March 6, 1951 M. L. NELSON 2,544,610

NUMERICAL COUNTER

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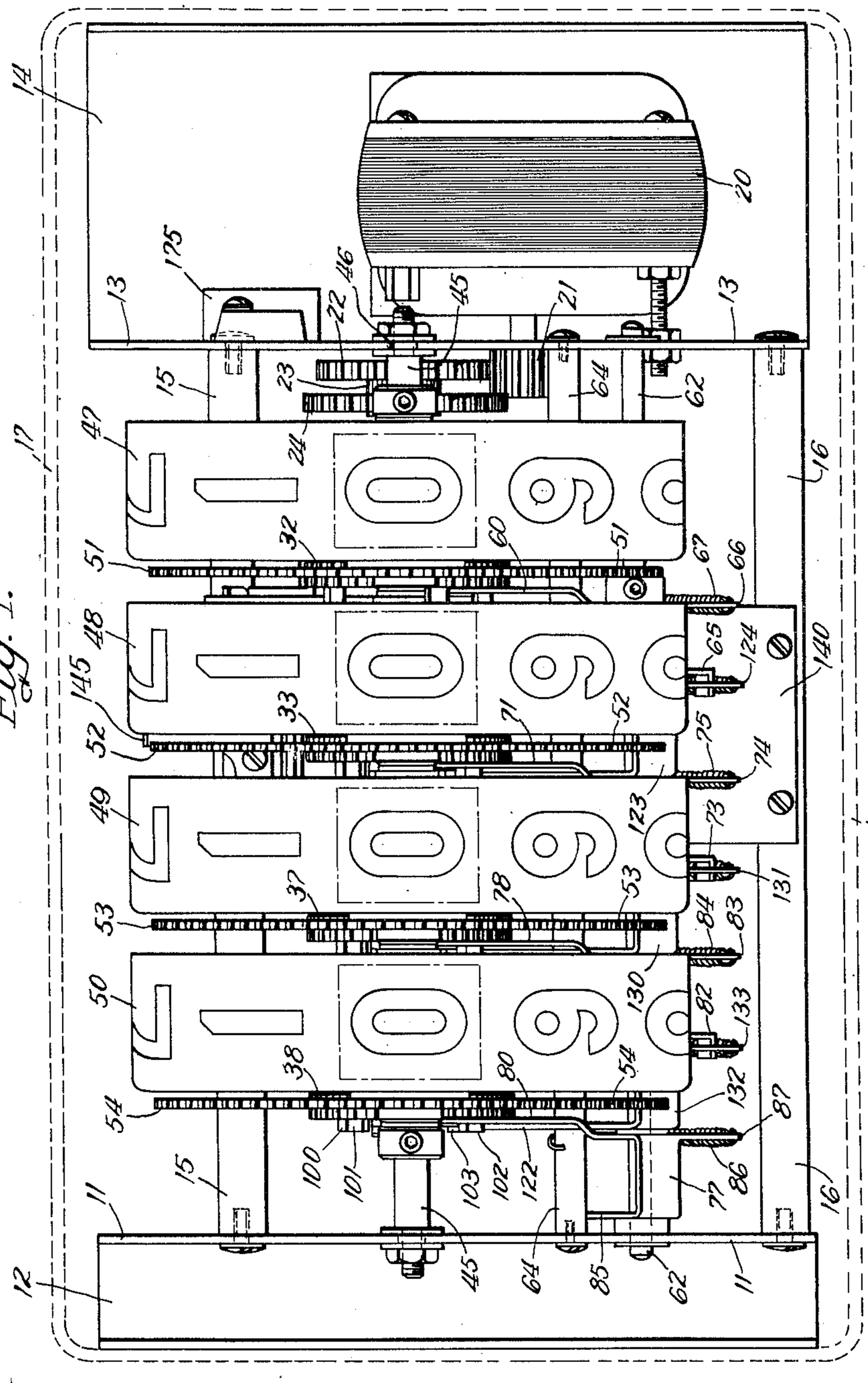
Fig. 1.



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NUMERICAL COUNTER

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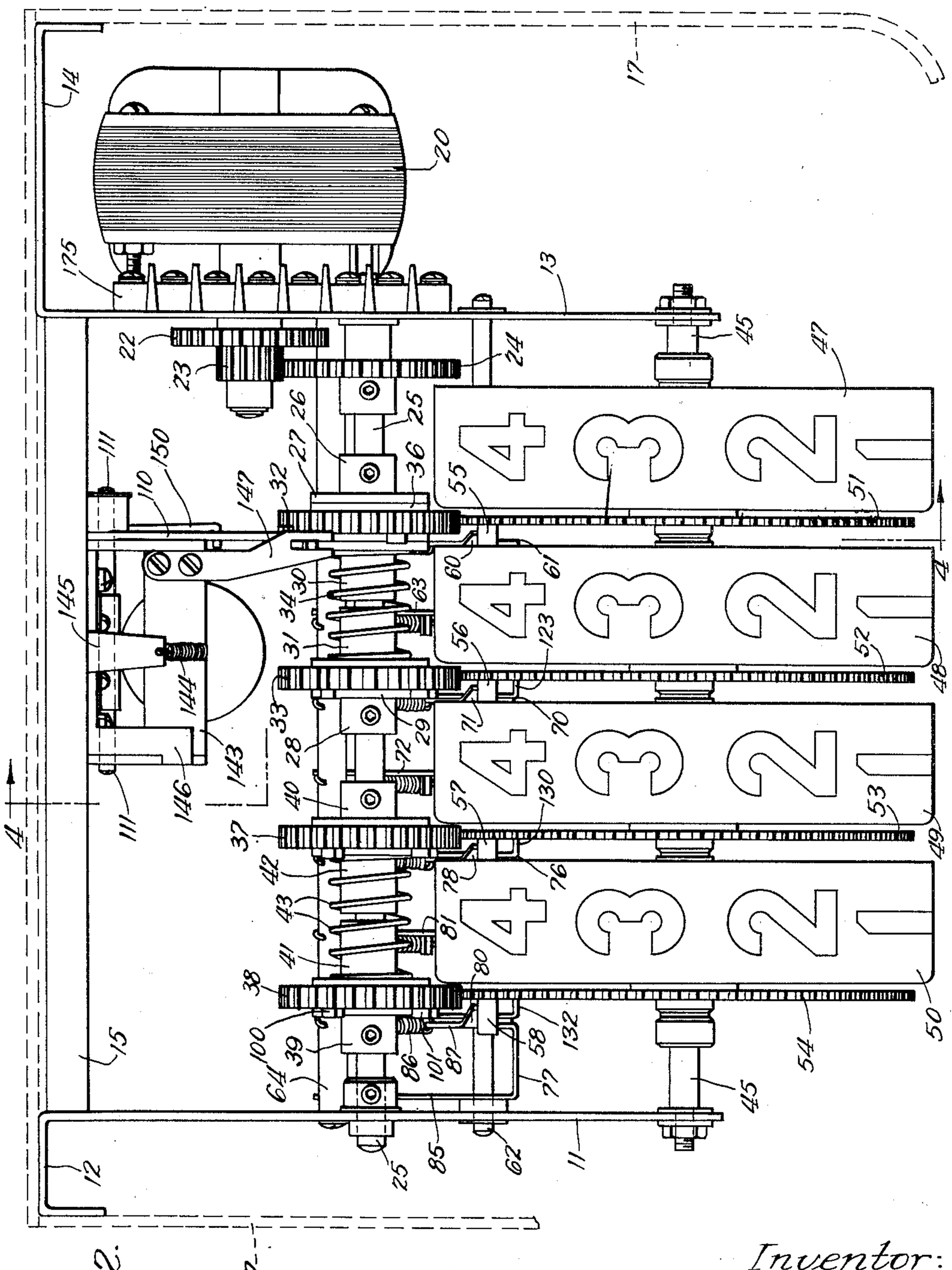

Fig. 2.

