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Kreidler

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[54] **PAWL MECHANISMS FOR THE INDICATION OF MEASUREMENTS OF VARIOUS ORDERS OF MAGNITUDE**

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[73] Assignee: **Metall-Invent S.A.**, Zug, Switzerland

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** ..... **58/23 D**; 58/7; 235/135

[51] **Int. Cl.** ... **G04c 3/00**; G04b 13/02; G06c 15/26

[58] **Field of Search** ..... 58/7, 23 D, 125 R, 125 B, 58/126 A; 235/135

[56] **References Cited**

UNITED STATES PATENTS

1,554,283	9/1925	Kern	235/135
1,950,647	3/1934	Bailer	235/135
2,355,514	8/1944	Deane et al.	235/135
3,668,858	6/1972	Hartwig	58/7

Primary Examiner—Edith Simmons Jackmon
Attorney, Agent, or Firm—Pugh & Laiche

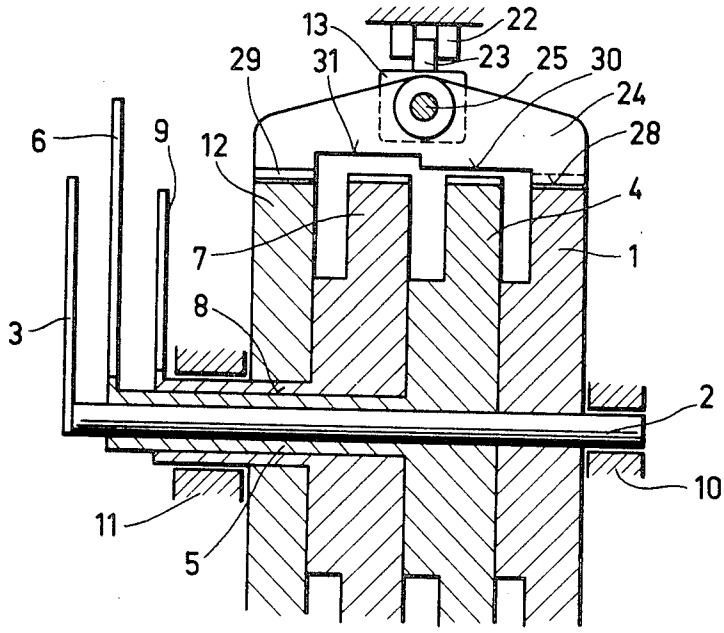
[57] **ABSTRACT**

Pawl mechanisms for showing or indicating measurements of various orders of magnitude (e.g. seconds, minutes and hours) for applications such as for example electric clocks.

Two basic embodiments are disclosed, the first (FIGS. **1–11**) comprising a shift pawl working in conjunction with notched wheels and having pawl lugs extending therefrom in a number equal to that of the notched wheels and being staggered in depth with respect to one another. The notched wheels have both standard and extra-deep notches along their periphery, the frequency of occurrence of the latter being related to the magnitude relationship of the next upper order of magnitude (e.g. every 60th notch in the seconds there being 60 seconds in a minute wheel). Thus, as the lug of the pawl used for one given order of magnitude engages into the extra-deep notch of the wheel in conjunction with which it works and moves lower, the lug on the pawl used for the next upper order of magnitude engages the notced wheel with which it operates in such a way as to move it forward by one division.

In a second embodiment (FIGS. **12–18**), use is made of a plurality of pawls in a number equal to that of the notched wheels in conjunction with which they work. Each of the notch wheels (except for the highest order magnitude wheel) is provided with a pawl engaging cam profile which is made as an auxiliary cylindrical surface concentrically formed with the periphery of the notched wheel and is provided with a number of depressions related to the jump to the next upper order of magnitude. When the pawl element engages a depression, and is thereby allowed to move further downward, the pawl element also then engages the notched wheel of the next upper order of magnitude, moving it forward one division. In a first design (FIGS. **14–16**), the concentric cylindrical surface is raised above the notched surfaces of the wheel and the lugs are of equal length; while in a second version (FIGS. **17** and **18**) the concentric cylindrical surface is below the notched surface and the lugs are staggered in length.

