

[54] ELECTROMECHANICAL SYSTEM

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[52] U.S. Cl. 58/4 A, 58/38

[51] Int. Cl. G04b 19/24, G04c 3/04

[58] Field of Search 40/111, 112;
58/4-6, 19, 38, 50, 125 C; 200/38 R, 38 FB

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Primary Examiner—Richard B. Wilkinson

Assistant Examiner—Edith Simmons Jackmon

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[57]

ABSTRACT

A horological instrument comprising at least two time drums, means rotatably supporting said drums, motor means associated with said drums so that each is rotatably driven and so that one drum controls the rotation of the other drum, said other drum having means associated therewith which divides each revolution thereof into segments of rotation and revolving one segment of rotation for each revolution of said one drum, means constituting an alarm system for said instrument including electrical alarm means for giving off an alarm, a rotatably supported alarm drum corresponding to each time drum, normally open electrical switch means including a moveable contact arm thereof carried on each alarm drum, each alarm drum manually rotatable to a pre-set alarm position corresponding to an advance rotational position of the respective time drum, a laterally projecting trip arm associated with each time drum, each alarm drum disposed adjacent its corresponding trip arm so that the respective contact arm thereon is actuated by the trip arm once upon each revolution of the time drum to close the respective electrical switch means, the alarm means being energized upon simultaneous closing of all said electrical switch means.