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NUMERICAL COUNTER

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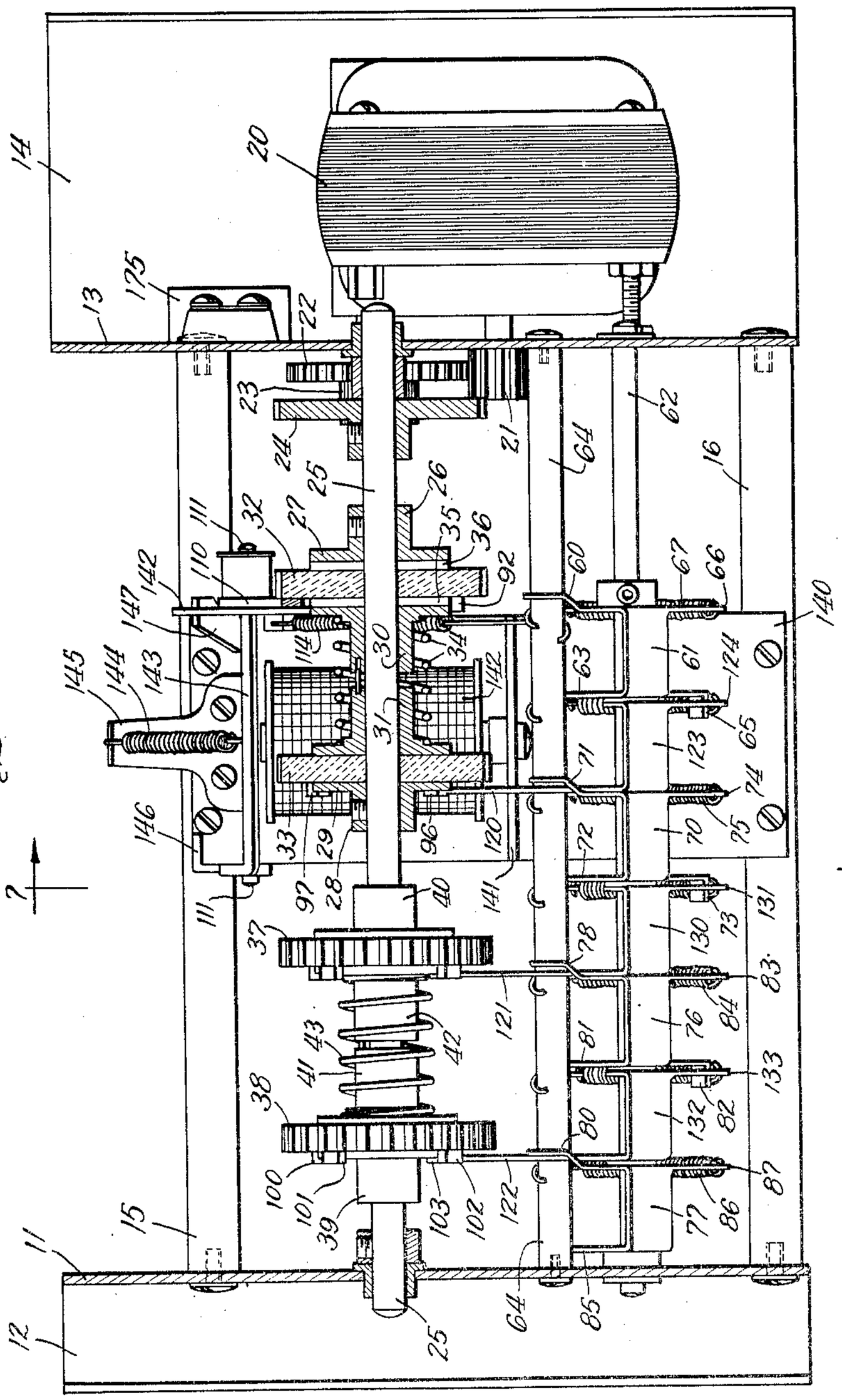

Fig. 3.

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Fig. 4.

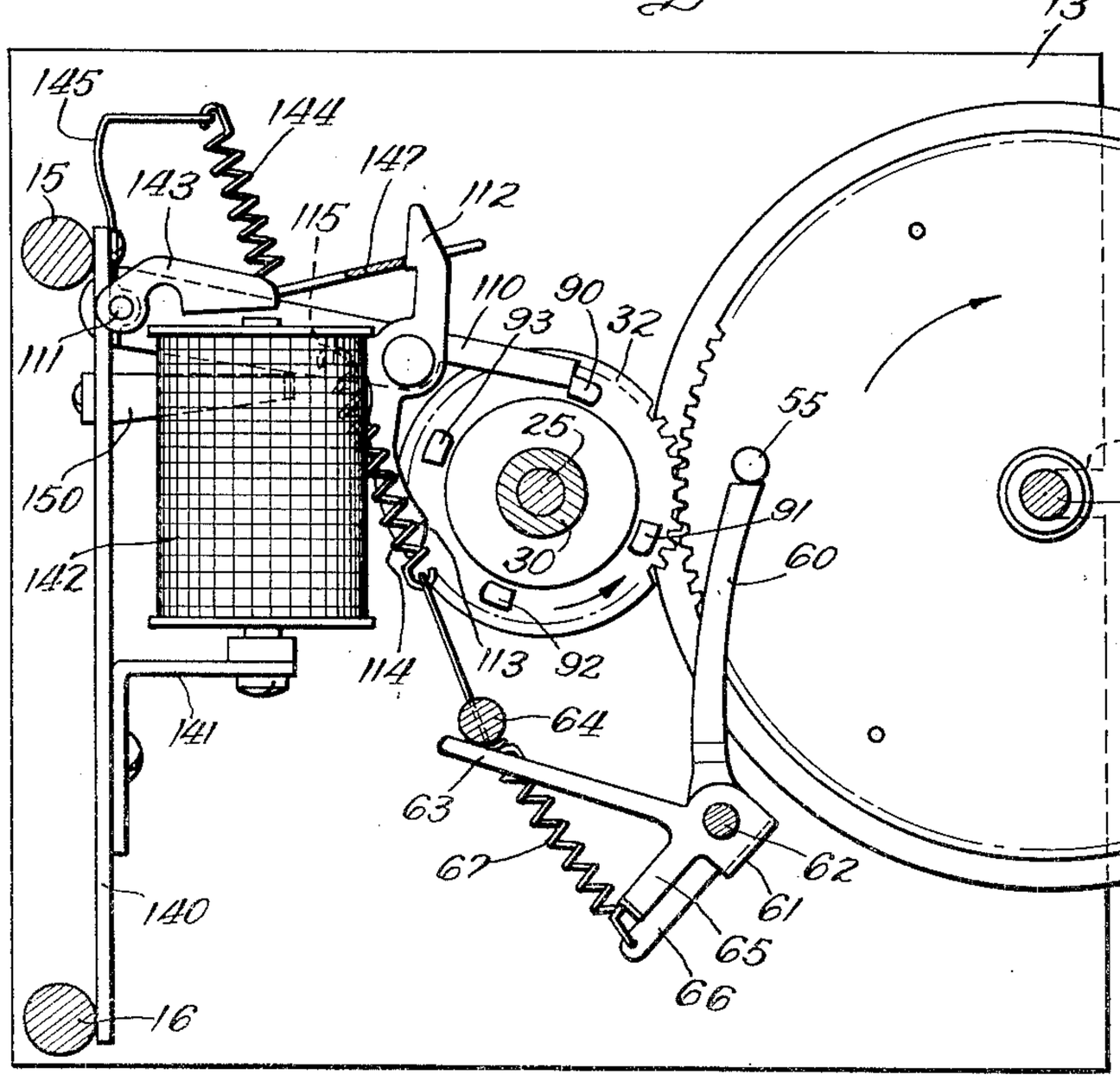

Fig. 5.