22 Claims, 19 Drawing Figures



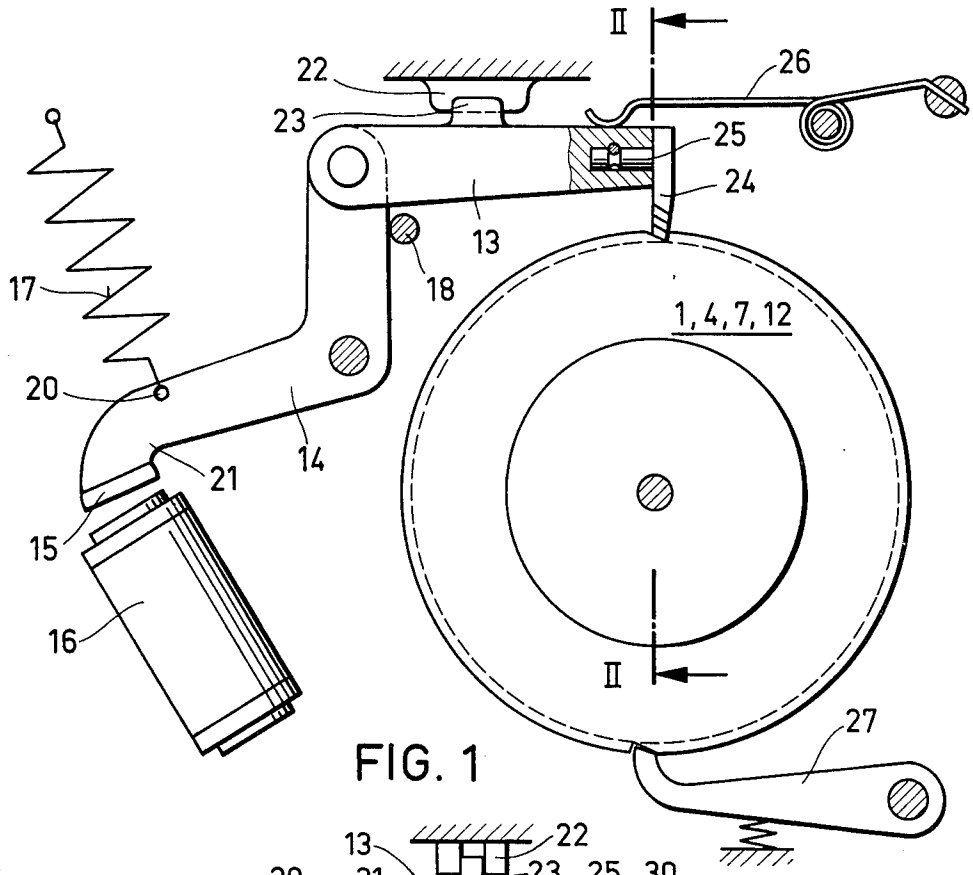

II
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FIG. 1

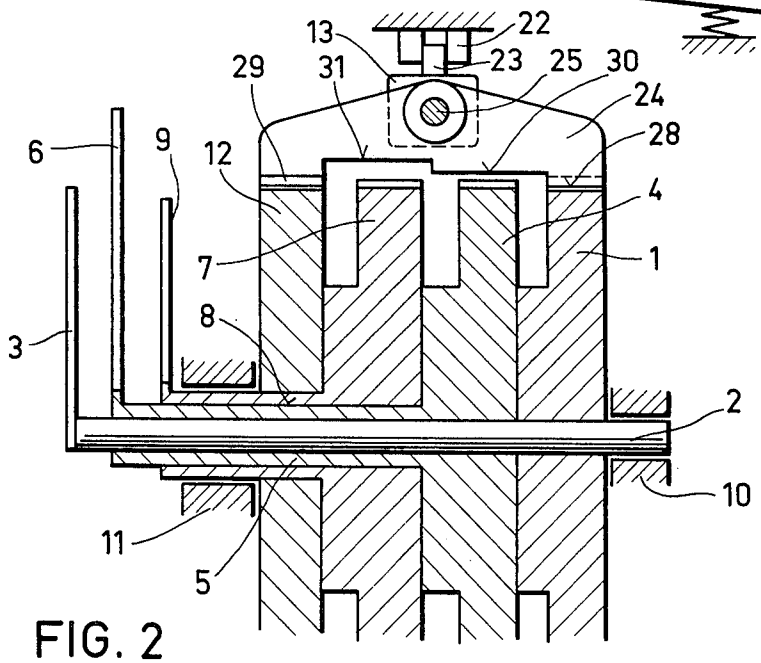
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FIG. 2

