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MULTIPLE STEP-UP MECHANISM

Filed April 25, 1951

3 Sheets-Sheet 1

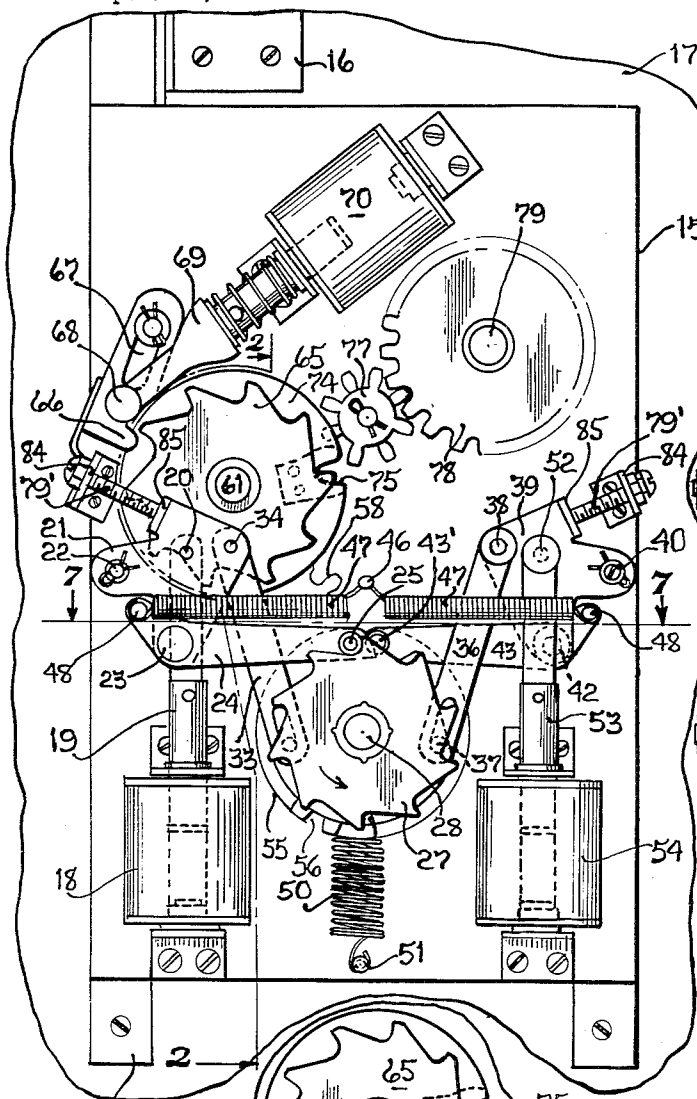


Fig. 1.

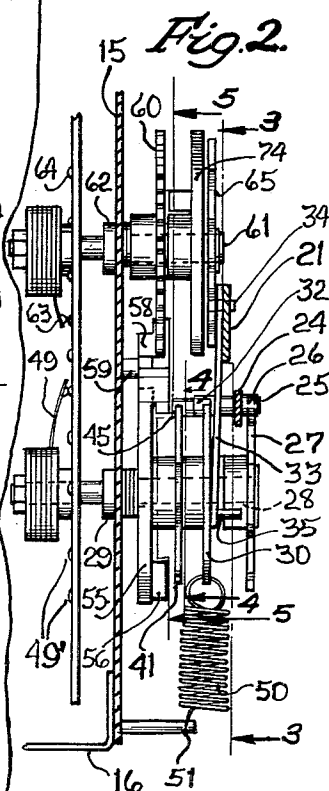


Fig. 2.

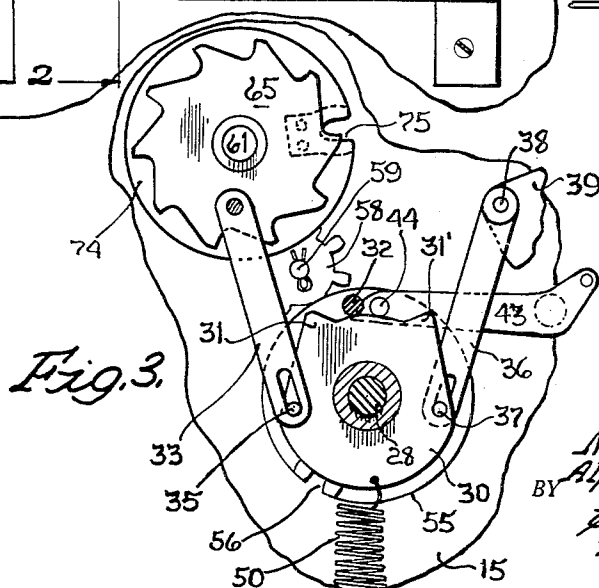


Fig. 3.