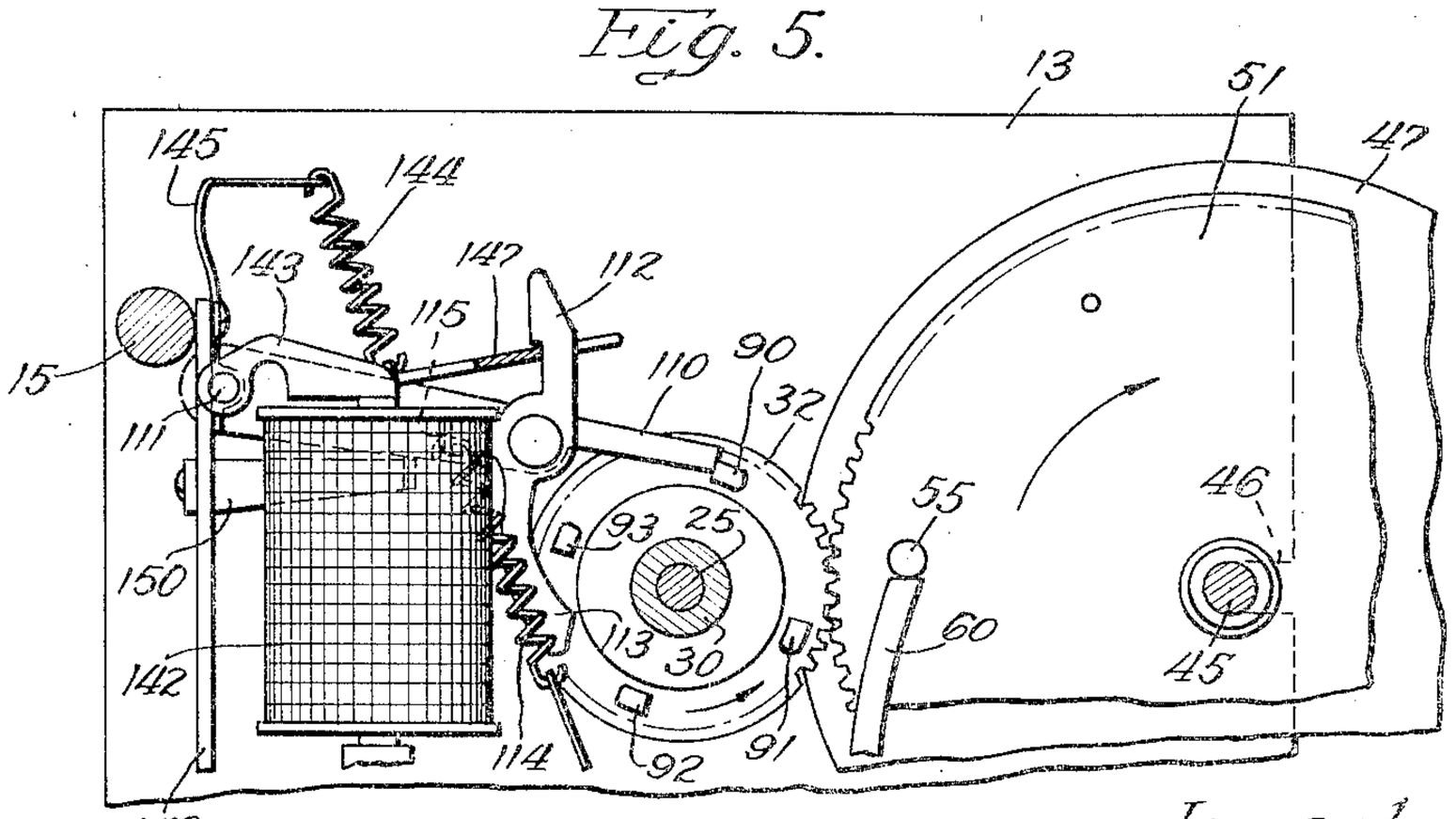

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Fig. 6.

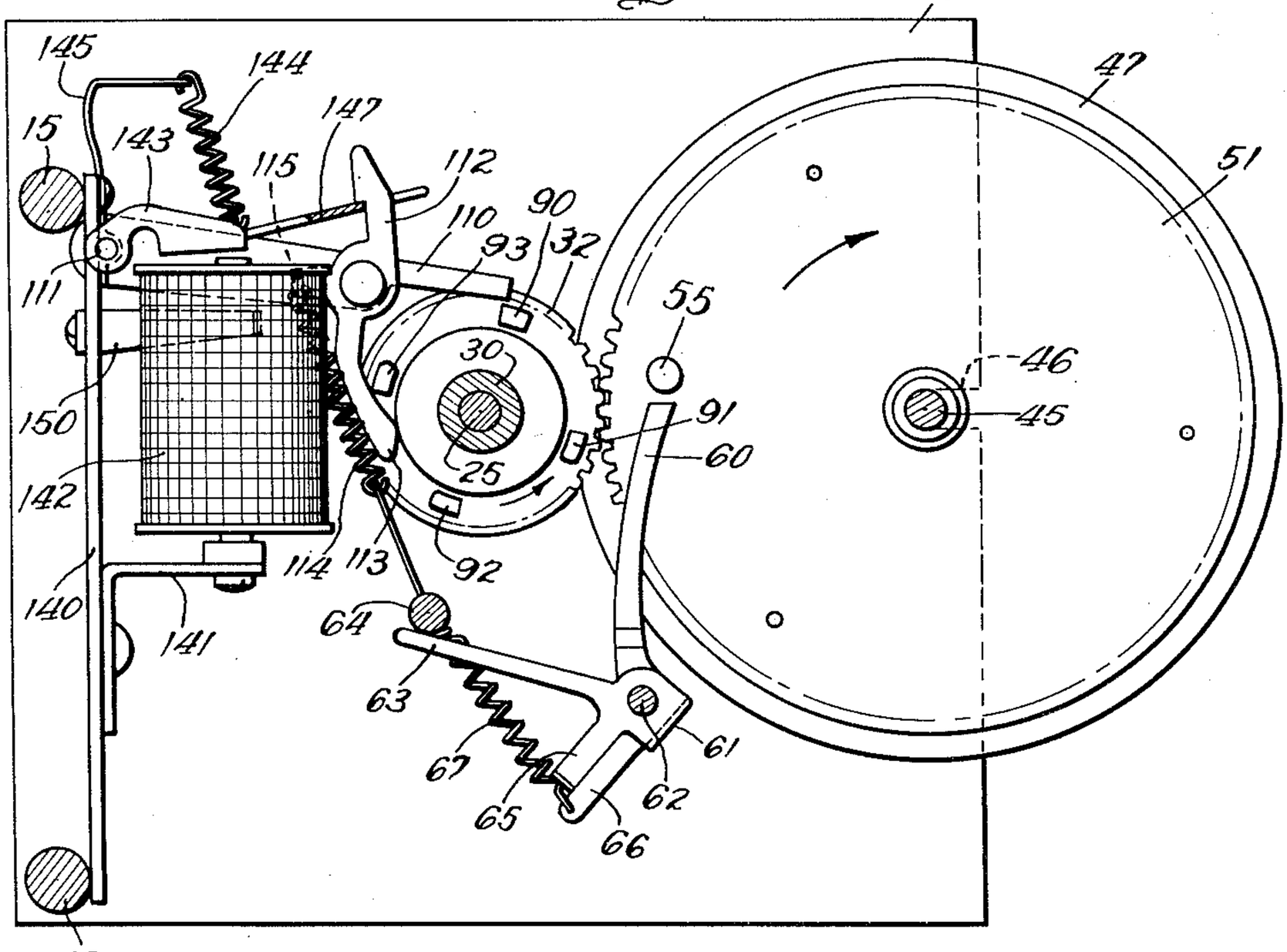

Fig. 7.