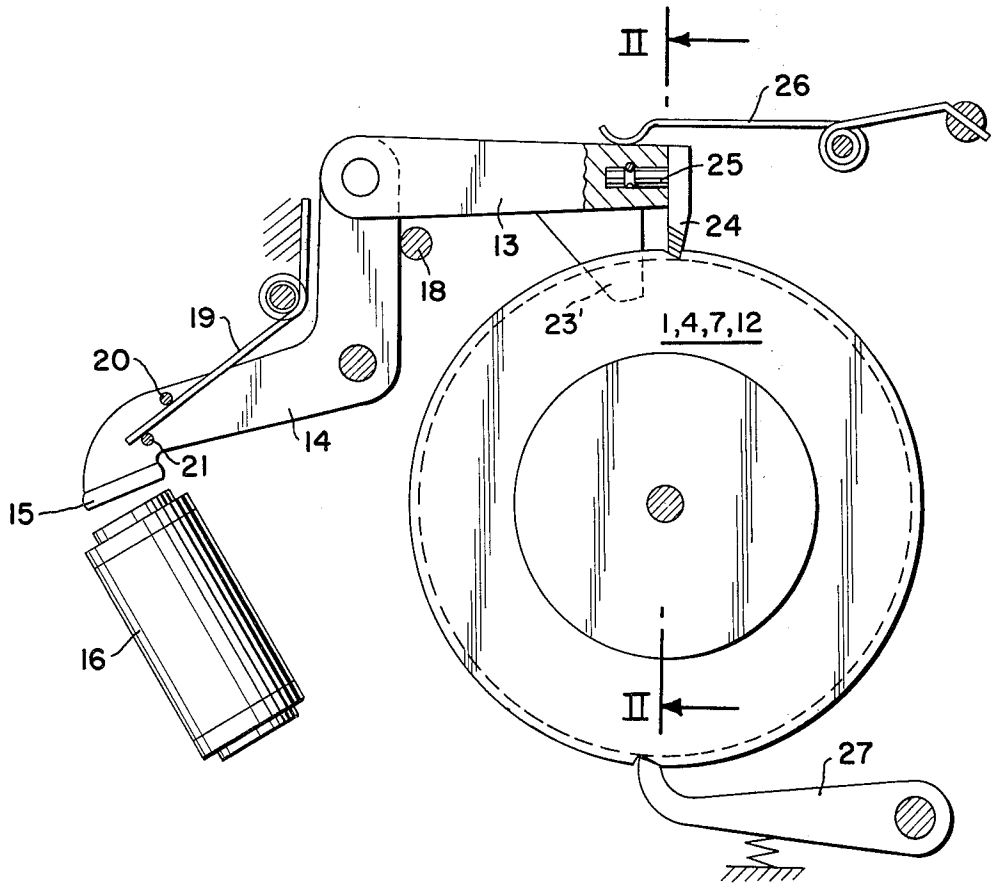


FIG. IA

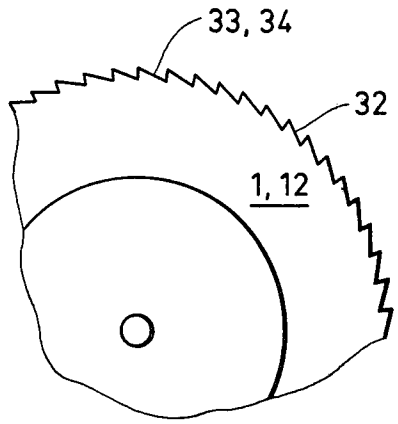


FIG. 3

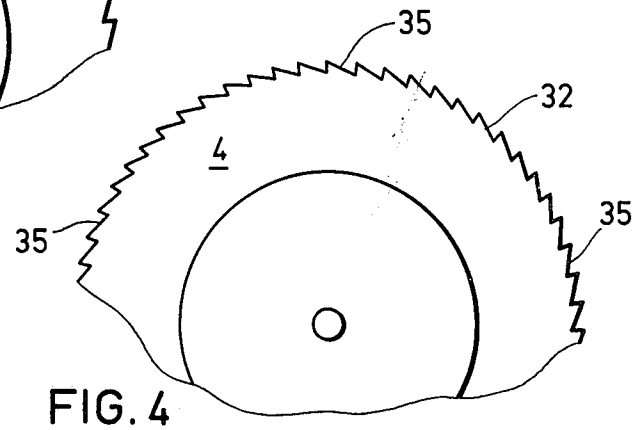


FIG. 4

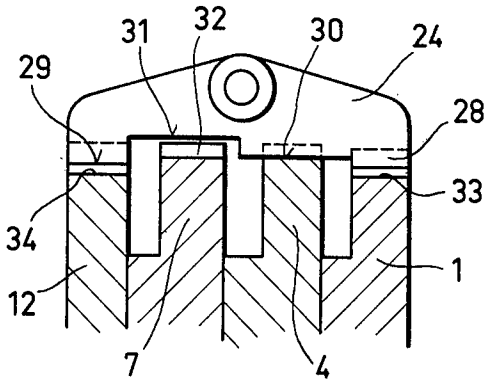


FIG. 5

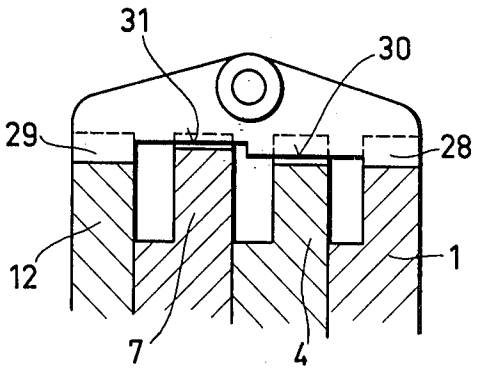


FIG. 6

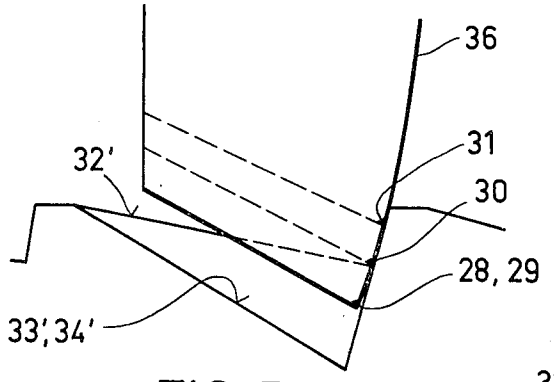
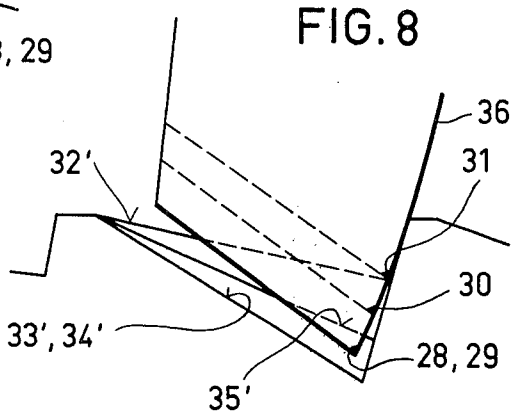


FIG. 7

FIG. 8



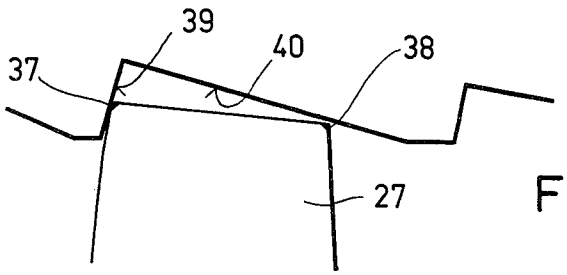


FIG. 9

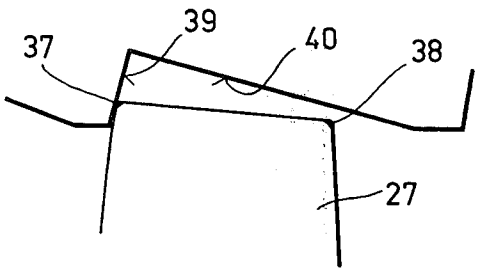
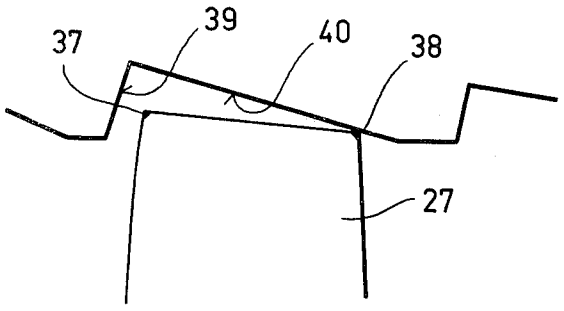