12 Claims, 59 Drawing Figures

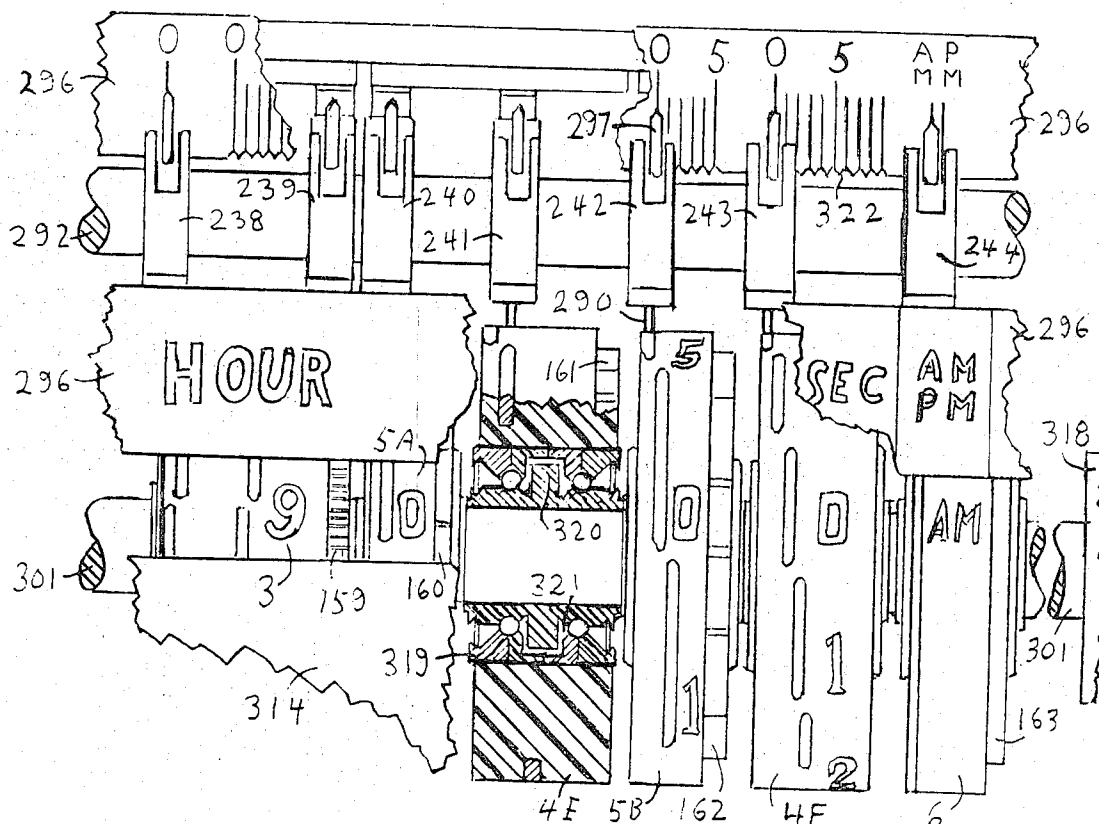


FIG. 1

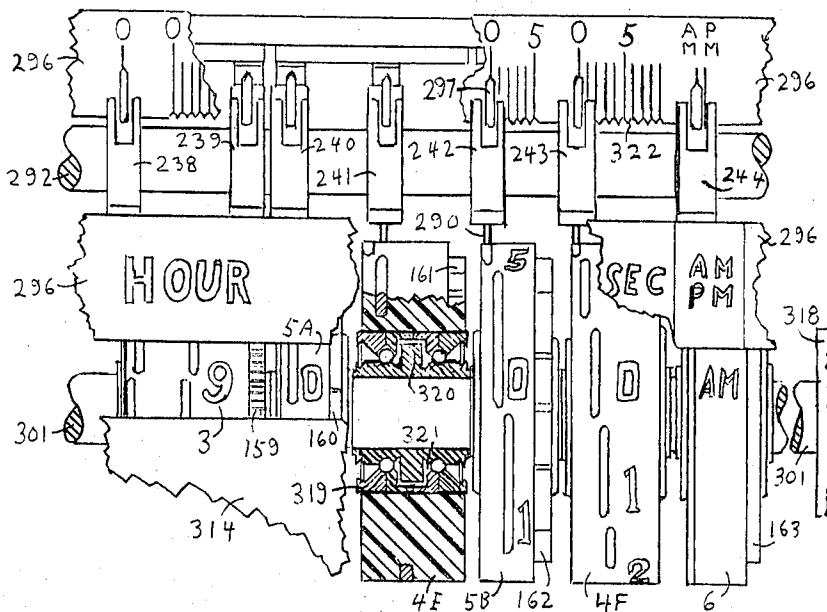


FIG. 2

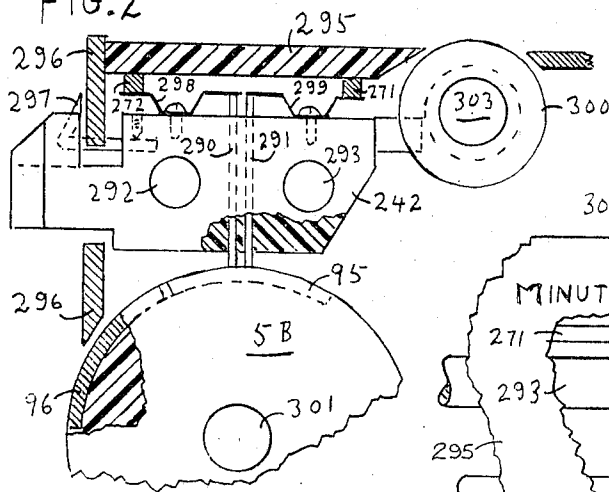