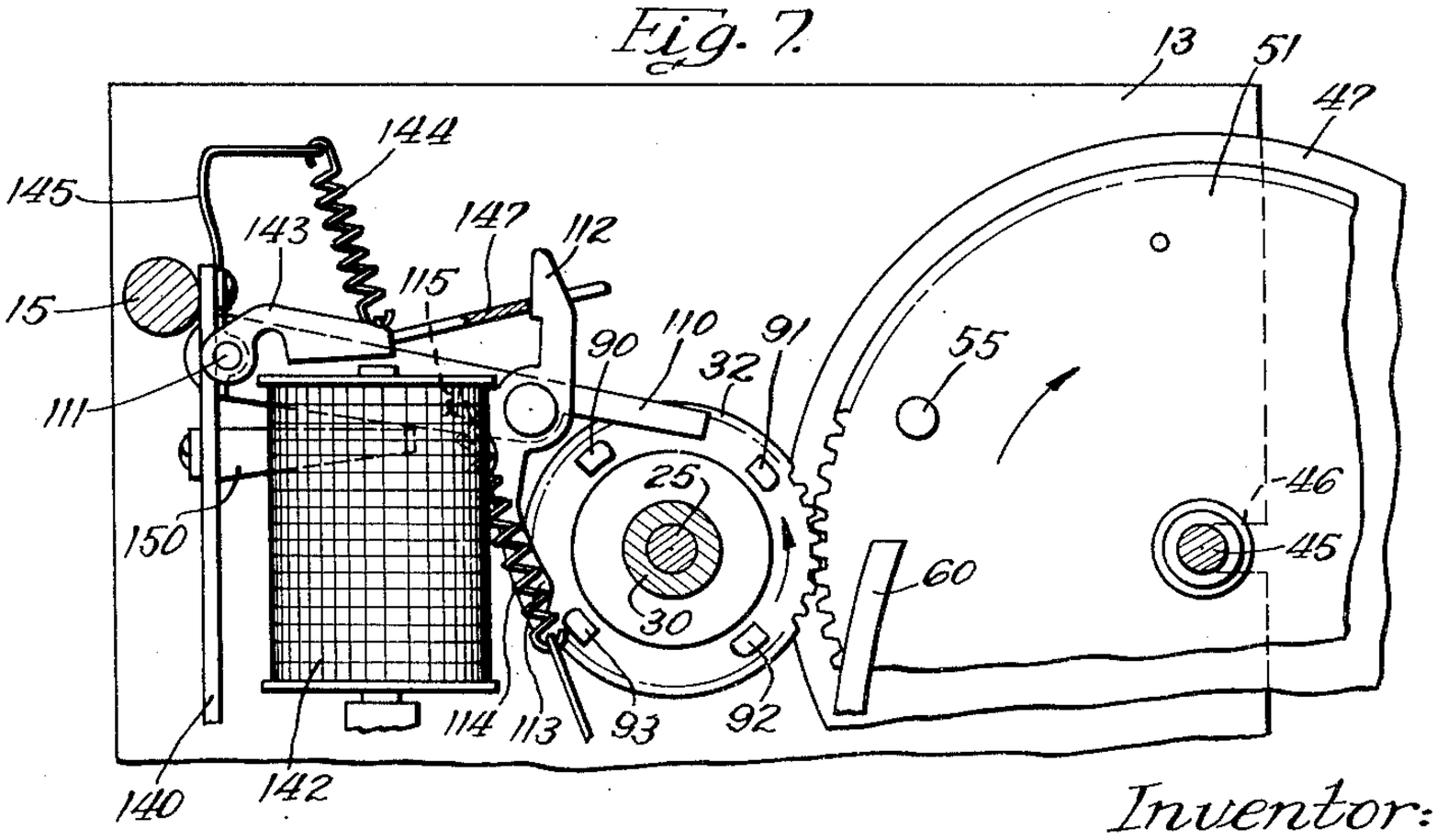

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Fig. 8.

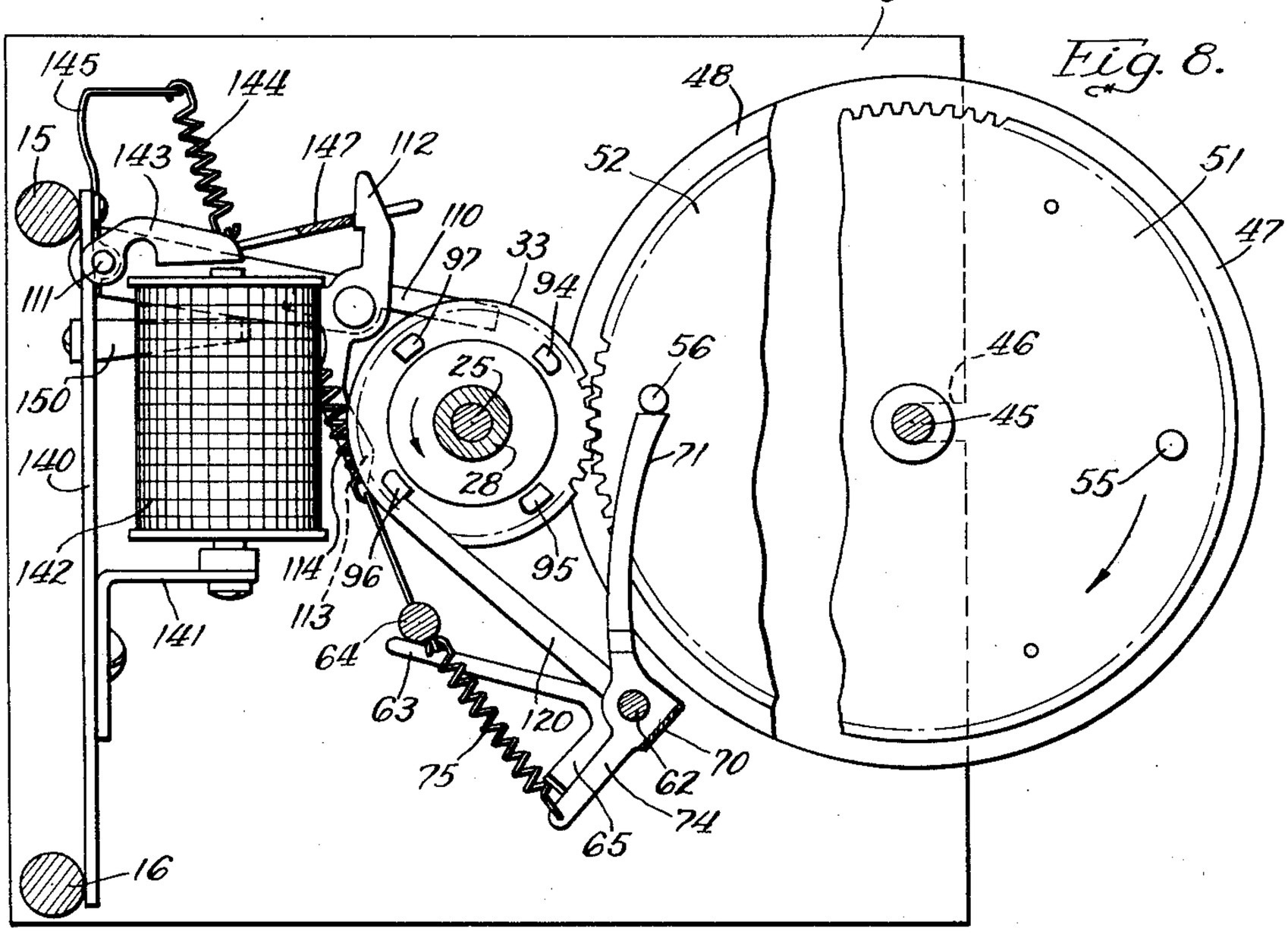
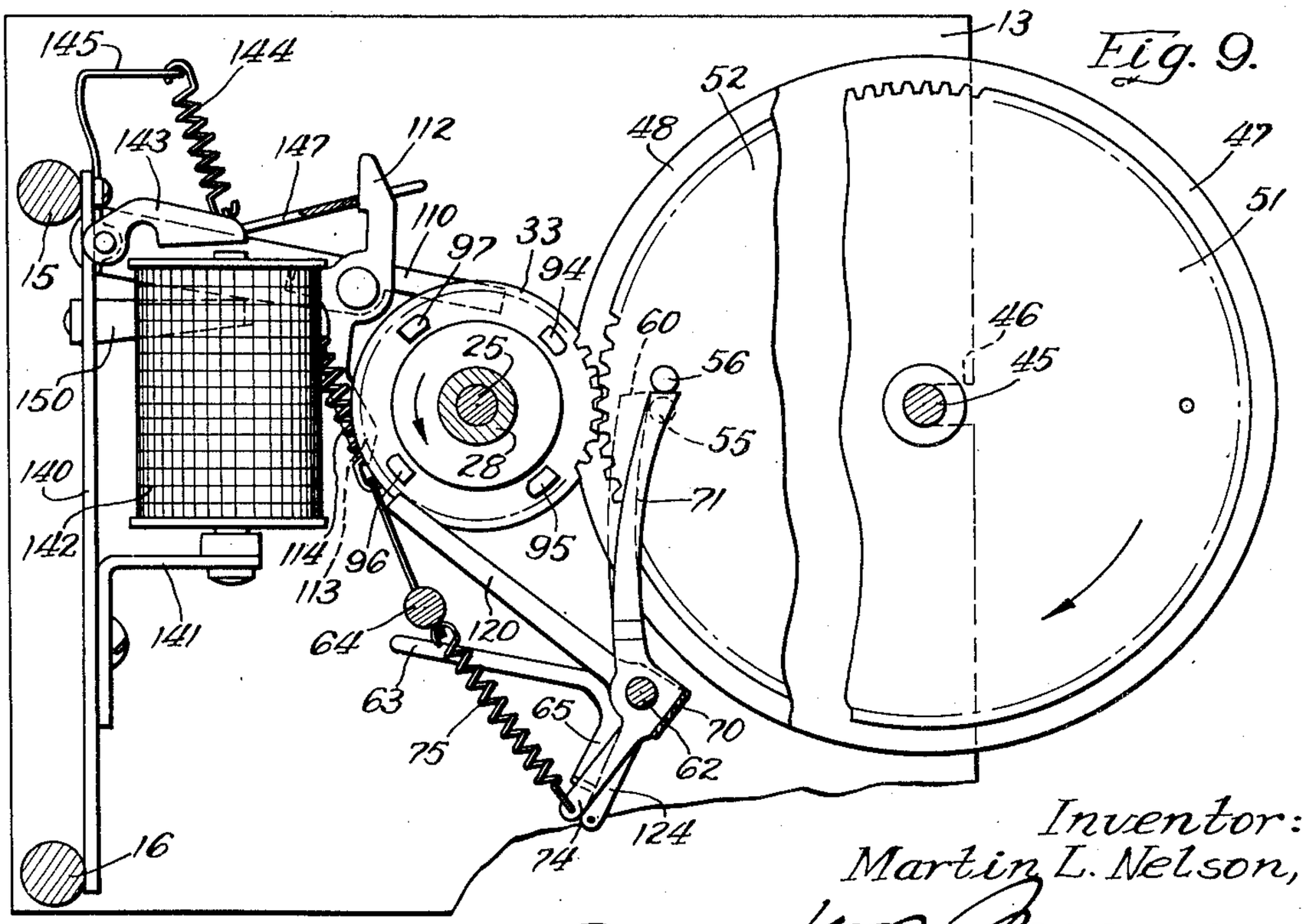


Fig. 9.