FIG. 10

FIG. 11



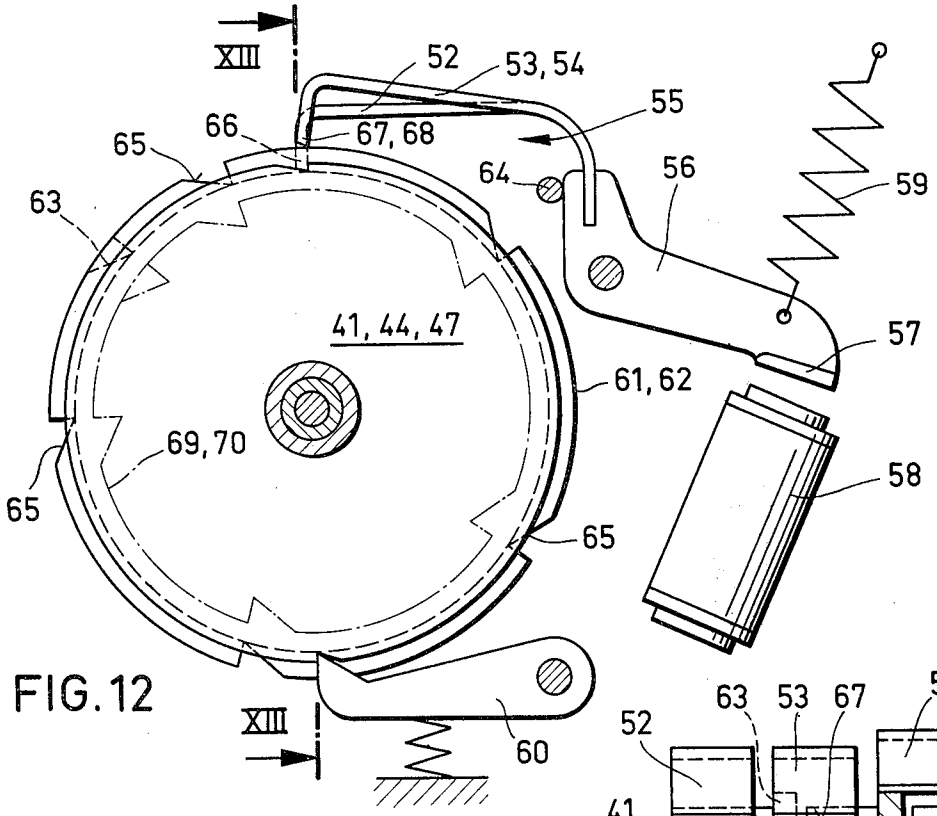


FIG. 12

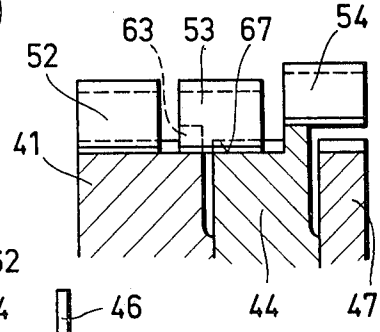


FIG. 14

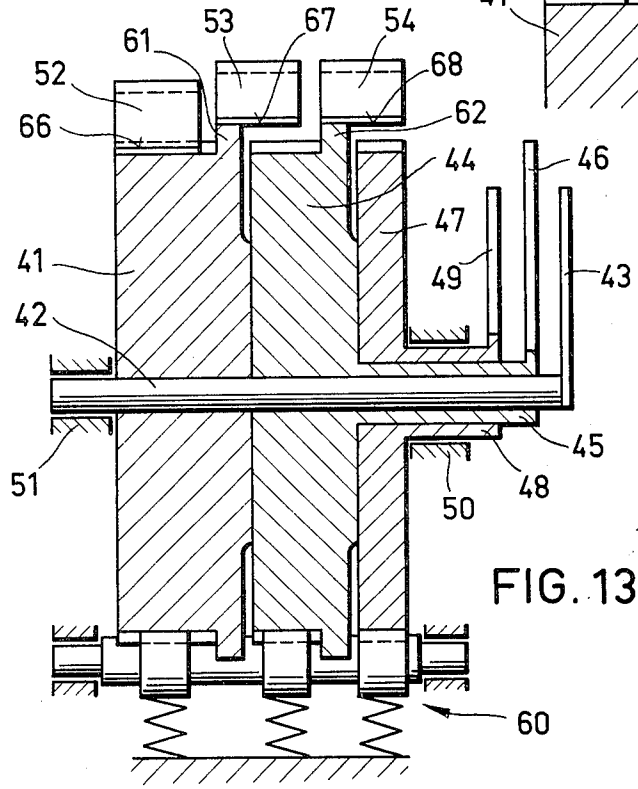


FIG. 13

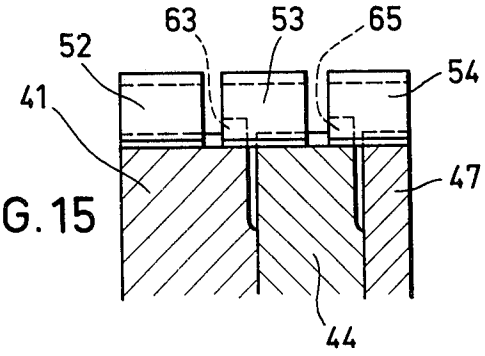


FIG. 15

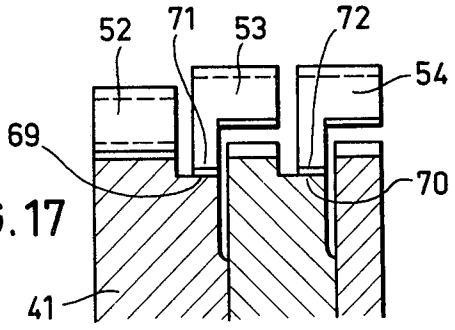


FIG. 17

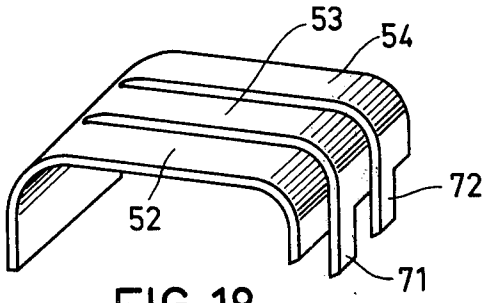
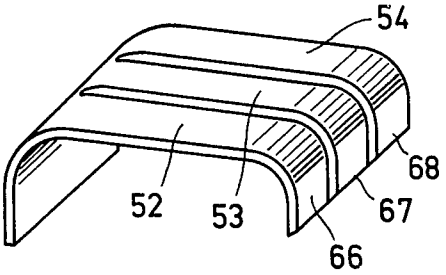


FIG. 18

FIG. 16



PAWL MECHANISMS FOR THE INDICATION OF MEASUREMENTS OF VARIOUS ORDERS OF MAGNITUDE

BACKGROUND OF THE INVENTION

The present invention is directed to pawl mechanisms to be used for the purpose of showing or indicating measurements of various orders of magnitude such as can be used, for example, to indicate the corresponding passage of seconds, minutes and hours in electric clocks.

Compared with the gear trains used in the prior art, the pawl mechanisms of the present invention should bring about marked simplification and economies, without affecting the accuracy of the readings.

The present invention uses a pawl mechanism with two or more notched wheels with the notches on the wheels arranged on angular divisions that are equal to each other or at least are related to each other by an integer. A number of notched wheels equal to the orders of magnitude to be shown is used with the pawl arrangement of the present invention. Additionally, the notched wheel used for a given order of magnitude is provided with means to control the release of its pawl in such a way that the notched wheel used for the next upper order of magnitude is permitted to move appropriately forward.

