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REGISTERING MECHANISM

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Fig. 1

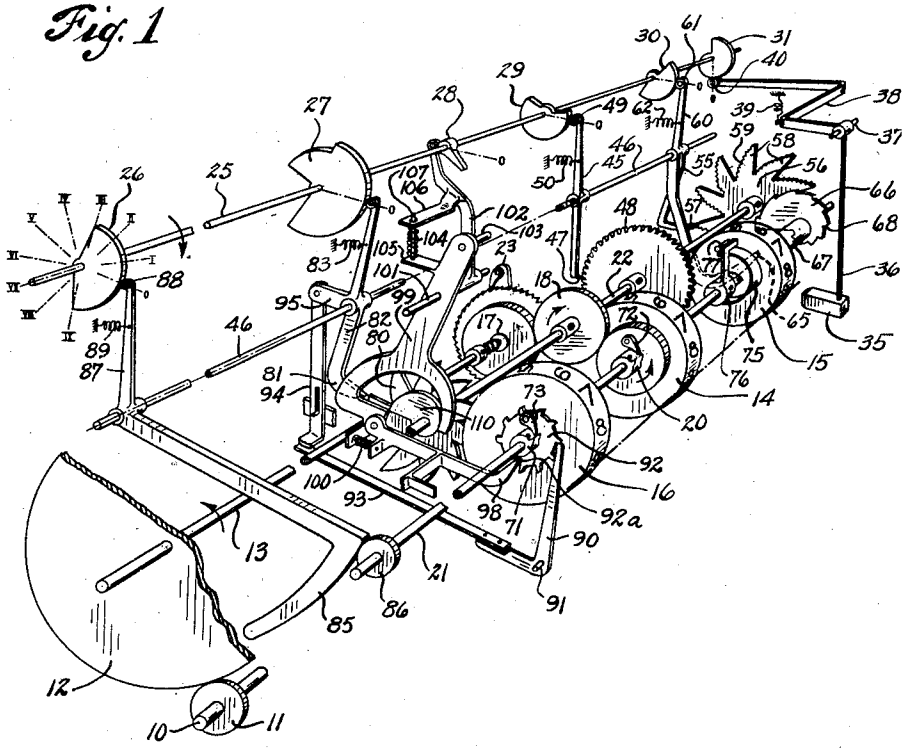
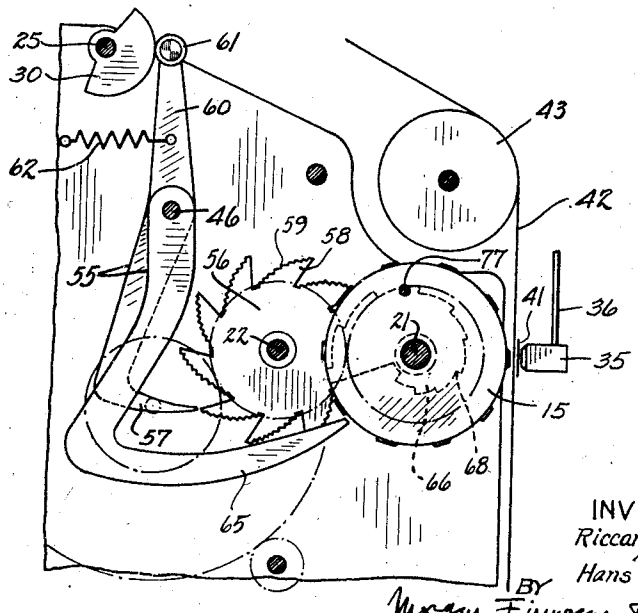


Fig. 2



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REGISTERING MECHANISM

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The present invention relates to registering mechanisms and more particularly to a novel and improved printing recorder.

Objects and advantages of the invention will be set forth in part hereinafter and in part will be obvious herefrom, or may be learned by practice with the invention, the same being realized and attained by means of the instrumentalities and combinations pointed out in the appended claims.