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Patented Mar. 6, 1951 2,544,610

UNITED STATES PATENT OFFICE

2,544,610

NUMERICAL COUNTER

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Application August 14, 1947, Serial No. 768,631

9 Claims. (Cl. 235—92)

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This invention is concerned with a numerical counter having a plurality of number wheels and impulse-controlled electromagnetic means for advancing such number wheels to display successively numerals of progressively higher numerical order.

An object of the invention is to provide a numerical counter of the type noted above, comprising a drive shaft which may be continuously rotated, drive means in frictional driving engagement with said shaft, one for each number wheel, electromagnetically operable means for intermittently coupling with said drive shaft the drive means associated with the number wheel of lowest numerical order for the purpose of successively operatively advancing such number wheel by angular amounts corresponding to the spacing between its numerals, and interlocking control means operated by each number wheel upon completing a full revolution for operatively coupling with said drive shaft the drive wheel associated with the number wheel of next higher numerical order to cause rotation of such number wheel by a corresponding angular amount.

Another object is to provide a numerical counter, as noted in the preceding paragraph, wherein the drive shaft may be rotated in reverse direction for the purpose of rotating to "0" all number wheels which had been advanced incident to the forward rotation thereof, and having control means for stopping the reverse rotation of each number wheel upon reaching its "0" position.

The objects intimated above and other objects and features will appear from the detailed description of an embodiment which is rendered below with reference to the accompanying drawings. In these drawings,

Fig. 1 shows diagrammatically the front elevational view of an embodiment of a numerical counter in which the improvements forming the subject-matter of the invention have been incorporated;

Fig. 2 indicates a top elevational view of the structure;

Fig. 3 is a front view analogous to Fig. 1, with the number wheels removed and with some parts in section and broken away to show details;

Figs. 4–7, inclusive, illustrative the operation of the units number wheel; and

Figs. 8 and 9 are diagrams to assist in explaining the transfer mechanism for causing the operation of number wheels of next higher numerical order incident to the completion of a full revolution of a number wheel of lower numerical order.

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Like parts are numbered alike throughout the drawings. Known details and elements will be discussed only to the extent required for conveying an understanding of the invention.

The counter illustrated in the drawings comprises a mounting member forming a side wall 11 and an angular extension 12, and a mounting member forming a side wall 13 and an angular extension 14. Two rodlike members 15—16 are provided for interconnecting the side walls 11 and 13. A suitable cover 17 may be provided, which is indicated in Figs. 1 and 2 in dotted lines. In this cover are formed sight openings for framing the numerals for display, as indicated in Fig. 1 in dot-dash lines, the number wheels being assumed to be in "0" position.

A suitable reversible motor 20 is mounted on a side wall 13 by means of posts, as shown. The motor shaft carries a pinion 21 which meshes with the gear wheel 22, and rotatable with the latter is a pinion 23 which meshes with the gear wheel 24, the latter gear wheel being keyed to the drive shaft 25. This drive shaft therefore may be selectively rotated in either direction of rotation.

Keyed to the drive shaft 25 is a bushinglike member 26 provided with a flange 27 and a bushinglike member 28 carrying a flange 29. A floating similarly flanged bushing 30 coacts with the bushing 26 and its flange 27, and a flanged floating bushing 31 coacts with the bushing 28 and its flange 29. Between the flanges of the bushings 26 and 30 is disposed a drive gear wheel 32 which is the units drive wheel of the structure, and between the flanges of the bushings 28 and 31 is similarly disposed the drive gear wheel 33 which is the tens drive wheel. These drive wheels are made of suitable material and are freely rotatable on the shaft 25, being frictionally coupled therewith by the flanges carried on the floating bushing members 30—31 which are resiliently held apart by the spring 34. Suitable friction bearing disks 35—36 may be provided, one for each side of the units drive wheel 32, as particularly indicated in Fig. 3. Similar drive gear wheels 37—38 are provided, freely rotatable on the shaft 25 and frictionally coupled therewith by means of the flanged bushinglike members 39—40 which are keyed to the drive shaft 25, one side of the drive wheel 37 being engaged by the flange extending from the bushinglike member 40 and one of the sides of the drive wheel 38 being similarly engaged by the flange extending from the bushing member 39. Coacting similarly flanged floating coupling or bushing mem-

bers 41—42 are disposed between the inner sides of the drive wheels 37—38 and are held in frictional driving engagement therewith by the spring 43 which attempts to spread these floating bushing members apart, thus frictionally coupling the drive wheels 37—38 with the flanges of the bushings 39—40, respectively. The drive gear wheels 37—38 are associated with number wheels of higher numerical order, the drive wheel 37 being provided for the hundreds number wheel and the drive wheel 38 for the thousands number wheel.

A shaft 45 is disposed in the forward portion of the structure and is suitably held in slots such as 46 (see Figs. 1 and 4) provided in the side walls 11 and 13. Rotatably mounted on this shaft 45 are the number wheels 47—50. The number wheel 47 is the units number wheel, and each of the remaining number wheels is a number wheel of progessively higher numerical order. Four number wheels have been shown for convenience of description; it is understood that more or less number wheels may be provided. Secured to each of the number wheels is a driven gear wheel which is normally in mesh with the corresponding drive gear wheel carried on the shaft 25. Thus, the units number wheel 47 carries the driven gear wheel 51, and similar driven gear wheels 52—54 are associated with the number wheels 48—50, respectively.

Each driven gear wheel 51—54 is provided with a pinlike control and stop member which extends axially therefrom. These pinlike members are indicated in Fig. 2 by numerals 55—58, respectively, the pinlike member 55 associated with the driven gear wheel 51 being also shown in Figs. 4–7. The function of these members is to prevent rotation of the corresponding number wheels, in counter-clockwise direction, as shown in Figs. 4–7, beyond the normal "0" position thereof, and to effect operative actuation of each number wheel of higher numerical order upon completion of a full revolution of the next adjacent number wheel of lower numerical order.

Each of these pinlike members 55—58 is for this purpose normally in engagement with the free end of a control arm extending from a pivotally mounted control bracket associated with the corresponding number wheel. Thus, as is particularly apparent from Figs. 2–5, the pinlike member 55 extending axially from the driven gear wheel 51 of the units number wheel 47 is normally in engagement with the free end of the control arm 60 extending from the control bracket 61 which is pivotally mounted on the shaft 62. A positioning arm 63 extends rearwardly from the control bracket for engagement normally with a stop rod or shaft 64 which, just like the shaft 62, is mounted between the side walls 11 and 13 of the structure. The control bracket 61 is also provided with an angular trip arm 65 for tripping a stop bracket 123 carrying a stop member 120 associated with the gear drive wheel 33 coacting with the tens number wheel 48 in a manner which will presently appear. An extension 66 projects from the control bracket 61 which coacts with a coiled spring 67, one end of which is secured to the extension 66 and the other end of which is anchored in the positioning shaft 64. The control bracket 61, with its various arms, is thus normally held in clockwise direction, as seen in Figs. 4 and 5, with the free end of its control arm 60 in engagement with the pinlike projection 55 axially extending from the driven gear wheel 51 associated with the units number wheel 47, and such number wheel is therefore prevented from rotating in counter-clockwise direction beyond its normal "0" position. However, when this number wheel is advanced in clockwise direction through a full revolution, the pin 55 will displace the arm 60 angularly in counter-clockwise direction to trip the stop arm 120 coacting with the drive wheel 33 so as to effect operative actuation of the tens number wheel. This transfer operation will presently be described more in detail.