In a first embodiment, a shift pawl works in conjuntion with the notched wheels, and pawl lugs, in a number equal to that of the notched wheels, are staggered in depth with respect to one another. In this arrangement, all the notched wheels — except that for the highest order of magnitude to be shown — have both standard and extra-deep notches. The frequency with which said extra-deep notches appear is related to the jump to the next upper order of magnitude. Thus, as the lug of the pawl used for one given order of magnitude engages into the extra-deep notch of the wheel in conjunction with which it works, the lug on the pawl used for the aforesaid next upper order of magnitude engages the notched wheel with which it operates in such a way as to move it forward by one division.

In a second embodiment, use is made of a plurality of pawls, in a number equal to that of the notched wheels in conjunction with which they work. Each one of those notched wheels — except that used for the highest order of magnitude to be shown — is provided with a cam profile. This cam profile is so designed, and so works in conjunction with the pawl used for the next upper order of magnitude that, as a certain angular position of the notched wheel used for a given order of magnitude (determined by the jump to the next upper order of magnitude) is reached, the pawl used for said next upper order of magnitude engages the relevant notched wheel in such a way as to move it forward by one division.

In the second embodiment, the cam profiles can suitably be made as cylindrical surfaces concentrically mounted with the notched wheels and provided with a number of depressions related to the jumps to the next upper order of magnitude. Each one of said depressions so operates with the pawl used for the next order of magnitude that said pawl is allowed to engage the relevant notched wheel, in such a way as to move it forward by one division, but only when such a depression is reached.

Other advantageous or practical details of the pawl mechanisms dealt with in the present invention will be apparent from the drawings and detailed description which follow.

The pawl mechanisms of the present invention are particularly suitable as a drive mechanism for, for example, the hands of an electric clock, with three pawl actuators on shafts fitted one into the other. Additionally, use is made of a division into a number of notches divisible by 60 such as, preferably, 60 itself; with a provision, on the wheel used for the seconds in the vicinity of every sixtieth notch, to disengage the pawl from the neighboring wheel, used for the minutes; which in turn is provided, in the vicinity of every twelfth notch, with means of disengaging the pawl from the neighboring wheel serving for the hours, thus enabling it to move forward by one division in due course.

BRIEF DESCRIPTION OF THE DRAWINGS

The drawings show the pawl mechanisms of the present invention in two embodiments (FIGS. **1–11** and **12–18**) as applied to a clock mechanism of the electric type, described in detail below. The drawings are described briefly as follows:

FIG. **1** is a side view of the mechanism used to drive the clock hands in a first embodiment of the pawl mechanism of the present invention, seen laterally; while FIG. **1A** is an identical view of an alternate version.

FIG. **2** is a longitudinal, cross-sectional view along section lines II—II of FIG. **1.**

FIG. **3** is a partial, side view of the wheel used for seconds; while

FIG. **4** is a partial, side view of the wheel used for minutes.

FIG. **5** is a partial, cross-sectional view, similar in perspective to FIG. **2,** showing the pawl mechanism in the shifting position for moving the minute wheel forward; while

FIG. **6** is a partial, cross-sectional view, identical in perspective and scope to FIG. **5,** but showing the pawl mechanism in the shifting position for moving the hour wheel forward.

FIG. **7,** on a much larger scale, shows the pawl engagement as the minute wheel is moved forward.

FIG. **8,** on the same scale as FIG. **7,** shows the pawl engagement as the hour wheel is moved forward.

FIGS. **9** through **11,** on the same scale as FIGS. **7** and **8,** show the engagement of the locking pawl into its related notched wheel.

FIG. **12** is a side view of the mechanism used to drive the clock hands in a second embodiment of the pawl mechanism of the present invention; while

FIG. **13** is a longitudinal, cross-sectional view along section lines XIII—XIII of FIG. **12.**

FIG. **14** is a partial cross-sectional view, similar in perspective to FIG. **13,** showing the pawl mechanism in the shifting position for moving the minute wheel forward; while

FIG. **15** is a partial, cross-sectional view, identical in perspective and scope to FIG. **14,** but showing the pawl mechanism in the shifting position for moving the hour wheel forward.

FIG. **16** is a perspective view of the pawl element.

FIG. **17** is a partial, cross-sectional view, similar in perspective to FIGS. **14** and **15,** but illustrating a modi-

fied version of the pawl element of the second embodiment, while

FIG. 18 is a perspective view, similar in perspective to FIG. 16, but showing the modified pawl element of FIG. 17.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As generally described above, the present invention is directed to pawl mechanisms which can be used for the purpose of showing or indicating measurements of various orders of magnitude such as can be used, for example, to indicate the corresponding passage of seconds, minutes and hours in electric clocks. For purposes of illustrative disclosure only, two preferred embodiments of the present invention will now be described in detail as applied to electric clocks, although of course many other embodiments and applications are possible.

First Embodiment (FIGS. 1–11)

A first embodiment for an electric clock is illustrated in FIGS. 1 through 11, and includes: a second wheel 1 fixedly mounted on an inner shaft 2 carrying on its exterior end second hand 3; adjacent minute wheel 4 mounted on the concentric, middle hollow shaft 5 for the minute hand 6; and hour wheel 7 mounted on the outer, concentric, hollow shaft 8 for hour hand 9; the shafts 2, 5 and 8 being mounted concentrically in bearings 10 and 11. Note particularly FIGS. 1 and 2. The bearings are fixedly attached to the housing (not specifically illustrated), with said shafts inserted into one another. Additionally, a back-up idler wheel 12 is mounted ahead of hour wheel 7 for rotation about the hour hollow shaft 8. Except for this particular mounting detail the idler wheel 12 is identical to second wheel 1. The wheel arrangement and structure are so designed that the notched peripheral areas of the wheels 1, 4, 7 and 12 are separated from each other at all times.

Pawl 13 is provided to actuate or drive notched wheels 1, 4, 7 and 12 and is pivotally mounted and attached to pawl lever arm 14. Pawl lever 14, in turn, is so supported in the housing that it can swing as needed. On its other end, pawl lever arm 14 carries armature 15 for use with electromagnet 16. Tension spring 17 is attached to the pawl lever arm 14, providing for the shifting or working stroke of pawl 13, whereas electromagnet 16 pulls it back to its resting position as required. The working stroke of pawl 13 is limited by a stop 18 fixedly mounted in the housing.