The invention consists in the novel parts, constructions, arrangements, combinations and improvements herein shown and described.

The accompanying drawing, referred to herein and constituting a part hereof, illustrates one embodiment of the invention, and together with the description, serves to explain the principles of the invention.

Of the drawing:—

Figure 1 is a diagrammatic perspective view, with certain parts omitted and certain other parts broken away, of an illustrative embodiment of the present invention; and

Figure 2 is a sectional view of the mechanism shown in Figure 1.

The present invention has for its object the provision of a novel and improved registering or recording mechanism, particularly adapted for use in connection with periodic demand meters, and which is more accurate than those heretofore provided. A further object is the provision of the periodic recording demand meter in which the printing and resetting operations take place in a relatively short period of time. Still another object is the provision of such a mechanism in which the drive from the meter to the recording mechanism is coupled to an intermediate printing drum rather than to the lowest printing drum. A further object is the provision of a recording meter in which the printing drums are advanced slightly immediately before printing, thereby preventing a faulty impression of only a portion of two digits.

In accordance with the illustrative form of the present invention a plurality of indicating or printing drums are provided, one for each digit of the sum to be indicated or printed, which are advanced as by an electric meter in accordance with the power consumption or other value being measured. Means are provided for periodically resetting the drums to an original position and if desired for recording the values just prior to the resetting operation, and during the printing and resetting period, the drums are moved so that a full digit is printed, and faulty impressions in which a portion of two digits might be printed are completely avoided. The drive from the meter to the drums is preferably connected to an intermediate drum and the lower drums are set in accordance with the minute fractional parts of a rotation of the lowest driven drum. Preferably the drums are reset to "9" rather than to "0", and just before printing are advanced to show the true value, this advance also serving to advance the drums to a position where the full digit is shown or printable.

It will be understood that the foregoing general description and the following detailed description as well are exemplary and explanatory of the invention but are not restricted thereto.

Referring now in detail to the illustrative embodiment of the invention as shown in the accompanying drawing, the invention is illustrated in connection with the periodic recording mechanism of a maximum demand meter. As embodied, a watt-hour meter or other measuring device drives a shaft 10 on which is mounted a pinion 11 meshing with a gear 12 on shaft 13. Shaft 13 is connected to the printing drum 14, by means of a friction clutch 17 having gear teeth on its outer periphery, an idler 18 and a one-way clutch 20. One-way clutch 20 is mounted to one side of the drum 14 on shaft 21, while idler 18 is fixed to shaft 22, and a pawl and ratchet 23 is provided for preventing reverse rotation of clutch 17 and its shaft 13. Transfer mechanism is provided between drums 14 and 16, as well as between the additional drums which may be provided as needed and whose number depends upon the recording capacity of the mechanism. In the form shown in the drawing, each complete revolution of the drum 14 causes drum 16 to be rotated one tenth of one revolution, although if desired the mechanism may be adapted for use on other than a decimal system.

Means are provided for timing and operating the recording mechanism, and for this purpose a cam shaft 25 is provided, and suitable clock-actuated mechanism (not shown) may be provided for rotating the cam shaft 25 one complete revolution at the end of each recording period of fifteen minutes, for instance. Cam shaft 25 carries on it a resetting cam 26, an advancing cam 27, an escapement operating cam 28, a detent operating cam 29, a feeler operating cam 30 and a printer cam 31.

Normally, and at the beginning of each recording period, each of the drums is set at "9", so that the drums shown in the drawing would be

in position to print the numeral "999", immediately before the drums are advanced by operation of the meter and rotation of the shaft 13. If at the end of the recording period 124 units have been measured by the metering apparatus, drum 14 will have been advanced 1.24 revolutions, drum 16 will have been advanced 0.12 revolution, drum 15 and the thousands drum (not shown) will not have been advanced. Thereafter, and as the timing shaft 25 rotates, the various recording operations take place, first advancing the unit drum 15 to its next position, advancing drum 14 to its next position and similarly advancing drum 16 to its own next position. Thereafter, the printing platen is actuated to make an impression of the proper numerals on each of the drums, and after completion of the printing operation all of the drums are restored to their original position, i. e., "999", and thereafter the forward movement of the drums in accordance with the metered quantity is resumed.