A pivotally mounted control bracket such as 61 is associated with each of the remaining number wheels and their associated driven gear wheels. The corresponding control bracket coacting with the tens number wheel 48 and its driven gear wheel 52 is indicated by numeral 70. Just like the control bracket 61, the pivotally mounted control bracket 70 has an arm 71, corresponding to arm 60 of bracket 61, the free end of which is normally in engagement with the pinlike member 56 projecting from the driven gear wheel 52 of the tens number wheel 48, as particularly shown in Figs. 8 and 9. The control bracket 70 also has a positioning arm 72 (see Fig. 3) which engages the stop rod 64, a trip bracket 73 for interlocking coaction with the stop bracket 130 carrying the stop arm 121 associated with the drive wheel 37 for coaction with the number wheel of next higher numerical order, and an arm 74 to which is secured one end of the spring 75, the other end of which is anchored in the stop rod 64. The control brackets 76—77 are similarly constructed and pivotally mounted on the shaft 62 for coaction with the number wheels 49—50, respectively, the control member 76 having the control arm 78 which normally is in engagement edgewise with the pin 57 extending from the driven gear wheel 53 of the number wheel 49 (see also Fig. 3), and the control bracket 77 having an arm 80 for engagement edgewise with the pin 58 projecting from the driven gear wheel 54 of the number wheel 50. The control bracket 76 also has an arm 81 which is in engagement normally with the stop rod 64, an angular trip bracket 82 which is in interlocking tripping relationship with the stop bracket coacting by means of its stop arm 122 with the drive wheel 38, which meshes with the gear wheel 54 of the number wheel 50, and an extension 83 to which is attached one end of the spring 84, the other end of which is anchored in the stop rod 64. The control bracket 77 is similarly constructed, having the control arm 80, already mentioned, and the arm 85 which is locked in back of the stop rod 64 by the spring tension furnished by spring 86, one end of which is anchored in the extension 87 and the other end of which is anchored in the rod 64. There is no trip bracket such as 65, 73 or 82 associated with the control bracket 77 because it has been assumed that the counter has only four number wheels, and therefore the control bracket coacting with the number wheel of highest numerical order does not have a tripping function for transfer purposes.

The trip or stop brackets 123, 130 and 132, carrying the stop arms 120, 121, 122, respectively, are likewise pivotally mounted on the shaft 62, and are biased thereon in clockwise direction, as seen in Figs. 8 and 9, by springs secured to the extensions 124, 131, 133, respectively, which are anchored in the stop rod 64.

It will be understood from the above discussion that, if the drive shaft 25 were rotated by the motor 20 in clockwise direction, as seen in

Fig. 4, such rotation would be frictionally effective to the drive gear wheels **32, 33, 37, 38**, attempting to rotate the driven gear wheels **51, 52, 53** and **54** of the number wheels **47—50** in counter-clockwise direction. Such rotation is inhibited due to the engagement of the control pins **55—58** projecting from the corresponding driven gear wheels which are in engagement with the free ends of the associated control levers or arms **60, 71, 78** and **80** projecting from the pivotally mounted control brackets **61, 70, 76** and **77**, respectively. But, if it is assumed that the various number wheels, or some of them, have been advanced, clockwise as seen in Fig. 4, from their normal "0" positions, the subsequent clockwise rotation of the shaft **25** would be effective to rotate them counter-clockwise until the control pins **55—58** engage their coacting control levers **60, 71, 78** and **80**, respectively, when the number wheels are again in normal "0" position.

Each of the drive gear wheels **32, 33, 37** and **38** is provided with a number of axially extending projections for coaction with escapementlike drive control means yet to be described. Thus the drive gear wheel **32** carries the projections **90—93**, as shown in Figs. 4–7, and the drive gear wheel **33** carries axial projections **94—97**, as shown in Figs. 8 and 9. Similar projections are provided on each of the remaining drive gear wheels **37—38**, the corresponding projections provided on the drive gear wheel **38** being marked in Fig. 1 by numerals **100—103**. The projections associated with each drive wheel constitute stop members for coaction with corresponding stop lever arms, one associated with each drive gear wheel to control the intermittent angular advance or rotation thereof.

The stop lever arm **110** associated with the drive gear wheel **32** coacting with the driven gear wheel **51** of the units number wheel **47** is pivotally mounted at **111**. Pivotally mounted on the lever arm **110** is a latch member **112** having a camming arm **113** (see also Figs. 4–7). A spring **114** is provided, one end of which is anchored in the stop rod **64** and the other end of which is anchored in a bracket extension **115** of the latch member **112**. This latch member with its camming arm **113** is thus biased in counter-clockwise direction, as seen in Fig. 4, and biases in clockwise direction the stop lever arm **110** so that its free end is disposed in the path of the stop projection **90** carried by the drive gear wheel **32**, preventing counter-clockwise rotation of this drive gear wheel when the shaft **25** is rotated counterclockwise by the motor **20**.

The stop arms for coaction with the stop members axially projecting from each of the remaining drive wheels **33, 37** and **38** are marked by numerals **120—122**, respectively. The stop arm **120** coacting with the drive gear wheel **33** extends from the pivotally mounted stop bracket **123**, already mentioned, and has an extension **124** which interlocks with the angular trip member **65** of the pivotally mounted control bracket **61** which carries the control arm **60** coacting with the number wheel **47**. The stop bracket **123** is biased in clockwise direction, by a spring anchored in the stop rod **64** which is secured to the extension **124**, as seen in Figs. 3 and 9. The stop arm **121** coacting with the stop projections on the drive gear wheel **37** extends similarly from the pivotally mounted stop bracket **130** which is in interlocking tripping relationship with the angular trip member **73** extending from the control bracket **70** associated with the number wheel **48**; and the stop arm **122** coacting with the stop projections on the drive gear wheel **38** extends in a similar manner from the pivotally mounted stop bracket **132**, its arm **133** being interlocked with the trip bracket **82** of the control bracket **76** which coacts with the number wheel **49**.

The normal position of the various stop arms coacting with the drive gear wheels **33, 37, 38**, respectively, such as the stop arm **120** associated with the drive gear wheel **33**, is indicated in Fig. 8. It will be seen from this figure that the free end of the stop arm **120** is in the path of the stop projection **96** carried by the drive gear wheel **33** to prevent the rotation of this drive gear wheel if the shaft **25** is rotated counterclockwise. The remaining stop lever arms **121—122** are in similar relationship with a stop projection on the drive wheels **37—38**, respectively, and it follows therefore that each of the drive gear wheels **33, 37** and **38** is held against rotation by the shaft **25**, if such shaft is rotated in counter-clockwise direction. It will be remembered that the stop lever arm **110** associated with the units drive gear wheel **32** is normally in the position shown in Fig. 4, thus likewise preventing rotation of the drive gear wheel **32** in response to counter-clockwise rotation of the shaft **25**.

Counter-clockwise rotation of the shaft **25** will thus have no effect so long as the mechanism and its various operating parts are in normal position, as discussed. Clockwise rotation of the shaft **25** will likewise be ineffective in normal position of the mechanism, due to the engagement of the control pins such as **55—58** with the free ends of the control lever arms such as **60** associated with the respective number wheels.

Secured to the rodlike members **15—16**, which interconnect the side walls **11** and **13**, is a platelike member **140** carrying a bracket **141** for mounting the electromagnet having the coil **142**. Suitable ears are provided for pivotally mounted the armature **143** which is biased in counter-clockwise direction, as seen in Figs. 2, 3 and 4–9, by a spring **144** extending from a bracket **145**. A suitable angular extension **146** (Figs. 2 and 3) may be provided for limiting the counter-clockwise displacement of the armature **143** to normal position. Secured to the armature **143** is a latch member **147**. This latch member is slotted at its free end, as particularly indicated in Figs. 2, 3 and 4, for accommodating the latch member **112** which is pivotally mounted on the stop lever or arm **110**. Accordingly, in normal position of the device the latch member is biased in downward direction, as seen in Fig. 4, and is unlatched from the coacting latch member **147** carried by the armature **143**.

It will now be assumed that the motor **20** is operatively actuated to rotate the shaft **25** in counter-clockwise direction, as the structure is illustrated in Fig. 4, and that a series of impulses is delivered to the coil **142** of the electromagnet for the purpose of successively advancing the number wheels to display successively numerals of progressively higher order.

