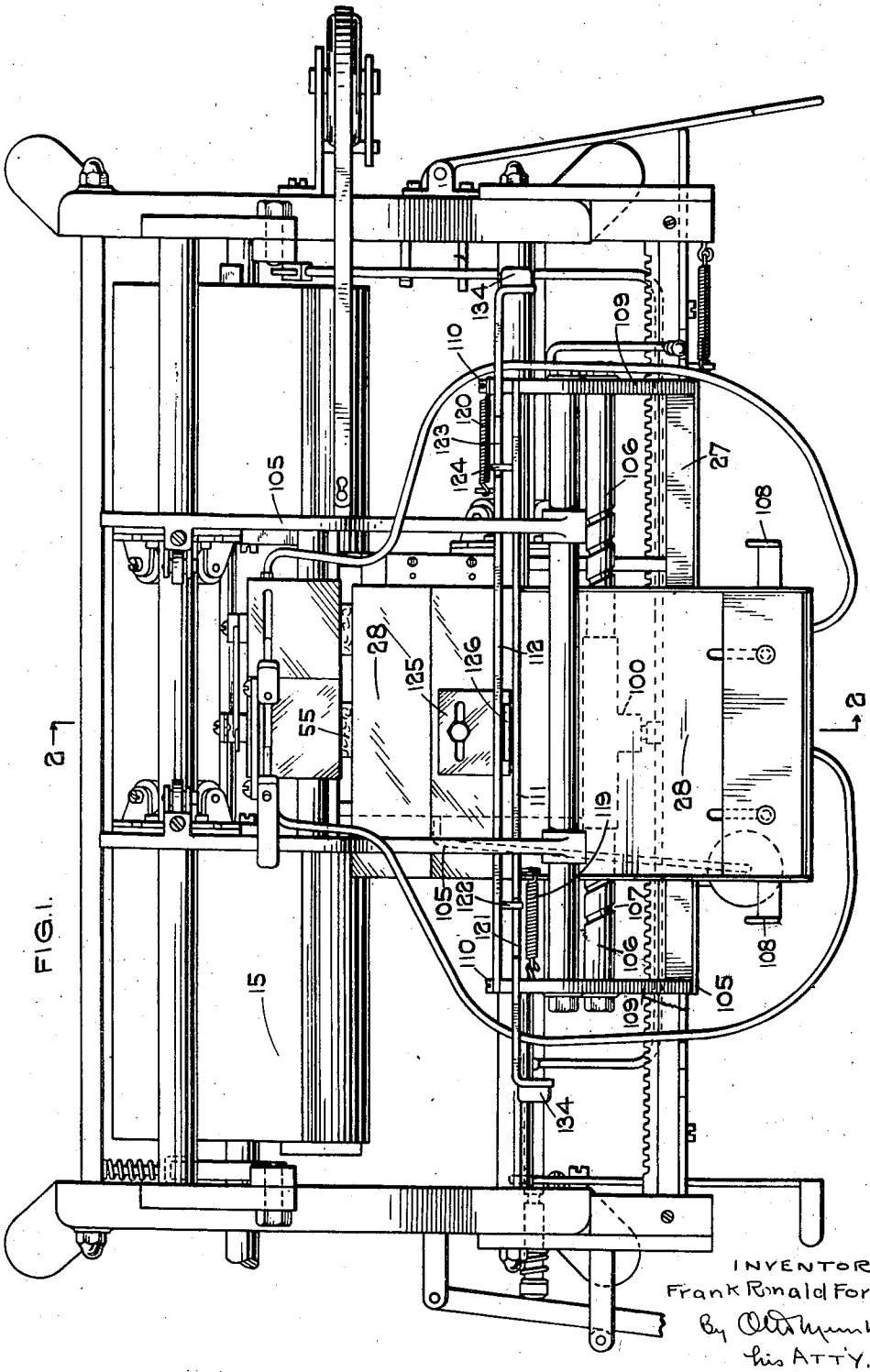

FIG. 1.