For facilitating description of the various operations and the functions of the various cam mechanisms, the time controlled cam shaft is shown as having ten positions, and these ten positions are laid off on cam 26 and are numbered in roman numerals.

The printing means which is actuated by cam 31 comprises a platen or hammer 35 mounted on the lower end of a resilient arm 36 and positioned to strike one of the printing faces on drum 15. Arm 36 is pivotally mounted on shaft 37 and is rigidly connected to an arm 38, resiliently urged upwardly by means of spring 39. A cam roller 40 is mounted at the rear of arm 38 and when the roller rides off the high part of the cam, the hammer 35 strikes an ink ribbon 41 pressing it towards the type face and against the record sheet 42, then rebounding slightly to permit easy unimpeded movement of the paper and ribbon. Similar hammers are provided for each of the other drums, and all may be actuated from the single cam 31 and arm 38. Record strip 42 is fed upwardly over roller 43 by means of the timing mechanism (not shown) where a time record is desired, or it may be fed forwardly only after each recording operation.

Means are provided for momentarily preventing driving of the drums 14, 15 and 16 from the meter during the advancing and printing periods and for this purpose a detent is provided comprising lever 45 pivoted on shaft 46 and having a tooth 47 at its lower end to engage the teeth of gear 48 which is fast on shaft 22. Toothed lever 45 is held out of engagement with gear 48 by means of cam roller 49 on the upper end of lever 45 which contacts with detent operating cam 29 and is resiliently urged into locking position by means of spring 50. This detent prevents movement of shaft 22, thereby holding the drums against movement by the meter, but permitting them to be advanced just prior to printing.

Means are provided for determining the position of the unit drum 15 and for setting a stop to restrain advance of this drum beyond the next unit or digit just prior to printing. For this purpose a bifurcated feeler 55 is pivotally mounted on shaft 46 and has its lower end 57 adapted to engage a toothed star wheel 56. For use on the decimal system, star wheel 56 is formed with ten points or teeth 58, each of which on its trailing side is divided into ten teeth or steps 59, the steps being of uniform size and spacing. Lever 55 is formed with an upwardly extending arm 60 carrying cam roller 61 which engages cam 30 and is held thereagainst by spring 62 which also serves to urge the feeler against a step of the star wheel 56. Star wheel 56 is fast on shaft 22 and is thus positioned in accordance with the position of drum 14, its rate of movement being the same as that of drum 14.

The other lower arm of bifurcated lever 55 is considerably longer than arm 57 and is provided with a forwardly projecting finger 65 extending towards drum shaft 21 to cooperate with the stepped disc 66 on sleeve 67 fast to drum 15 but freely rotatable on shaft 21. Finger 65 is positioned a definite distance from shaft 21 by cooperation between finger 57 and teeth 59 to form a definite abutment for one or the other of steps 68 on disc 66, thereby limiting the amount of advancing rotation which can be given to drum 15.

Drums 14 and 16 are each connected to shaft 21 by means of a one tooth ratchet 20 and 71 which cooperate with their pawls 72 and 73 mounted on drums 14 and 16 respectively. Drum 15 is connected to shaft 21, on which it is mounted, by means of leaf spring 75, which has its inner end fastened to the hub of arm 76 fast on shaft 21 and has its outer end fastened to a stop pin 77 extending laterally from the side of the drum 15. These parts are arranged to move drum 15 resiliently in a clockwise direction by clockwise movement of shaft 21 and the tensioning of spring 75, while the drum is moved in a counterclockwise direction by positive engagement of the arm 76 with pin 77. Drum 15 is normally stationary during the recording period, but at the end of the period, drum 15 is set for printing by clockwise movement of the shaft, turning the drum to a lower number until it reaches the proper digit as determined by the setting of stop finger 65 acting against the stepped disc 66. Thus, just prior to printing, the drum 15 moves oppositely to the normal accumulating movement of drums 14 and 16.