Upon delivery of the first impulse to the electromagnet, the armature **143** is attracted in clockwise direction, as seen in Fig. 4, and, inasmuch as the pivotally mounted latch member **112** is biased in counter-clockwise direction by the spring **114**, this latch member **112** will interlock with the coacting latch member **147** and assume the relative position as seen in Fig. 5. The shaft **25**, it will be recalled, rotates in

counter-clockwise direction. The drive wheel 32 for driving the drive gear wheel 51 of the units number wheel 47 is still prevented from rotating, by frictional force transmitted to it through the couplings including the bushinglike members 28 and 30 because the free edge of the stop lever arm 110 is in the path of rotation of the projection 90 axially extending from the drive wheel 32. It may be mentioned here that the displacement of the stop arm 110 is limited by a stop bracket 150 extending from the plate 140, holding the arm 110 in the position shown.

Upon cessation of the first impulse, the armature 143 is released to normal; and, inasmuch as latch member 112 is now interlocked with the coacting latch member 147, the release of the armature to normal carries the latch member 112 and therewith the stop lever arm 110 counter-clockwise to the position in which the parts are shown in Fig. 6, the displacement being against the pull of the spring 114. The free end of the stop lever arm 110 is thus removed from engagement with the stop projection 90 carried by the drive gear wheel 32, and this wheel can rotate counter-clockwise, being frictionally coupled with the rotating shaft 25.

The relative position of the parts at the inception of rotation of the drive wheel 32 is apparent from Fig. 6. The driven gear wheel 51 of the units wheel 47 has been angularly displaced, as shown in this figure, and the control pin 55 axially projecting from the driven gear wheel 51 moves away from the control lever arm 60. The stop projection 93 now engages the camming arm 113 associated with the latch 112 and moves the camming arm to the left, thereby rotating the latch member 112 clockwise, thus releasing its interlocking engagement with the coacting latch member 147 and allowing the stop lever arm 110 to drop into its normal position, as indicated in Fig. 7, in which position it is in the path of the stop projection 91 to intercept this projection and stop rotation of the drive gear wheel 32 when the stop projection 91 reaches the relative position in which the stop projection 90 is shown in Figs. 4 and 5.

The drive gear wheel 32 now has been advanced by a certain angular amount and, being geared with the driven gear wheel 51 of the units number wheel 47, it has rotated this gear, and therewith the units wheel, by 36°, appropriate ratio of the gears being provided, and the units number wheel is thus advanced to display through its sight opening the number "1."

Successive impulses delivered to the coil 142 of the electromagnet cause successive attraction and subsequent release of the armature 143 and thereby successive latching and unlatching of the coacting latch members 112 and 147, and intermittent lifting and releasing of the stop lever arm 110, as described, thus successively effecting the operative coupling of the drive gear wheel 32 for rotation with the shaft 25 and successively arresting its rotation after it has been displaced angularly by the amount determined by the angular spacing of the stop members 90—93, respectively. The units number wheel 47 is thus angularly advanced step by step to display successively its numerals of progressively higher numerical order, until the tenth impulse is delivered, at which time the units number wheel again displays "0." Upon delivery or, rather to say, upon cessation of the tenth impulse, both, the units and the tens number wheels 47 and 48 must be rotated to display their numeral "1."

The operation of the units number wheel has been explained; the advance of the tens number wheel 48 is accomplished by the interlocking coaction of the control bracket 61, associated with the units number wheel, with the stop bracket 123 carrying the stop lever arm 120. It is assumed in Fig. 8 that the driven gear wheel 51 of the units wheel 47 has been advanced, as described, in clockwise direction, the control pin 55 being shown approximately 180° removed from the position in which it has been shown in Figs. 4 and 5. The corresponding control pin 56 associated with the driven gear wheel 52 of the tens number wheel 48 is in engagement with the free edge of the control arm 71 and the stop arm 120 extending from the pivotally mounted stop bracket 123 is in engagement with the stop projection 96 extending from the drive gear wheel 33, thus preventing this drive wheel from rotating with the shaft 25. The units wheel finally goes into its "0" position, thereby moving its control pin 55 with respect to the control arm 60, displacing this control arm in counter-clockwise direction, as indicated in Fig. 9, thus likewise displacing its angular trip member 65 relative to the interlocking extension 124 of the stop bracket 123 (see also Fig. 3) and moving this bracket, and therewith the stop arm 120, into the position shown in Fig. 9. The free end of the stop arm 120 is thus removed from the path of rotation of the stop projection 96 extending from the drive gear wheel 33, and this drive wheel, coincident with the rotation of the units number wheel to display the numeral "0," responsive to cessation of the tenth current impulse delivered to the coil 142 of the electromagnet, will therefore be able to rotate with the shaft 25 in counter-clockwise direction, thereby rotating the driven gear wheel 52 and therewith the tenths number wheel 48 by 36°, or one step, at which time the control pin 55 of the driven gear wheel 51 of the units number wheel has passed its normal position, allowing the control arm 60 to return to normal, as seen in Figs. 4 and 5, thus returning the stop bracket 123, and therewith the stop lever arm 120, to normal, disposing it in the path of the stop member 97. The counter now registers numeral "10." The following series of ten impulses will again be effective to rotate the units number wheel step by step, as already described. Upon cessation of the twentieth impulse, the transfer will again be effected to step the tens number wheel 48 to display the numeral "2" in the same manner as this number wheel was advanced by one step upon delivery of the tenth impulse to the electromagnet. The counter now registers the numeral "20."

The operation continues in this manner, the tens number wheel being advanced one step for every ten steps of the units number wheel, and when the tens number wheel has completed a revolution, its control pin 56 will displace the control arm 71 extending from the control bracket 70 (Fig. 3) to trip the stop bracket 130 so as to remove the stop arm 121 from the path of the corresponding stop projection on the drive wheel 37 to allow this drive wheel to move the third number wheel 49 by one step, and so on, until the third number wheel has completed a revolution, when it will effect tripping of the stop bracket 132 to effect rotation of the drive gear wheel 38 for rotating the final number wheel 50 by one step. Each number wheel effects in this manner,

coincident with completion of one full revolution, the operative actuation of the adjacent number wheel of higher numerical order.

When it is desired to restore the counter to "0" position from any numerical position to which it may have been advanced, the motor **20** is caused to rotate the shaft **25** in reverse direction, clockwise as seen in Figs. 4–9. The number wheels having been advanced to some numerical position, their associated control pins **55—58** are out of engagement with their respective control lever arms such as **60, 71, 78** and **80**. There is nothing to oppose the clockwise rotation of the drive gear wheels **32, 33, 37** and **38** attempting to rotate in counter-clockwise direction the associated driven gear wheels of the various number wheels, and these gear wheels are therefore simultaneously rotated in counter-clockwise direction until their associated control pins **55—58** encounter the coacting control arms such as **60, 71, 78** and **80**, when the return rotation will be stopped. The number wheels are then again in zero position.

The resetting of the counter to "0" from any numerical position to which it has been advanced is thus accomplished practically instantaneously because, even if it is assumed that each of the number wheels has been advanced to its highest numerical position, which is numeral "9," it will require less than one full revolution of the shaft **25** to return the number wheels to "0."

Numeral **175** indicates a suitable terminal device for connecting the electromagnet with a desired source of impulses and for properly wiring the reversible motor **20** and such auxiliary means as switches and the like to obtain the operations explained in the foregoing description.

A relatively large-scale embodiment has been shown, but it is understood that the structure may be made as large or as small as practicable and desirable.

Changes may be made within the scope and spirit of the appended claims.

I claim:

1. A numerical counter comprising a number wheel, a drive wheel for said number wheel, motor means for applying constant torque to said drive wheel which normally attempts to rotate said number wheel in forward add direction, stop means for normally inhibiting the rotation of said drive wheel, said stop means comprising a stop member on said drive wheel which projects axially therefrom, a pivotally mounted stop lever for engagement with said stop member, a latch member pivotally mounted on said stop lever, impulse-controlled electromagnetic means, and a latch member controlled by said electromagnetic means for coaction with the latch member on said stop lever, whereby said stop lever is intermittently released responsive to successive operative actuation of said electromagnetic means to allow said torque to become intermittently operatively effective to rotate said drive wheel for rotating said number wheel.

2. The structure and combination defined in claim 1, wherein said motor means is adapted to rotate said drive wheel and therewith said number wheel in reverse direction to restore the number wheel to "0" position from any numerical position to which it may have been advanced, a pivotally mounted stop arm disposed alongside said number wheel, and a pinlike stop member carried by said number wheel and axially projecting therefrom for engagement with the free end of said stop arm responsive to reverse rotation of said number wheel for stopping further reverse rotation thereof when said number wheel reaches "0" position.