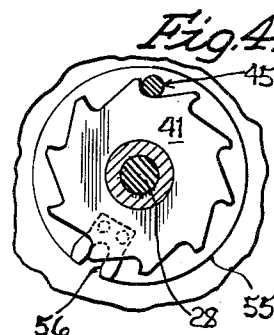


Fig. 4.

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MULTIPLE STEP-UP MECHANISM

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3 Sheets-Sheet 3

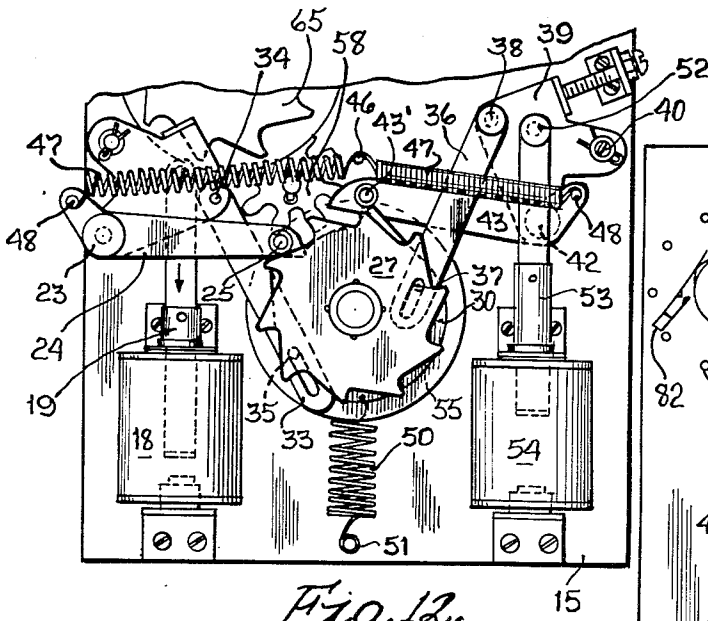


Fig. 12.

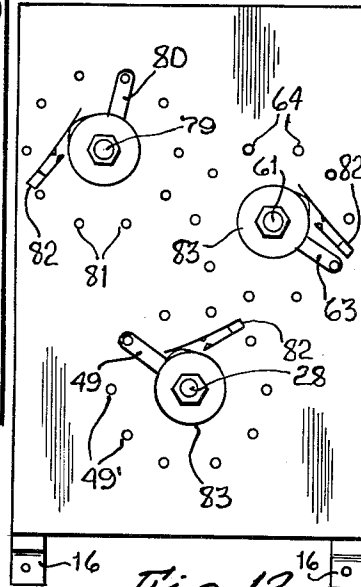


Fig. 13.

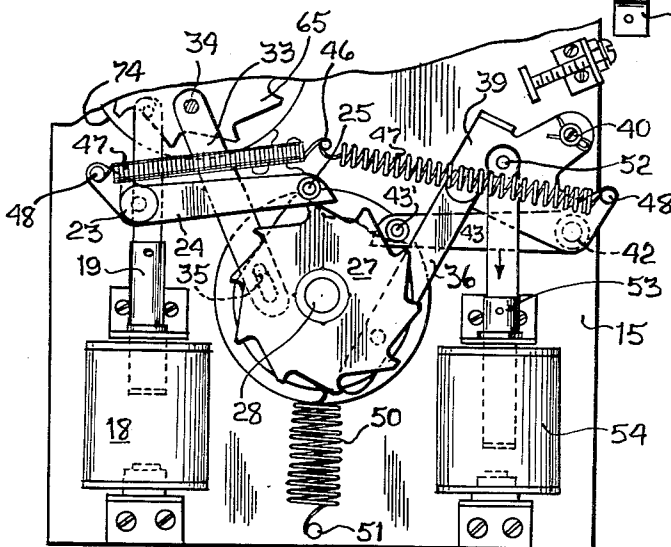


Fig. 11.

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MULTIPLE STEP-UP MECHANISM

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Application April 25, 1951, Serial No. 222,911

6 Claims. (Cl. 74—128)

This invention relates to a multiple step-up mechanism.