FIG. 3

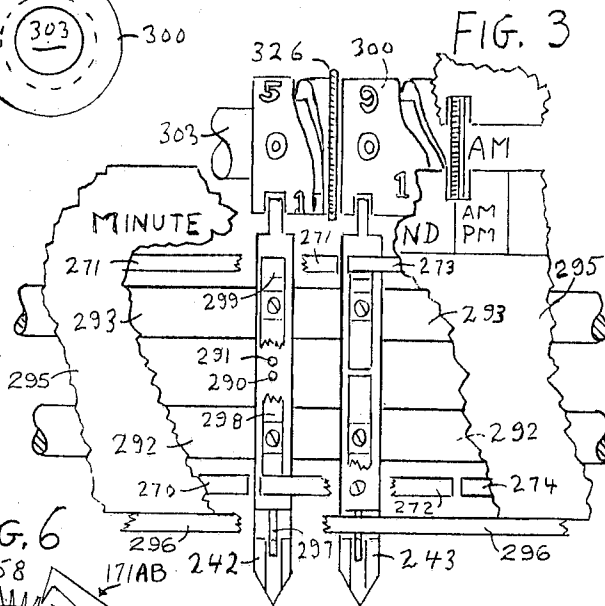
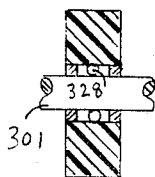
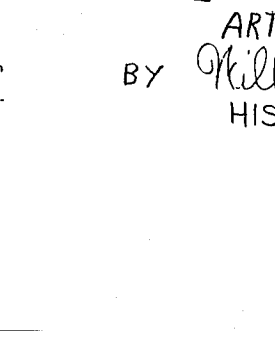