Means are also provided for moving the several drums ahead to the next digit, so as to prevent faulty impressions in which the lower part of a "3" and the upper part of a "4" might be printed where the recorded value is between 3 and 4. These means also serve to compensate for the fact that at the beginning of each recording period the drums are returned to "999". As embodied, a ten-toothed star wheel 80 is mounted on shaft 22 and is moved clockwise by means of finger 81 at the lower end of arm 82 pivotally mounted on shaft 46 and moved by cam 27 against the tension of spring 83. The rear faces of the teeth of star wheel 80 are spiral shaped, while the leading faces of the teeth are radial and as finger 81 is urged against the teeth by spring 83 any resulting movement of shaft 22 is forward in the direction of the arrow (on gear 18), thereby moving drum 14 counterclockwise to the next digit, but not more than one-tenth revolution.

The unit drum is similarly advanced by means of gear segment 85 which is pivotally mounted on shaft 46 and meshes with pinion 86 fast on shaft 21. Segment 85 is integral with the upwardly projecting arm 87 on which is mounted cam roller 88 to contact with and be operated by cam 26 against the tension of spring 89. As segment 85 is released for movement by spring 89 under the control of cam 26, pinion 86 is rotated at least one-tenth revolution, causing unit drum 15 to be rotated in a clockwise direction by power applied through shaft 21 and spring 75 until the stepped disc 66 is stopped by engagement with finger 65, where this disc and drum

are held until after printing and further movement of the shaft 21 causes a tensioning of spring 75.

During the advancing of drums 14 and 15, drum 16 is held against retrograde movement by means of a bell crank 90 pivoted at 91 and engaging the teeth of a ratchet 92 on the side of drum 16. Bell crank 90 is connected with a leaf spring 93 which is engaged and moved by slide bar 94 pinned to a short arm 95 extending from lever 82.

For advancing drum 16 to the next digit, a pawl 98 is slidably mounted to engage ratchet wheel 92 and means are provided for moving this pawl to advance drum 16 not more than one-tenth revolution. Pawl 98 is pivotally mounted on the C-ended lever 99 and is held against ratchet 92 by compression of spring 100. Lever 99 is pivotally mounted on shaft 101 on which is also mounted lever 102. A stop 103 and compression spring 104 limit the relative movement of levers 99 and 102. Spring 104 is compressed between plates 105 and 106 and is mounted on a pin 107 fixed to plate 105 and projecting through an aperture in plate 106. At its upper end, lever 102 carries a roller which engages cam arm 28, which moves levers 99 and 102 counter-clockwise to advance pawl 98 and drum 16 against the holding action of bell crank 90.

For resetting the drums 14, 15 and 16 after printing, cam 26 operates segment 85 rotating shaft 21 counter-clockwise a full revolution. During this rotation ratchets 70 and 71 and stop arm 76 pick up their respective drums and return them to their original position, "999". This return movement is limited by the extent of rotation of pinion 86 while drums 14 and 15 are held against overrunning by clutch 17 and detent 80.

Cam 110 also serves to act as the transfer mechanism from drum 14 to drum 16. Cam 110 rotates with drum 14 and causes oscillation of lever 99 and corresponding reciprocation of pawl 98 while spring 104 tends to move lever 99 in a counterclockwise direction under control of cam 110. Each revolution of drum 14 or shaft 22, therefore, causes a single feeding motion of pawl 98 to advance drum 16 by one tooth of disc 92 or one-tenth of a revolution. The recess 92a between two teeth and corresponding to the 9 position of this drum 16 is the normal position of pawl 98.