The invention has for a principal object the provision of a multiple step-up mechanism of this character which will be highly efficient in use and economical in manufacture.

A further and equally important object of this invention is the employment as a unitary structure of at least two step-up mechanisms operatively related to each other in a manner such that either may be advanced step-by-step independent of each other or by the operation of one of such mechanisms.

Another object of this invention is to provide a multiple step-up and escapement mechanism combined as a unitary structure and especially adaptable for controlling the score or free play circuit of a conventional coin controlled ball rolling amusement game apparatus.

Other objects will appear hereinafter.

The invention consists in the novel combination and arrangement of parts to be hereinafter described and claimed.

The invention will be best understood by reference to the accompanying drawings showing the preferred form of construction, and in which:

Fig. 1 is an elevational view of the invention.

Fig. 2 is a sectional detail view taken substantially on lines 2—2 of Fig. 1;

Fig. 3 is a fragmentary sectional detail view taken substantially on lines 3—3 of Fig. 2;

Fig. 4 is a fragmentary sectional detail view taken substantially on lines 4—4 of Fig. 2;

Fig. 5 is a fragmentary sectional detail view taken substantially on lines 5—5 of Fig. 2;

Fig. 6 is a fragmentary elevational view of that part of the mechanism for stepping up the score from 10 to 90 as shown in the upper part of Fig. 1 but showing the parts thereof in different position;

Fig. 7 is a sectional detail view taken substantially on lines 7—7 of Fig. 1;

Fig. 8 is a fragmentary sectional detail view taken substantially on lines 8—8 of Fig. 5;

Figs. 9 and 10 are perspective views of gear elements embodied in the invention;

Fig. 11 is a fragmentary elevational view of the step-up and reset mechanism illustrated in Fig. 1, but showing parts thereof in different positions;

Fig. 12 is a fragmentary elevational view similar to Fig. 11 showing the parts thereof in different position; and

Fig. 13 is an elevational view of the reverse side of the device as illustrated in Fig. 1.

To accomplish the several objects of the invention we provide a relatively flat, rectangular shaped mounting plate 15 to which are secured, by spot welding or the like, brackets 16. These brackets 16 facilitate mounting the plate 15 upon a stationary support 17.

Mounted upon the plate 15 in the lower left-hand corner thereof is an electromagnetic coil 18. This coil 18 includes a plunger 19, the upper end of which is con-

nected as at 20 to a rocker plate 21 pivotally mounted by means of a pin 22 to the plate 15.

Pivotally connected to a downwardly extending portion of the plate 21 as at 23 is an arm 24 having a pin 25 extending from opposite sides thereof. The end portion 26 of the pin 25 provides a dog adapted to engage the teeth of a ratchet wheel 27. This ratchet wheel 27 is fixed to a shaft 28 journaled in a suitable bearing 29 provided by the plate 15. Adjacent this ratchet wheel 27 and mounted for free rotation on the shaft 28 is a cam disc 30, a hill 31 of which is adapted to be engaged by the other end portion 32 of the pin 25. A lever 33 has one end portion pivotally connected as at 34 to the rocker plate 21. The opposite end portion of this lever 33, by means of a slot and pin connection 35, is connected to the cam disc 30. A second lever 36 has one end portion connected to the cam disc 30 by means of a slot and pin connection 37. The opposite end portion of the lever 36 is connected as at 38 to a rocker plate 39. This rocker plate 39 is pivotally connected as at 40 to the plate 15.

Adjacent the cam disc 30 and arranged between such disc 30 and the plate 15 is a ratchet wheel 41 fixed to the shaft 28. The rocker plate 39 has pivotally connected thereto as at 42 an arm 43 similar to the arm 24 and, like the arm 24, carries at its outer end portion a transversely extending pin 43'. One end portion 44 of this pin 43' is adapted to engage a cam hill 31' of the cam disc 30 while the other end portion 45 of the pin 43' engages the teeth of the ratchet wheel 41.

A pin 46 projects laterally from the plate 15 and has connected thereto confronting end portions of springs 47, the opposite ends of which are connected as at 48 to adjacent end portions of the arms 24 and 43 whereby to yieldably maintain these arms in the position shown in Fig. 1.