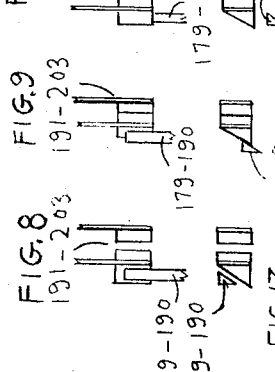
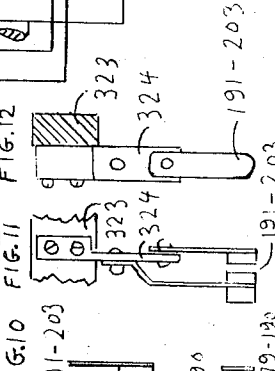
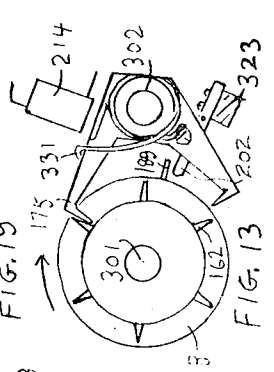
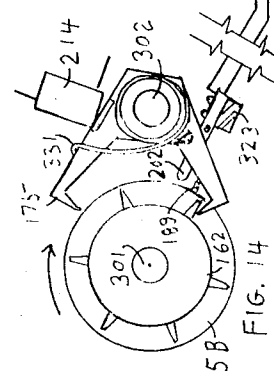