Alternatively, as shown in FIG. 1A, instead of tension spring 17 and stop 18, a hinged spring 19, the free end of which bears against a follower pin 20 provided on pawl lever arm 14, can be used. Quiet stroke limiting can thus be achieved between the follower pin 20 and a stop pin 21, also mounted on pawl lever arm 14.

Shift pawl 13 is held in the longitudinal direction in a guide 22 fixedly mounted in the housing by means of a guide lug 23. Alternatively a guide lug 23′ that moves between two of the notched wheels, for example, wheels 4 and 7, could be used (again, note FIG. 1A).

As a further variation, a reverse drive arrangement can also be made, wherein the electromagnet 16 serves for the shift or operating stroke, and the spring 17 for the return stroke.

A pawl crosshead 24 is pivotally mounted on pawl 13 (by means of pivot 25) so that it can rotate about its longitudinal axis. Pawl 13, in turn, is spring loaded (note hinge spring 26 resting against the housing) in such a way that notched wheels 1, 4, 7 and 12 are engaged in the required manner. A spring loaded lock pawl 27 holds each notched wheel 1, 4, 7 and 12 after every shift in its position.

Four lugs 28–31, staggered with respect to one another, are provided on crosshead 24. The two outer lugs, namely lug 28 for the seconds wheel 1 and lug 29 for the back-up wheel 12 are equal in length. Lug 30 for minute wheel 4 is a little shorter, while lug 31, used for hour wheel 7, is shorter still.

Additional back-up or idler wheel 12, with it related lug 29, serves the purpose of achieving an even, stress-free seat for pawl beam or crosshead 24, and, additionally, to reduce wear by the technique of dividing the seating pressure between the two outer wheels 1 and 12. Were this not done, allowing for the fact that the seconds wheel 1 makes a number of forward shifts that is many times greater than the others, the wear could become too great.

The peripheral pitch circles are equal on all four notched wheels 1, 4, 7 and 12, all of which have an exemplary 60 notches. The wheel 1 used for the seconds is provided on its circumference with one extra deep "minute notch" 33, the "standard" depth notches being designated by 32; note FIG. 3. The same applies to the idling back-up wheel 12, on which an identical minute notch 34 is included. Conversely, five extra deep notches, or "hour notches" 35, are included, evenly distributed around the circumference of the minute wheel 4, so that the latter has an extra deep notch every 12th position; note FIG. 4.

It is electrically arranged for the electromagnet 16 to be energized 60 times per minute by means of a suitable timed impulse system. Every second, electromagnet 16 is deactivated and tension spring 17 (or alternatively hinged spring 19) moves seconds wheel 1 by means of pawl 13 and lug 28 one division. Thereafter electromagnet 16, working against spring 17 (or 19), is electrically activated and returns the pawl to its resting position. At the same time, idler wheel 12 is moved forward by one division by lug 29 in generally the same manner.

As seconds lug 28 reaches the minute notch 33 of the seconds wheel 1 and companion lug 29 gets to the minute notch 34 of idler wheel 12, minute lug 30 engages one of the notches 32 of minutes wheel 4, so that it is rotated forward by one division (note FIG. 5). By the same token, when minutes lug 30 also reaches one of the hour notches 35 of the minutes wheel 4, the pawl crosshead 24 sinks deeper, so that hour lug 31 engages the hours wheel 7 and, in turn, rotates the latter forward by one division (note FIG. 6). Thus, seconds hand 3 moves every second, minutes hand 6 every 60 seconds (every minute), and hours hand 9 every 12 minutes (namely every 720th second), all by one division.

In order that the pawl lugs 28–31 engage the same pitch circle in the notches of all four notched wheels 1, 4, 7 and 12 for any given depth of engagement, their leading edges 36 are curved according to a cylindrical surface, the axis of which coincides with that of the pivot of pawl 13 on lever arm 14. In order to increase the shifting accuracy, cylindrical surface 36 can be cor-

rected to make allowance for the curvilinear deflection of the axis of the pawl pivot during the work stroke.

As schematically illustrated in FIG. 7, the lengths of lugs 28, 29, 30 and 31, along with the depths of standard notches 32, and extra deep minute notches 33, 34, and hour notches 35, are so chosen that, as seconds lug 28 engages into minutes notch 33 and the companion lug 29 engages into minute notch 34, these two lugs do not quite reach the bottom 33' of the notch, because minute lug 30 has already reached the bottom 32' of its related standard notch in minutes wheel 4. By the same token, as seconds lug 28 and back-up lug 29 become engaged at the same time in minutes notches 33 and 34, respectively, and minutes lug 30 sinks into an hour notch 35, the lugs 28, 29 do not reach the bottom of those notches, for hour lug 31 has already reached bottom 32' of the relevant standard notch in hour wheel 7. At the beginning of the return stroke, following the minute shift, only minute lug 30 thus finds itself in bottom contact with a notched wheel, namely minutes wheel 4. Similarly, during the return stroke following an hour shift, only hour lug 31 is in contact with its related wheel 7, a feature that greatly contributes to a reduction of friction losses in the mechanism.

Finally, each lock pawl 27, designed to lock the notched wheels in position when so desired, is so arranged with respect to the notched wheel with which it operates, that both of its locking edges 37 and 38 align the notched wheel, in conjunction with flanks 39 and 40 of the relevant notch, in the angular position it has reached, and lock it there. FIG. 9 shows in close-up detail the correct locked position of the notched wheel, in which locking edges 37 and 38 both rest against flanks 39 and 40 of the notch. On the other hand, should the notched wheel not have been rotated far enough, as shown for example in FIG. 10, the front locking edge 37 of the pawl 27 would bear against the rear flank 39 of the notch, and turn the wheel fully to its proper position. If, on the contrary, the wheel had gone slightly beyond the proper location as it was rotated, as for example is shown in FIG. 11, rear locking edge 38 would then push against bottom flank 40 (corresponding to notch bottoms 32', 33' and 35' in FIGS. 7 and 8), in order to turn the wheel back to its proper position.