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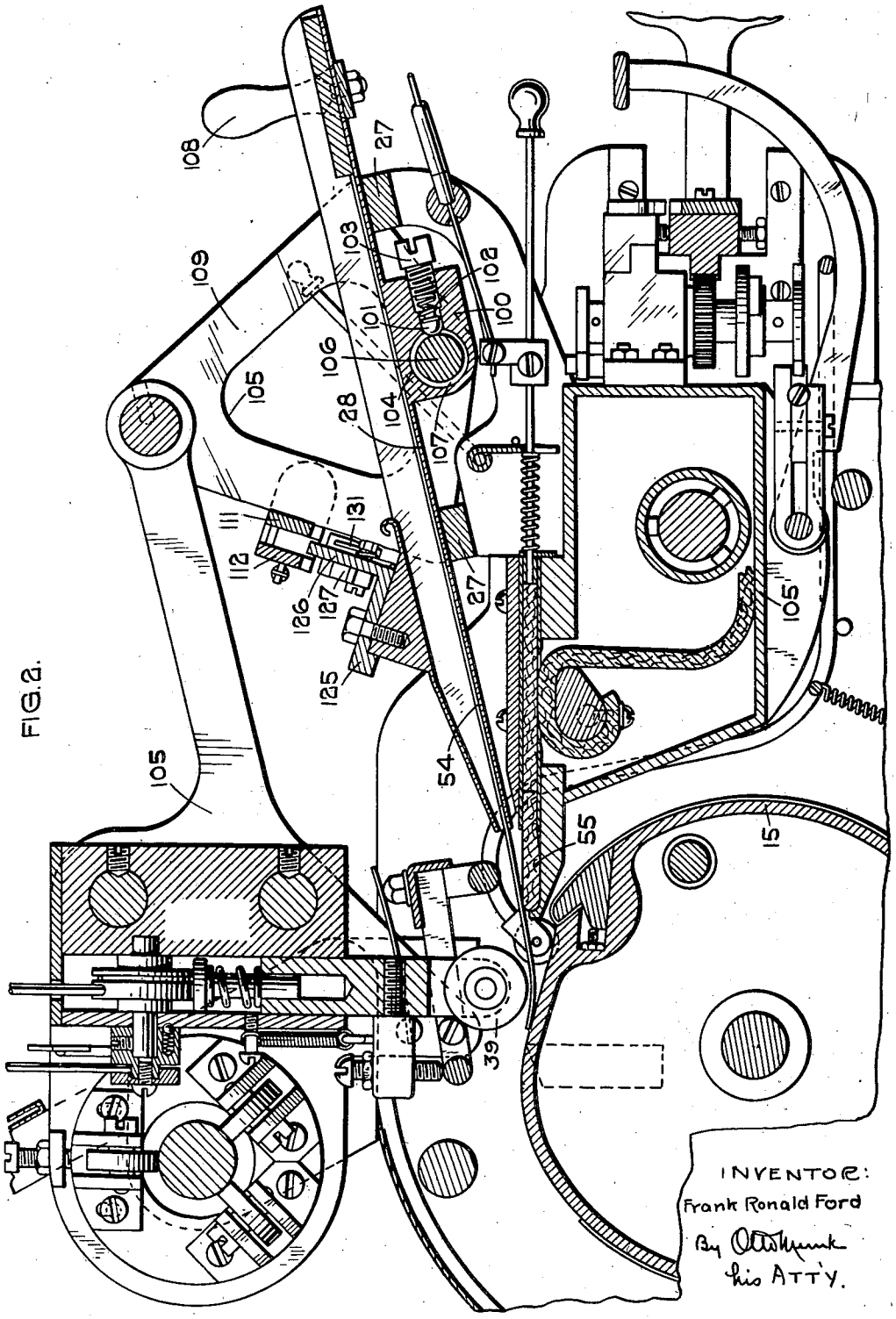

FIG. 2.

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FIG. 3.