On the shaft 28 is fixed a contact arm 49 which is adapted to successively engage contact heads 49', there being nine of such heads. This is accomplished each time the coil 18 is energized. When such coil is energized the plunger 19 is moved downwardly to rock the plate 21 to move the dog 25 in a position to engage a tooth of the ratchet wheel 27 whereby to advance the ratchet wheel 27 when the plunger returns under the power of the springs 47 to its other position. When the arm 24 is thus moved, the pin portion 32 thereof engages the hill 31 of the cam disc 30 and rotates such disc 30 in a counter-clockwise direction as viewed in Fig. 3 to engage the pin 44 with the cam hill 31'. Such engagement of the pin 44 with the cam hill 31' will pivot the arm 43 upwardly as viewed in Fig. 3 to disengage the pin 45 from the ratchet wheel 41 to permit the rotation of the ratchet wheel 27 in the aforesaid counter-clockwise direction.

One end portion of a spring 50 is connected to the cam disc 30, while the other end portion thereof is connected as at 51 to the plate 15. This spring 50 is related to the cam disc 30 in a manner such as to return the cam disc to the position shown in Fig. 3.

The rocker plate 39 is pivotally connected as at 52 to the upper end portion of a plunger 53 of an electromagnetic coil 54, which coil constitutes a reset coil in that when such coil is energized and the plunger 53 moved downwardly, the plate 39 will be rocked in a counter-clockwise direction as viewed in Fig. 1 to engage the pin 45 with a tooth of the ratchet wheel 41 whereby to rotate this ratchet wheel in a counter-clockwise direction as viewed in Fig. 4. At the same time the pin 44 engages the hill 31' of cam disc 30 to rotate such disc in a clockwise direction to engage the hill 31 with the pin 32 whereby to elevate the arm 24 upwardly to disengage the dog 26 from the ratchet wheel 27.

Adjacent the ratchet wheel 41 is a disc 55 fixed to the shaft 28 and carrying a tooth segment 56 which is located opposite the position of the ninth tooth of the ratchet wheel 41. At the end of each complete revolution, this tooth segment 56 is adapted to engage a tooth segment 57 of a gear 58 rotatably mounted on a pin 59 carried by the plate 15. This gear 58 meshes with a gear 60 mounted for free rotation on the shaft 61 journaled in a bearing 62 carried by the plate 15. On this shaft 61, like on the shaft 28, is a wiper finger 63 adapted to successively engage contact heads 64. On the shaft 61 is a ratchet wheel 65 adapted to be engaged by a dog 66 slidably and pivotally connected to the plate 15 by a slot and pin connection 67. This dog is connected as at 68 to the outer end portion of a plunger 69 of an electromagnetic coil 70 mounted on the plate 15.

The gear 60 is provided with a plurality of equally spaced openings 71 formed concentrically in the gear. Successively engaging these openings is a pin 72 carried by a spring finger 73 in turn carried by a disc 74 fixed to the shaft 61. The arrangement is such that the ratchet wheel 65 can be rotated by the dog 66 independent of the rotation of the gear 60. The disc 74 carries a tooth segment 75 adapted to engage a tooth segment 76 of a gear 77 each time the disc 74 completes one revolution. The gear 77 meshes with a gear 78 carried by and fixed to a shaft 79 journaled in a bearing (not shown) carried by the plate 15. On this shaft 79, like on the shafts 28 and 61, is arranged a contact finger 80 adapted to engage contact heads 81.

By the arrangement of the floating disc 74, the ratchet wheel 65 may be advanced step-by-step independent of the advancement of the ratchet wheel 27. This is accomplished when the coil 70 is energized. When the reset coil 54 is energized the ratchet wheel 65 and the gear 78 is reset through the medium of the operation of the gears 58 and 77.

The pivotal movement of the plates 21 and 39 in their anti-clockwise and clockwise direction, respectively, is limited by limiting screws 79' carried by brackets 84 mounted on the plate 15 and engaging lateral extensions 85 provided by the plates 21 and 39.

The wiper fingers 49, 63 and 80 in Fig. 13, are each shown in zero position. To prevent overriding from such position during the retracting operation of the shafts 28, 61 and 79 there is provided a switch 82 adjacent a cam 83 on each of such shafts which opens when engaged by the cam 83 to deenergize the circuit to the coil 18, 54 and 70, which circuit remains deenergized until again energized by the closing of the operating switch circuit.

From the foregoing description it is apparent that we have provided a high score step-up mechanism substantially compact in construction, one which will occupy a relatively small space and one in which a plurality of step-up units are combined for purposes of registration by illumination or otherwise of high scores.