3. A numerical counter comprising a units number wheel and a plurality of additional number wheels of progressively higher numerical order, a driven gear wheel associated with each number wheel, a drive gear wheel for and meshing with each driven gear wheel, motor means for applying constant torque to all drive gear wheels for the purpose of attempting to rotate said gear wheels so as to rotate said number wheels in forward add direction, stop means associated with each drive gear wheel for normally inhibiting the rotation thereof, latch means individual to the stop means associated with the drive gear wheel for the units number wheel, impulse-responsive electromagnetic means for intermittently releasing said latch means to allow said torque to become intermittently operatively effective to rotate the units number wheel successively by predetermined angular amounts, and trip means operable by each number wheel at the conclusion of a full revolution thereof for momentarily releasing the stop means associated with the drive gear wheel for the number wheel of next higher numerical order to allow said torque to become operatively effective to rotate such number wheel by a predetermined angular amount.

4. A numerical counter comprising a rotatable units number wheel, a rotatable drive shaft, motor means for continuously rotating said drive shaft, a drive wheel rotatably disposed on said drive shaft and geared with said units number wheel, coupling means for frictionally coupling said drive wheel with said drive shaft attempting to rotate such drive wheel and therewith said units number wheel in forward add direction, a pivotally mounted lever arm, a stop member projecting axially from said drive wheel, a latch member pivotally mounted on said lever arm, means for resiliently biasing said latch member and therewith said lever arm to dispose the free end of such lever arm normally in the path of said stop member to inhibit the rotation of said drive wheel, an impulse-responsive electromagnet, a coacting latch member operatively effective responsive to the energization of said electromagnet for lifting said pivotally mounted latch member and therewith said lever arm relative to said stop member to permit rotation of said drive wheel, whereby said lever arm is intermittently operatively actuated responsive to successive energization of said electromagnet to allow successive rotation of said drive wheel for successively advancing said units number wheel by predetermined angular amounts.

5. A numerical counter comprising a rotatable units number wheel, a rotatable drive shaft, motor means for continuously rotating said drive shaft, a drive wheel rotatably disposed on said drive shaft and geared with said units number wheel, coupling means for frictionally coupling said drive wheel with said drive shaft attempting to rotate such drive wheel and therewith said units number wheel in forward add direction, a pivotally mounted lever arm, a stop member projecting axially from said drive wheel, a latch member pivotally mounted on said lever arm, means for resiliently biasing said latch member and therewith said lever arm to dispose the free end of such lever arm normally in the path of said stop member to inhibit rotation of said drive wheel, an impulse responsive electromagnet, a

coacting latch member operatively effective responsive to the energization of said electromagnet for lifting said pivotally mounted latch member and therewith said lever arm relative to said stop member to permit intermittent rotation of said drive wheel, and a camming member associated with said pivotally mounted latch member for engagement by said stop member incident to rotation of said drive wheel, whereby said pivotally mounted latch member and associated lever arm are released to normal to dispose the free end of said lever arm in the path of said stop member for limiting the amount of angular advance of said drive wheel.

6. In a numerical counter, a plurality of number wheels of progressively higher numerical order disposed rotatably side by side on a common shaft, a driven gear wheel associated with each number wheel, a drive shaft and motor means for continuously rotating it, a drive gear wheel for each driven gear wheel, a friction clutch member for each drive gear wheel carried on said drive shaft, a coacting friction clutch member for each drive gear wheel, means for axially resiliently biasing each coacting clutch member to engage its associated drive gear wheel for transmitting frictional driving power thereto, a pivotally mounted lever arm associated with each drive gear wheel for normally inhibiting the rotation thereof, an impulse responsive electromagnet, an escapement device controlled by said electromagnet for intermittently releasing the lever arm associated with the drive gear wheel coacting with the driven gear wheel for the number wheel of lowest numerical order to allow rotation of said drive gear wheel for advancing the corresponding number wheel of lowest numerical order successively by predetermined angular amounts, said escapement device comprising a plurality of angularly spaced stop members axially projecting from the drive gear wheel coacting with the number wheel of lowest numerical order, a latch member pivotally mounted on the associated lever arm, means for resiliently biasing said latch member and said lever arm to hold the free end of such lever arm normally in engagement with one of said stop members to inhibit rotation of said drive gear wheel, a coacting latch member actuated by said electromagnet upon energization thereof for interlocking with said pivotally mounted latch member to lift such latch member and associated lever arm upon deenergization of said electromagnet for the purpose of releasing the engagement thereof with said stop member to allow rotation of the corresponding drive gear wheel, a camming member associated with said pivotally mounted latch member for engagement by the stop member to release the pivotally mounted stop member from the coacting latch member to restore said lever arm to normal position in which its free end is contacted by one of said stop members to determine the amount of angular displacement of said drive gear wheel incident to each operative actuation of said electromagnet, and trip means actuated by each number wheel incident to completion of a full revolution thereof for momentarily releasing the lever arm associated with the drive gear wheel coacting with the number wheel of next higher numerical order to allow rotation of such drive wheel for rotating the corresponding number wheel by a predetermined angular amount.

7. A numerical counter comprising a plurality of number wheels of progressively higher numerical order arranged for individual rotation side by side on a common relatively stationary non-rotatable shaft, a drive shaft, a reversible motor for selectively continuously driving said drive shaft in either one or the other direction of rotation, a drive wheel for each number wheel rotatably disposed on said drive shaft and frictionally resiliently coupled therewith, a plurality of angularly spaced stop members axially projecting from each drive wheel, a pivotally mounted stop lever arm for stop engagement with one of the stop members of each drive wheel to inhibit rotation thereof in one direction of rotation of said drive shaft, namely, in the direction effective to rotate the associated number wheel in forward add direction, a control member associated with each number wheel, a pivotally mounted control lever arm for each number wheel arranged for engagement by the corresponding control member thereof in normal "0" position of such number wheel to inhibit rotation of such number wheel in reverse direction from said "0" position thereof incident to corresponding rotation of said drive shaft, an impulse-responsive electromagnet, an escapement device associated with the drive wheel for driving the number wheel of lowest numerical order controlled by said electromagnet for intermittently releasing the associated stop lever arm to allow the corresponding drive wheel to rotate for the purpose of rotating the coacting number wheel successively by predetermined angular amounts, and interlocking means actuated by the control lever arm associated with each number wheel incident to completing a full revolution thereof for momentarily releasing the stop lever arm of the drive wheel associated with the number wheel of next higher numerical order to cause rotation of such drive wheel by a predetermined angular amount.

8. In a numerical counter, a stationary shaft, a units number wheel and a plurality of number wheels of higher numerical order rotatably mounted on said stationary shaft, a driven gear wheel for each number wheel, a rotatable drive shaft, a drive gear wheel for and in mesh with each driven gear wheel, said drive gear wheels being rotatable on said rotatable drive shaft, friction means for coupling said drive gear wheels with said drive shaft to rotate such drive gear wheels and therewith the coacting driven gear wheels and the corresponding number wheels associated therewith, stop means carried by each drive gear wheel, detent means for coaction with the stop means of each drive gear wheel to inhibit rotation thereof in a direction corresponding to forward rotation of its associated number wheel, stop means carried by each number wheel, detent means for coaction with the stop means carried by each number wheel to inhibit rotation thereof in the reverse direction beyond a predetermined position which corresponds to the "0" position thereof, electromagnetic impulse responsive means for intermittently actuating the detent means coacting with the stop means of the drive wheel for the units number wheel to allow rotation of such drive wheel for rotating the units number wheel to display its successively higher numerals, and trip means operated by the detent means of each number wheel, except the number wheel of highest numerical order, upon completing a full revolution, for momentarily actuating the detent means coacting with the stop means carried by the drive gear wheel of next higher numerical order to allow such drive gear wheel to rotate its corresponding number wheel to record a count.

9. In a numerical counter of the class described, a stationary shaft, a units number wheel and a plurality of number wheels of higher numerical order rotatably disposed on said stationary shaft, a rotatable shaft, drive means for each number wheel carried on said rotatable shaft, detent means for each drive means to prevent rotation thereof in a direction corresponding to forward add rotation of its associated number wheel, electromagnetic impulse responsive means for intermittently actuating the detent means coacting with the drive means of the units number wheel to allow forward rotation of said units number wheel by angular amounts so as to display its successively higher numerals, a stop member carried by each number wheel, and a pivotally mounted control lever arm for coaction with each stop member, said lever arm having the dual function of causing under control of said stop member upon completion of a full forward revolution of its associated number wheel momentary release of the detent means for the drive means of the number wheel of higher numerical order to allow such drive means to rotate its number wheel forwardly by a predetermined amount and of preventing rotation of its associated number wheel in reverse direction beyond a predetermined angular position by engagement of said stop member with its free end.

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