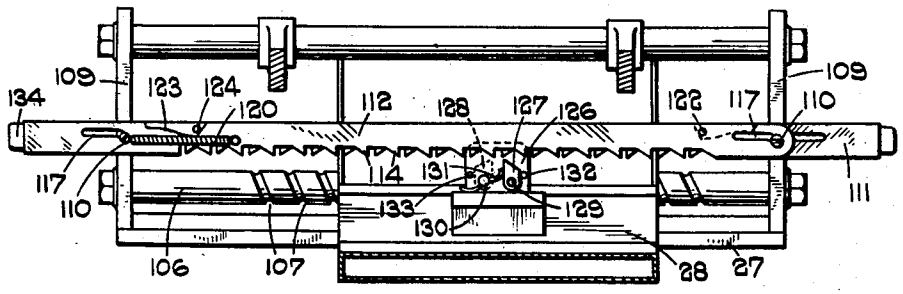
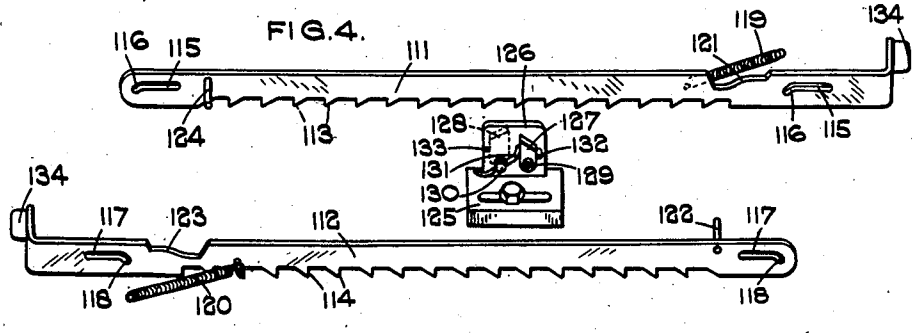


FIG. 4.



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UNITED STATES PATENT OFFICE

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MECHANISM FOR PRODUCING STEP BY STEP MOTION

Frank Ronald Ford, Sparkbrook, Birmingham, England

Application December 11, 1941, Serial No. 422,500
In Great Britain July 23, 1941

5 Claims. (Cl. 101—132.5)

This invention relates to mechanism for producing step by step motion and has for its object to provide means whereby a member mounted for reciprocating movement can be moved one step at a time in either direction at will. Further in the preferred form the mechanism enables the member to be moved by hand any number of steps at one movement in either direction.

The mechanism constructed in accordance with the present invention comprises a pair of rack bars mounted for limited reciprocating movement upon a pair of fixed pins, each bar having a pair of primary cam slots, each pin engaging two of the primary slots one in each bar, these primary slots being arranged with their cam portions normally adjacent the pins and at opposite ends, a pin on each bar engaging a secondary cam surface on the other bar, an abutment on the member to be moved for each rack bar, means acting on the rack bars tending to pull the cam portions of the primary slots into engagement with the fixed pins, whereby the teeth of the rack bars are normally out of engagement with the abutment, but endwise movement applied to either rack bar brings one of its teeth into engagement with one of the abutments and so produces movement of the member to be moved and also brings the tooth on the other rack bar into position in which it acts as a stop to limit the said movement.

The teeth on the two rack bars may be of ratchet form and arranged in opposite directions.

The abutments are of ratchet form and they may consist of pivoted detents acted upon by springs pressing them up against stops so that they act as immovable stops against pressure in one direction but can give way to pressure in the opposite direction.

If it is desired that it should be possible to move the member to be moved in either direction by a greater number of steps than one at a single movement the member to be moved may be provided with a spring pressed nose adapted to engage in succession a number of recesses or shoulders in a bar placed parallel to the movement. The two rack bars forming the step by step motion are normally out of engagement with the abutments on the member to be moved so that movement over and above one step is thus freely permitted.

The present invention is particularly applicable to office appliance machines such as duplicators, typewriters, etc. In the accompanying drawings it is shown applied to the feed tray of a duplicating machine constructed in accordance with my U. S. A. application Serial No. 372,119.

Referring to the drawings:

Figure 1 is a plan view showing one form of the invention.

Figure 2 is a section on line 2—2 of Figure 1.

Figure 3 is a detailed view showing the step by step motion.

Figure 4 is a perspective view showing the parts of the step by step motion separated.

The machine illustrated in the drawings apart from the mechanism controlling the movements of the tray forms the subject of an application filed concurrently herewith. The machine is a duplicating machine and comprises a cylinder 15 on which a master sheet is fastened, a pair of pressure rollers 39 which are adapted to press the copy sheets 54 on to the master sheet on the cylinder. The machine also comprises moistening members 55 by which the copy sheets are moistened before reaching the master sheet.

The tray to which the step by step motion according to the present invention is applied is shown at 28. This tray is supported upon a pair of bars 27 and on its underside it is provided with a block 100 containing a nose shaped pin 101 pressed by a spring 102 behind which is a screw 103. The nose shaped pin 101 projects into the circular hole 104 which extends through the block.

The machine is provided with a moving carriage indicated generally in Figure 1 at 105 and this carriage carries a bar 106 in which is a helical groove 107. This bar 106 extends through the opening 104 and as the feed tray 28 moves sideways the nose shaped pin 101 engages successive turns of the slot 107 thus forming a check to the movement.