While we have illustrated and described the preferred form of construction for carrying our invention into effect, this is capable of variation and modification without departing from the spirit of the invention. We, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail ourselves of such variations and modifications as come within the scope of the appended claims.

Having thus described our invention, what we claim as new and desire to protect by Letters Patent is:

1. A multiple step-up mechanism comprising a mounting plate, a pair of similar members rotatably mounted on said plate, means for advancing one of said members step-by-step in one direction, means for retracting said one of said members step-by-step in an opposite direction, a train of gears operatively connecting said members together whereby the other of said members is advanced one step upon each completed revolution

of said one member, a gear member rotatably mounted on said plate, a train of gears operatively connecting said gear member to said other member, said train of gears and said gear member having cooperating means to rotate said gear member one step in one direction upon each completed revolution of said other member, and mechanism for advancing said other member step-by-step independent of the said one member.

2. A multiple step-up mechanism comprising a mounting plate, a pair of ratchet wheels rotatably mounted on said plate, electromagnetic means for advancing one of said ratchet wheels step-by-step in one direction, means for retracting said one of said wheels step-by-step in an opposite direction, a train of gears operatively connecting said wheels together whereby the other of said wheels is advanced one step upon each completed revolution of said one wheel, a gear member rotatably mounted on said plate, a train of gears operatively connecting said gear member to said other wheel, said train of gears and said gear member having cooperating means to rotate said gear member one step in one direction upon each completed revolution of said other wheel, and mechanism for advancing said other wheel step-by-step independent of said one wheel.

3. A multiple step-up mechanism comprising a mounting plate, a pair of ratchet wheels rotatably mounted on said plate, means for advancing one of said ratchet wheels step-by-step in one direction, means for retracting said one of said wheels step-by-step in an opposite direction, a train of gears operatively connecting said wheels together whereby the other of said wheels is advanced one step upon each completed revolution of said one wheel, a gear member rotatably mounted on said plate, a train of gears operatively connecting said gear member to said other wheel, said train of gears and said member having cooperating means to rotate said gear member one step in one direction upon each completed revolution of said other wheel, and means for rotating said other wheel step-by-step independent of the rotation of said one gear, said last-named means including an electromagnetic element.

4. A multiple step-up mechanism comprising a mounting plate, a pair of ratchet wheels rotatably mounted on said plate, means for advancing one of said ratchet wheels step-by-step in one direction, means for retracting said one of said wheels step-by-step in an opposite direction, a train of gears operatively connecting said wheels together whereby the other of said wheels is advanced one step upon each completed revolution of said one wheel, a gear member rotatably mounted on said plate, a train of gears operatively connecting said gear member to said other wheel, said train of gears and said gear member having cooperating means to rotate said gear member one step in one direction upon each completed revolution of said other wheel, mechanism for rotating said other wheel independent of rotation of said one wheel and means for disengaging said retracting means for said one wheel during the operation of said advancing means on said one wheel.

5. A multiple step-up mechanism comprising a mounting plate, a pair of ratchet wheels rotatably mounted on said plate, electromagnetic means for advancing one of said ratchet wheels step-by-step in one direction, means for retracting said one of said wheels step-by-step in an opposite direction, a train of gears operatively connecting said wheels together whereby the other of said wheels is advanced one step upon each completed revolution of said one wheel, a gear member rotatably mounted on said plate, a train of gears operatively connecting said gear member to said other wheel, said train of gears and said gear member having cooperating means to rotate said gear member one step in one direction upon each completed revolution of said other wheel, mechanism for advancing said other wheel step-by-step independent of said one wheel, and means for disengaging said retracting means

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for said one wheel during the operation of said advancing means on said one wheel.

6. A multiple step-up mechanism comprising a mounting plate, a pair of ratchet wheels rotatably mounted on said plate, means for advancing one of said ratchet wheels step-by-step in one direction, means for retracting said one of said wheels step-by-step in an opposite direction, means operatively connecting said wheels together whereby the other of said wheels is advanced one step upon each completed revolution of said one wheel, a gear member rotatably mounted on said plate, a train of gears operatively connecting said gear member to said other wheel, said train of gears and said gear member having cooperat-

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ing means to rotate said gear member one step in one direction upon each completed revolution of said other wheel and mechanism for advancing step-by-step said other wheel independent of said one wheel.

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