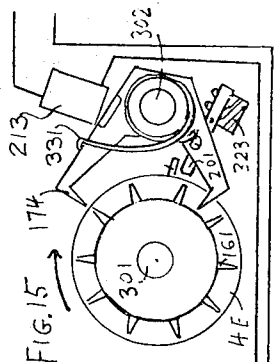
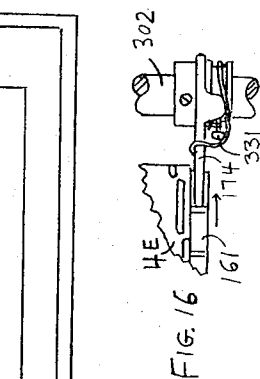
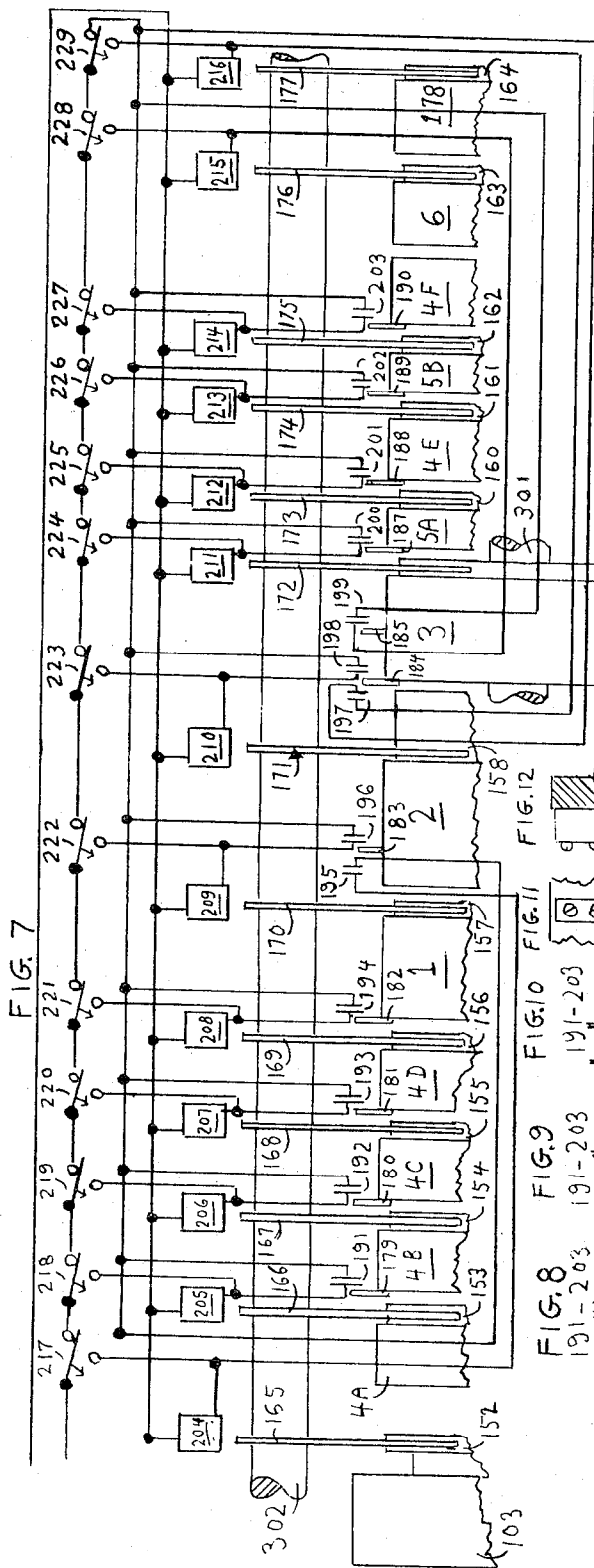
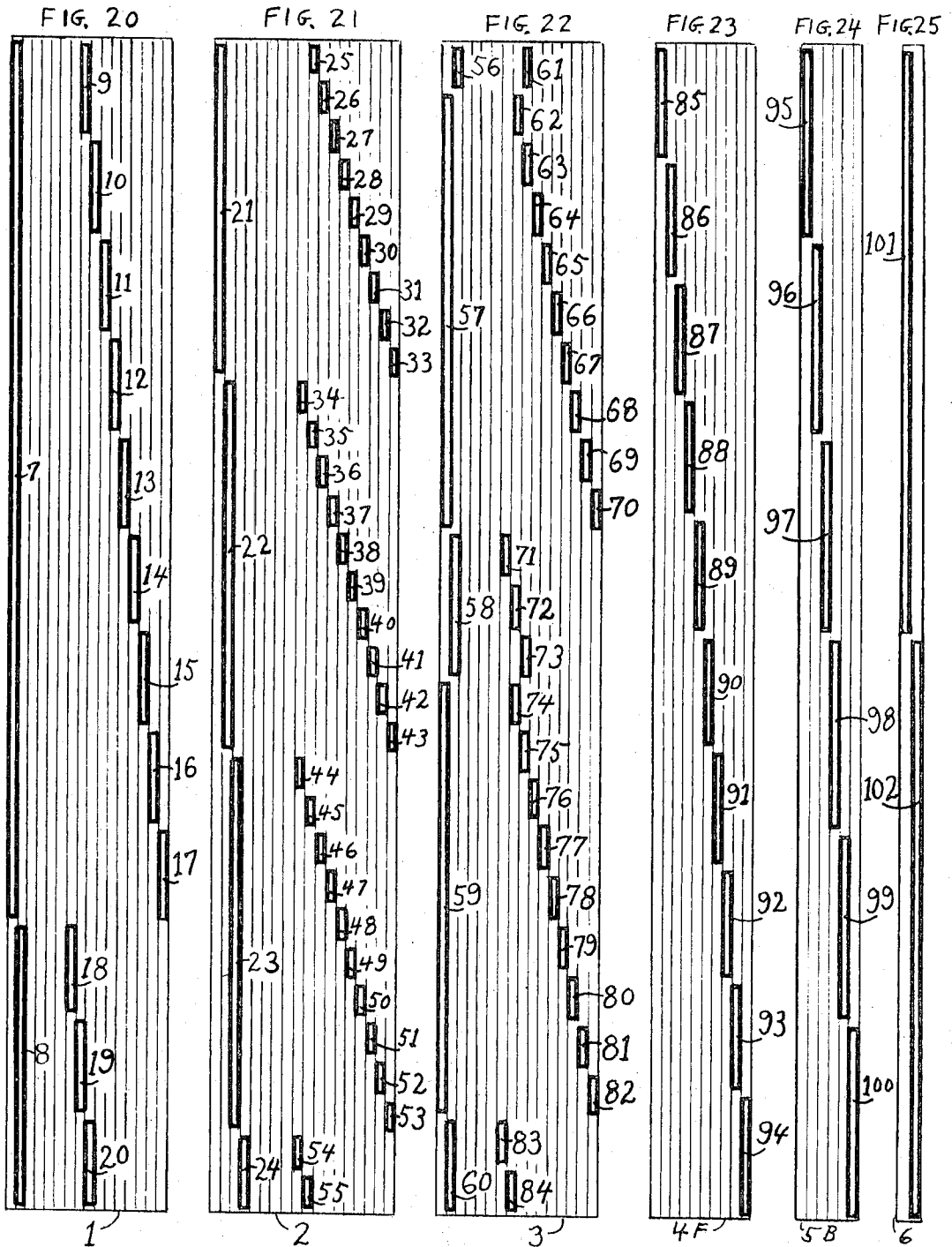