The arrangement further provides that the feed tray 28 can be pushed sideways in either direction for any number of spaces that may be required and in order to facilitate this movement it is provided with handles 108.

The step by step mechanism is shown in detail in Figures 3 and 4. Brackets 109 forming part of the carriage 105 are provided with fixed projecting pins 110 and mounted for reciprocating movement on these pins are two rack bars 111 and 112. These rack bars are provided with teeth 113 and 114 of ratchet form and arranged in opposite directions.

The rack bar 111 is provided with two primary cam slots 115 each having its left hand end 116 inclined downwardly.

The rack bar 112 is also provided with two cam slots 117 each having its right hand end 118 inclined downwardly.

These rack bars 111 and 112 are mounted on the pins 110 as shown in Figure 3 with the inclined or cam portions of the slots engaging the pins.

Further the bar 111 is acted upon by a spring 119 tending to pull it to the right and the bar 112 is acted upon by a spring 120 tending to pull it to the left.

The upper edge of the rack bar 111 is provided with a secondary cam surface 121 engaged by a pin 122 projecting from the back of the rack bar 112.

The top edge of the rack bar 112 is provided with a secondary cam surface 123 which is engaged by a pin 124 projecting from the front of the rack bar 111.

On its upper side the feed tray is provided with a bracket 125 having a web 126 on opposite sides of which are pivoted two ratchet like detents 127 and 128. These are oppositely arranged and are pivoted respectively at 129, 130. Each is acted upon by a spring 131 the detent 127 being pushed by the spring against a stop 132 and the detent 128 being pushed by the spring against a stop 133.

The teeth 114 are adapted to engage the detent 127 and the teeth 113 are adapted to engage with the detent 128.

As will be seen from Figure 3, however, the teeth of both rack bars are normally out of engagement with the detents so that the tray can be pushed from side to side by any required distance or any number of steps, the nose shaped pin 101 moving over successive turns of the helical groove 107.

When it is desired to move the tray in either direction with a step by step movement one of the rack bars 111 or 112 is operated.

When the rack bar 111 is pushed to the left the engagement of its primary cam slots by the pins 110 causes it to move downwardly as well as moving to the left and brings one of its teeth into engagement with the detent 128. At the same time the pin 124 acts upon the secondary cam surface 123 of the rack bar 112 and forces that rack bar downwardly and a little to the right as it is constrained to do by the engagement between these primary cam slots and the pins 110. This brings one of the teeth 114 into a position to engage the detent 127 and to act as a stop to limit the length of the step of movement.

When the rack bar 111 is released both rack bars return to their original position.

The movement is exactly the same only reversed if the rack bar 112 is pushed to the right.

Both rack bars are provided with finger pieces 134 by which they may be operated.

What I claim then is:

1. Step by step motion mechanism comprising a pair of rack bars, each bar having a pair of primary cam slots, a pair of fixed pins, each engaging two primary cam slots one in each rack bar, said slots being arranged with their cam portions normally engaged by the pins and at opposite ends of the slots, each bar being formed with a secondary cam surface, a pin on each rack bar and projecting laterally therefrom and engaging the secondary cam surface of the other rack bar, a member to which the step by step motion is to be imparted by the teeth of the rack bars, abutments on said member for engagement one by the teeth of each rack bar, and means acting on the rack bars tending to pull the cam portions of the primary cam slots into engagement with the fixed pins, whereby the teeth of the rack bars are normally out of engagement with the abutments, but endwise movement applied to either rack bar brings one of its teeth into engagement with the abutment and so produces a movement of the member to be moved, and also brings a tooth of the other rack bar into a position in which it cooperates with the abutment to limit such movement.

2. Mechanism according to claim 1, wherein the teeth on the rack bars are of ratchet form and arranged in opposite directions.

3. Mechanism according to claim 1, wherein the abutments on the member to be moved are of ratchet form, and are pivotally mounted, a spring acting on each of said abutments, and a stop on the member to be moved for each abutment, each spring pressing its abutment against the stop.

4. Mechanism according to claim 1 including a fixed bar having a series of recesses and a spring pressed nose on the member to be moved engaging one of said recesses.

5. Mechanism according to claim 1, wherein the member to be moved is the feed tray of a duplicating machine having a laterally moving carriage and the ratchet bars and fixed pins are mounted on the carriage of the machine.

FRANK RONALD FORD.