Pawls similar to 98 and connected therewith are provided for the thousands and higher drums, and these pawls are connected rigidly with pawl 98 so as to be moved thereby and to feed these other drums from "9" to "0" position, but are so arranged that they are moved out of operative position after the first operation of pawl 98, due to the movement of pawl 98 out of the deepest recess 92a, after which conventional transfer mechanism serves to move the thousands and ten thousands drums on movement of the hundreds drum.

The operation of the illustrative embodiment will be clear from the foregoing description but may be summarized and further explained, as follows:

At the beginning of a recording period the drums have been returned to their normal position of "999". As the meter or other operating instrumentality operates, pinion 10 drives gear 12, driving the clutch 17 by its external gear teeth and gears 18 and 20 to rotate drum 14 in a counter-clockwise direction. During this time, drum 16 is advanced at one-tenth the rate of drum 14 by the transfer mechanism 98, 110.

Assume that by the end of the recording period 257 units have been metered, the drums will be positioned as follows:

Drum 16—between 1 and 2.
Drum 14—between 4 and 5.
Drum 15—at 9.

Cam shaft 25 then begins to rotate at a relatively rapid speed, and when this has moved to position "I", detent cam 29 releases lever 45 and spring 50 moves tooth 47 into position holding gear 48 against movement and so long as tooth 47 is in this position, drums 14 and 16 are held against possible movement such as might occur if pinion 11 rotated during this period.

With cam shaft 25 in position "II", cam 30 releases arm 60 and spring 62 moves feeler 57 against the stepped star wheel 58 and into engagement with seventh step 59 of the fifth tooth 56, (counting from the normal or at rest position of star wheel 56), thereby setting stop finger 65.

In position "III", cam 27 releases lever 82 very slightly, setting stop 90 and cam 28 also begins to move pawl 98 to advance drum 16 to the next digit.

In position "IV", cam 26 releases arm 87 so that spring 89 raises segment 85 rotating pinion 86 clockwise, and the seventh step 52 of disc 66 engages finger 65 stopping further rotation of drum 15, by force applied through the spring 75 connecting the drum to the shaft 21, but spring 75 permits further rotation of shaft 21 until roller 88 rides against the hub of cam 26.

Also in this sector, cam 28 completes its operative movements which comprises first contacting with lever 102 to rock lever 99 about pivot 101, by force applied through spring 104, thereby moving pawl 98 to the right, to set the drum 16 to the next higher digit after which the lever 102 is freed from cam 28 allowing it later to be returned to the left by rotation of the cam 110.

When the cams turn to position "V" cam 29 retracts tooth 47, cam 27 releases lever 82 so that finger 81 can engage the proper tooth of star wheel 36 to advance drum 14 and also serves to press the upper end of bell crank 90 against a tooth of ratchet 92 to center drum 16 accurately. Thus, by the action of cams 27 and 28, drums 14 and 16, respectively, have been advanced to the next higher digit, independently of each other.

In position "VI" printing cam 31 has raised hammers 35 to their extreme position and then allows them to fall against the ribbon 41 pressing it against the paper supported by the type face of drums 14, 15 and 16.

In position "VIII" cams 27 and 30 return their levers 82 and 60 to their original positions.

Position "IX" serves to return the drums to their original position of "999" as segment 85 is lowered by cam 26. As segment 85 moves downwardly, pinion 86 is rotated counterclockwise and pawls 72, 73 and stop arm 76 move their respective drums back to their original positions.

The parts are all now in their original positions, cam shaft 25 stops and the consumption during the new period again advances the drums.

Assuming that no consumption has taken place during the period the drums are set at "999" and must be moved to "000" for recording.

Drum 15 is moved to "0" by movement of segment 85 under control of disc 66 and stop 65.

Drum 14 is moved to "0" by the advance feeding motion of finger 81 against star wheel 36.

Drum 16 is moved to "0" by reciprocation of pawl 98 by cam 28 and this feed also advances the thousands and other drums to "0" position.