FIG. 4





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FIG. 26

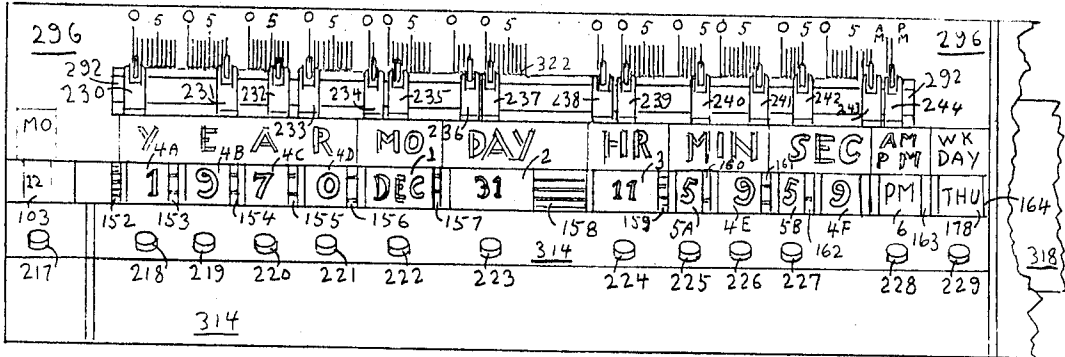


FIG. 27

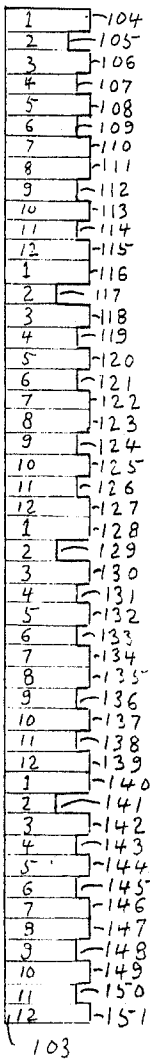


FIG. 28

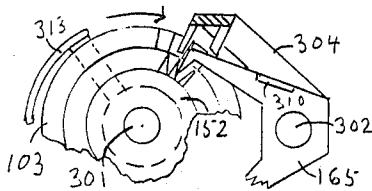


FIG. 29

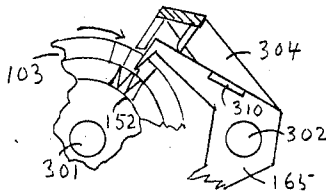


FIG. 30

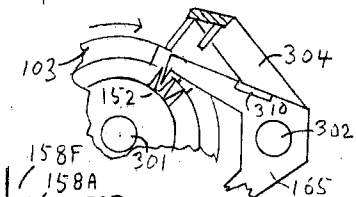


FIG. 31

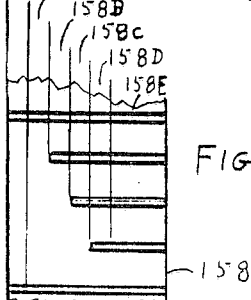


FIG. 32

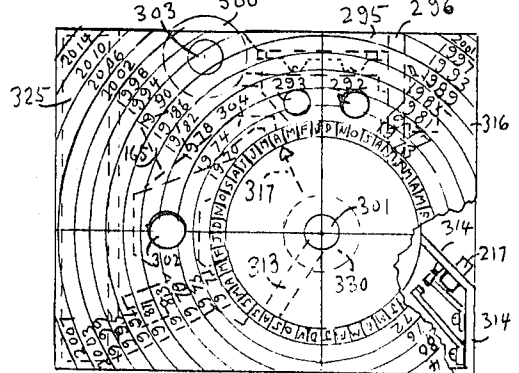
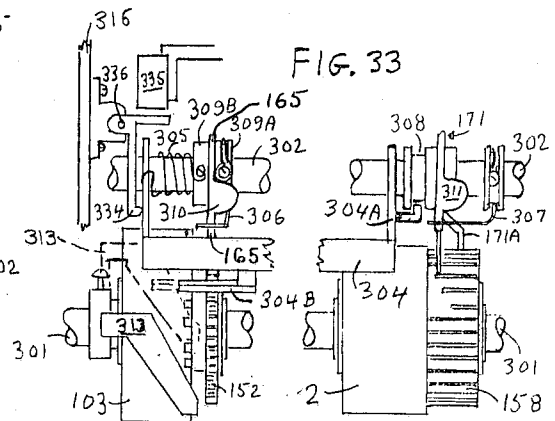