Second Embodiment (FIGS. 12–16)

In the second embodiment of the present invention, as illustrated in FIGS. 12 through 18, there is included: a seconds wheel 41 fixedly mounted on inner shaft 42 carrying at its exterior end seconds hand 43; minutes wheel 44 mounted on middle, hollow shaft 45 carrying minutes hand 46; and hours wheel 47 mounted on the outer hollow shaft 48 which carries the hours hand 49. The shafts 42, 45 and 48 mounted coaxially in bearings 50 and 51 which are fixedly attached to the housing (not specifically illustrated), by having the shafts inserted one into the other. As in the first embodiment, the wheels are so arranged that their rims are laterally separated from each other. In order to reduce wear on the seconds wheel, which is most frequently actuated, its notched periphery has been made suitably wider than that of the other two wheels 44 and 47 (note FIG. 13).

One auxiliary pawl element is provided for the purpose of moving each wheel forward by means of the seconds pawl 52, the minutes pawl 53, and the hours pawl 54. Those pawls, as shown more specifically in FIG. 16, are made of a leaf spring 55 that is suitably bent and divided into individual pawls 52, 53 and 54 by longitudinal slits that do not extend over its whole length.

The closed end of leaf spring 55 is inserted into pawl lever 56, whose other end is provided with an armature 57 for electromagnet 58. The pawl lever 56 is pivotally mounted in the housing. Pawl lever 56 is drawn by return spring 59. The return stroke is limited by stop 64 which is fixed to the housing. Notched wheels 41, 44 and 47, are locked in whatever position they may have reached by a spring loaded locking pawl 60.

The three notched wheels have equal peripheral, pitch circle diameters and are provided with 60 notches, all equally spaced. Seconds wheel 41 and minutes wheel 44 each carry projecting cylindrical surfaces 61 and 62, concentrically with them, the diameter of which is slightly greater than the addendum or pitch circle of said wheels. A recess 63 is provided on the surface of cylinder 61 (seconds wheel 41), reaching at least to the bottom of the notches on the wheel 41.

Cylinder 62 (minutes wheel 44) carries five equally spaced recesses 65 on its periphery, in other words one recess every twelfth notch, also reaching to the bottom of the notches.

While seconds pawl 52 can engage the notches of seconds wheel 41 unhindered with its lug 66, the corresponding lugs 67 and 68 of the minutes 53 and hours 54 pawls bear on the cylindrical surfaces 61 and 62, thus being kept from engaging the notches of the relevant notched wheels 44 and 47.

Electromagnet 58 is actuated with 60 current impulses per minute by means of a suitable time signal device, so that it causes pawl system 55 to make one stroke a second. Accordingly, seconds wheel 41 is shifted forward by one division every second by its pawl 52 and lug 66. The return or back stroke takes place under the action of spring 59, which electromagnet 58 had placed under tension during the forward or work stroke. Every 60th stroke, recess 63 of cylindrical surface 61 of seconds wheel 41 releases minutes pawl 53, so that the latter rotates minutes wheel 44 forward by means of its lug 67 one more division (note FIG. 14). Every 12th division of minutes wheel 44, one of the recesses 65 provided on cylindrical surface 62 releases the hours pawl 54, so that the pawl 54 shifts hours wheel 47 by one division (note FIG. 15).

In a variant of the second embodiment (note FIGS. 17 and 18) that is no less suitable to achieve the results sought, cylindrical surfaces 61 and 62 that protrude beyond the addendum circles of the wheels used for seconds 41 and minutes 44 are replaced by depressed cylindrical surfaces 69 and 70 (note phantom lined elements 69, 70 of FIG. 12), the diameter of which is smaller than that of the addendum circles. Indeed, their diameter is preferably smaller than the root circles of the wheels (note dashed line circle in FIG. 12). In this case, the pawl lugs of the minutes pawl 53 and hours pawl 54 are provided with extra long finger lugs designed to operate with the cylindrical surfaces and their recesses. The minutes and hours finger lugs are designated by 71 and 72, respectively, as shown with particular clarity in FIGS. 17 and 18. In all other respects, the operation of this variant design is analogous to the operation described above with respect to the design of FIGS. 13–15.

Because many varying and different embodiments may be made within the scope of the inventive concept herein taught, and because many modifications may be made in the embodiments herein detailed in accordance with the descriptive requirements of the law, it is to be understood that the details herein are to be interpreted as illustrative and not in a limiting sense.

What is claimed as invention is:

1. A three pawl mechanism used as a drive mechanism for the hands of an electric clock for the purpose of showing seconds, minutes and hours measurements in their appropriate orders of magnitude comprising:

three notched wheels, (**1, 4, 7, 41, 44, 47**) having addendum and pitch circles and being used for seconds, minutes and hours wheels, the notches of all three wheels being arranged according to angular divisions that are equal among themselves or related to one another by an integer; the addendum and pitch circles of all three wheels being of equal diameter; and

a pawl system (**13, 24, 55**) having three pawls (**28, 30, 31, 52, 53, 54**) corresponding to said three notched wheels, the notched wheel (**1, 41**) used for the seconds wheel being provided with means of control (**33, 63**) serving to release the pawl engagement in order to move the notched wheel (**4, 44**) used for the minutes wheel, the minutes notched wheel (**4, 44**) being provided with means of control (**35, 65**) serving to release the pawl engagement in order to move the notched wheel (**7, 47**) used for the hours wheel; the notched wheel used for seconds wheel (**1, 41**), the notched wheel used for the minutes wheel (**4, 44**), and the notched wheel used for the hours wheel (**7, 47**) being arranged coaxially with shafts inserted one into the other, while a division is used providing for a number of notches divisible by 60, preferably 60 itself, in which means are provided on the seconds wheel for the release of pawl engagement in the neighboring minutes wheel every 60th notch, while means also being provided on said minutes wheel for the release of pawl engagement with the neighboring hours wheel every 12th notch, permitting its moving forward by one division.

2. The mechanism of claim **1**, wherein there is further included a shift pawl (**13**) having three pawl lugs (**28, 30, 31**) thereon stepped with respect to one another and wherein the seconds and minutes notched wheels are provided with both standard (**32**) and deeper notches (**33, 35**), with the incidence of the deeper notches derived from the jump to the next order of magnitude, in such a way that, as the lug (**28, 30**) used for a given order of magnitude enters the extra deep notched wheel working with it (**1, 4**), the lug used (**30, 31**) for the next upper order of magnitude engages the notched wheel in use for it (**4, 7**) in such a way as to move it forward.