The following table will be helpful in studying the operation of the described mechanism:

	Hundreds	Tens	Units
Start at	9	9	9
Metered value	2	3	4
Drum movement	0.23 rev.	2.34 rev.	0.0 rev.
Drum shows	1	2	0.9
Drum advanced for printing	0.07 rev.	0.6 rev.	0.5 rev.
Recorded value	2	3	4
Revolutions from start	0.3 rev.	2.4 rev.	0.5 rev.
Reset movement	+0.7 rev.	+0.6 rev.	−0.6 rev.

For use in computing and other printing or registering devices, the cam shaft 25 may be operated whenever desired or on the completion of certain other operations, while the shaft 10 may be manually or otherwise advanced. The printing accessories may be dispensed with if registered values are required and no record is desired.

The invention in its broader aspects is not limited to the specific mechanisms shown and described but departures may be made therefrom within the scope of the accompanying claims without departing from the principles of the invention and without sacrificing its chief advantages.

What we claim is:

1. Registering mechanism including in combination a pair of registering members, one indicating complete movements of the other, means for advancing one and the other thereby, and a third registering member, and means operated after said advancing means for moving said third member under a common control with one of the other members.

2. Registering mechanism including in combination three indicating drums, means for advancing one of said drums, means for advancing another drum by movement of the one drum, means controlled with one of the two drums for positioning a stop, and means for moving the third drum against the stop.

3. Registering mechanism including in combination a pair of indicating drums, means for advancing one of said drums, means for moving the other drum operating after said advancing means, and means controlled with the first drum for limiting movement of the second drum.

4. Registering mechanism including in combination a pair of indicating drums interconnected by transfer means and having digits on their faces, means for advancing said drums, means for returning each of said drums to "9", means for advancing the drum of lower order to the next higher digit, and means for aligning the digits on the drum of high order.

5. Registering mechanism including in combination a pair of indicating drums interconnected by transfer means and having digits on their faces, means for advancing said drums, means for returnnig each of said drums to "9", means for advancing the lower one of said drums to the next higher digit, means for aligning the digits of the higher of said drums, and a third drum positioned in accordance with small movements of one of the other drums.

6. Registering mechanism including in combination a pair of indicating drums having digits on their faces, means for advancing said drums, means for resetting said drums to a normal initial position, means for advancing said drums periodically and immediately before resetting and means for aligning the digits of one of the drums immediately before resetting.

7. Totalizing mechanism including in combination a pair of indicating drums having digits on their faces, means for advancing said drums, means for resetting said drums to a normal initial position, means for advancing said drums periodically and immediately before resetting, and means for aligning the digits of one of the drums immediately before resetting.

8. Totalizing mechanism including in combination a pair of drums, means for advancing one of said drums, a cam driven with said one drum, a pawl operated by the cam, a ratchet on the other drum, centering means cooperating with both drums, a third drum rotatable independently of the others and a stop set with one of the other drums before centering and controlling the position of the third drum.

9. Totalizing mechanism including in combination a plurality of drums having digits on their faces, a shaft on which the drums are rotatable, transfer mechanism interconnecting certain of the drums, means for driving one of the intermediate drums, a stop positioned by the driven drum for controlling the positioning of one of the drums, means for rotating the shaft for positioning the last drum and resetting all of the drums, means for advancing and aligning the digits on the other drums, a cam shaft periodically rotated, a cam for operating the resetting means, a cam for operating the advancing means, a cam for operating the stop, all of said cams being timed for proper sequential operation.

10. Registering mechanism including in combinatcn a shaft, a stepped star wheel on the shaft and rotated thereby, a drum rotated by the shaft, a feeler engaging a step on the star wheel, a stop positioned by the feeler, a second drum, and cam means for advancing slightly the first drum and then rotating the second drum to a position corresponding to the position of the first drum before its advance, and for resetting both drums.

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