3. The mechanism of claim **2**, wherein, on said second wheel (**1**), every sixtieth notch is made deeper than the standard notches (**32**) to serve as a minute notch **33**, while on said minutes wheel, every 12th notch is made deeper, to serve as an hour notch (**35**) and additionally a pawl beam (**24**) fixed on said shift pawl (**13**) mounted over all notched wheels is provided with lugs staggered with respect to one another, in such a fashion that the longest of them (seconds lug **28**) working in cooperation with the seconds wheel is engaged at every shift stroke, the second longest (minute lug **30**) engages only every 60th shift stroke, namely when the seconds lug sinks into the minute notch of the seconds wheel, and finally, the shortest lug, working in conjunction with the hours wheel (hour lug **31**) engages only every 720th shift stroke, namely when the minute lug also sinks into a hour notch of the minute wheel.

4. The mechanism of claim **2**, wherein, as the seconds and minutes notched wheels are moved forward simultaneously, only one pawl lug reaches the bottom of its notched wheel notch.

5. The mechanism of claim **4**, wherein the lengths of the pawl lugs and depths of the notches are so chosen that, as the second lug (**28**) sinks into the minute notch (**33**) of the seconds wheel, it does not reach the bottom (**33'**) of said notch, for the minute lug (**30**) first has reached the bottom (**32'**) of the relevant normal or standard notch in the minutes wheel, while upon simultaneous sinking of the seconds lug in the minute notch and of the minutes lug in an hour notch (**35**) neither notch bottoms (**33', 35'**) is reached, for the hour lug first has reached the bottom (**32'**) of the relevant standard notch in the hours wheel.

6. The mechanism of claim **1**, wherein said pawl system (**55**) working in cooperation with said three notched wheels (**41, 44, 47**) having three individual pawls (**52, 53, 54**) and each of said wheels (**41, 44**) with the exception of said wheel (**47**) of the next order is provided with a cam profile (**61, 63, 62, 65**) so designed and working in conjunction with the individual pawl (**53, 54**) for the next upper order of magnitude in such a way that, when an angular position of the notched wheel (**41, 44**) for a given order of magnitude is reached, the individual pawl (**53, 54**) for said next upper order of magnitude engages the notched wheel (**44, 47**) with which it works in order to move the latter forward by one division.

7. The mechanism of claim **6**, wherein said cam profiles are cylindrical surfaces (**61, 62, 69, 70**) concentric with the notched wheels and provided with a number of depressions (**63, 65**) derived from the jump to the higher upper order of magnitude, of which each one operates in conjunction with the individual pawl used for this next upper order of magnitude, in such a way that the engagement of said pawl in the relevant notched wheel, in order to move in forward by one division is permitted only when such a depression or recess is reached.

8. The mechanism of claim **7**, wherein the cylindrical surfaces (**61, 62**) acting as cam profiles are given a diameter in excess of the addendum diameter of the notched wheels, while individual pawls (**53, 54**) for the second and each higher order of magnitude are of such width that they rest against the cylindrical surface provided on the notched wheel of the relevant next lower order of magnitude, being kept from engaging the notched wheel in conjunction with which they work until there is penetration in one of the recesses or depressions (**63, 65**).

9. The mechanism of claim **8**, wherein the cylindrical surfaces (**69, 70**) used as cam profiles are given a diameter smaller than the addendum circle diameter of the notched wheels, and the relevant individual pawls are prolonged by fingers (**71, 72**) resting against the cylindrical surface carried by the notched wheel of the next lower order of magnitude, so that there is no engagement of the relevant notched wheel until the appropriate lug finger enters one of the recesses.

10. The mechanism of claim 7, wherein the cylindrical surfaces (61, 69) provided on the seconds wheel (41) are provided with a recess in the area of every 60th notch (63) which allows individual pawl 53 of the minutes wheel (44) to engage said wheel in order to move it forward by one division, while cylindrical surfaces (62, 70) of the minutes wheel (44) are provided with a recess (65) in the area of every twelfth notch, allowing the individual pawl (54) for the hours wheel (47) to engage said wheel in order to move it forward by one division.

11. The mechanism of claim 10, wherein the notched periphery of the secon ds wheel is wider than those of the minutes and hours wheels (44, 47).

12. The mechanism of claim 6, wherein the pawl system (55) consists of a suitably bent leaf spring divided into said three, individual pawls (52, 53, 54) by two longitudinal slits running short of its whole length.

13. The mechanism of claim 1, wherein in addition to the notched wheels used for the order of magnitude of seconds, minutes and hours to be shown, and on the side opposite that of the seconds notched wheel, an idler notched wheel (12) equal in diameter to said seconds wheel is provided, for which there is an additional lug (29) on the pawl system.

14. The mechanism of claim 3, wherein the pawl beam (24) for mutually stepped pawl lugs (28, 30, 31) is attached to the pawl (13) in such a way as to be free to swing about its longitudinal axis.

15. The mechanism of claim 2, wherein the pawl (13) carries a lug (23) serving to guide it longitudinally in a fixed groove (22).

16. The mechanism of claim 1, wherein there is further included a pivoting shift pawl and wherein the bearing surface (36) on the individual pawls is curved as a cylindrical surface, the axis of which coincides with the pivot axis of the pawl (13).

17. The mechanism of claim 16, wherein the cylindrical surface (36) on the individual pawl is corrected in keeping with the curved deflection of the pawl pivot during a stroke.

18. The mechanism of claim 1, wherein there is further included a pivoting shift pawl and wherein the shift or work stroke of the shift pawl (13) is effected by means of a loaded spring (17,19), which acts on the shift pawl (13) and is armed by the driving force used to achieve the return stroke.

19. The mechanism of claim 1, wherein there is further included a pivoting shift pawl and wherein the shift stroke is effected by the driving force against the action of a return spring (59) acting on the shift pawl (55).

20. The mechanism of claim 19, wherein a leaf, strip or hinged spring (19) is used, the free end of which rests against a pin (20) on the shift pawl, subject to blocking between said pin and a second stop pin (21) on the shift pawl as a means of limiting its stroke.

21. The mechanism of claim 1, wherein there is further included locking pawls (27) so arranged and designed, with respect to the notched wheels in cooperation with which they work, as to have both of their locking sides or edges (37, 38), operating jointly with the flanks (39, 40) of the corresponding notch, align the notched wheel it the proper angular position and lock in there.

22. The mechanism of claim 22, wherein the pawl (13) carries a lug (23') serving to guide it between two notched wheels.

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