FIG. 33



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FIG. 34

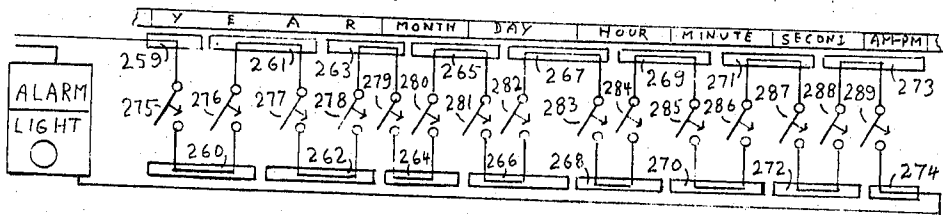


FIG. 35

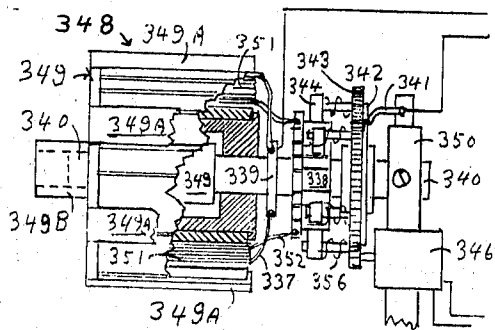


FIG. 36

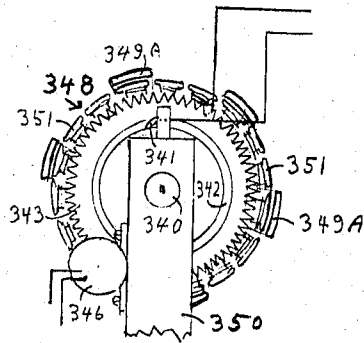
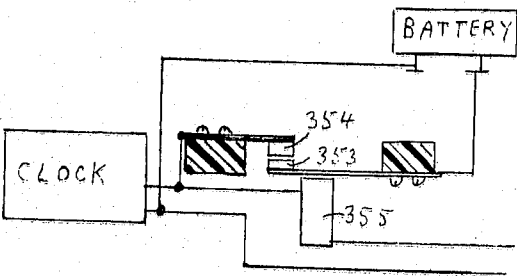


FIG. 37



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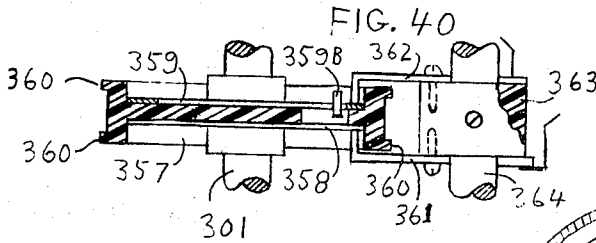
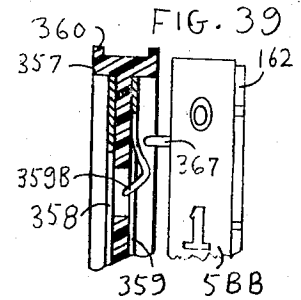
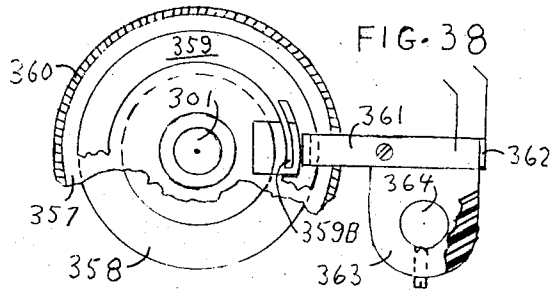


FIG. 42

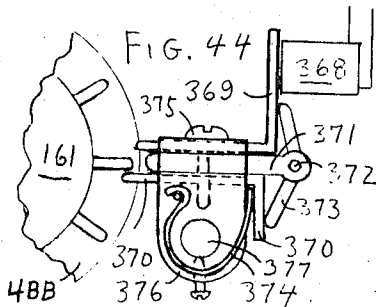
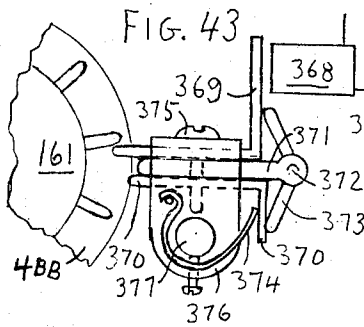
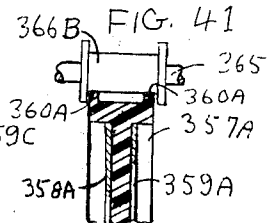
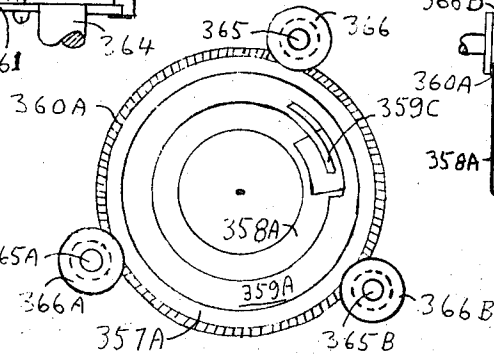


FIG. 45

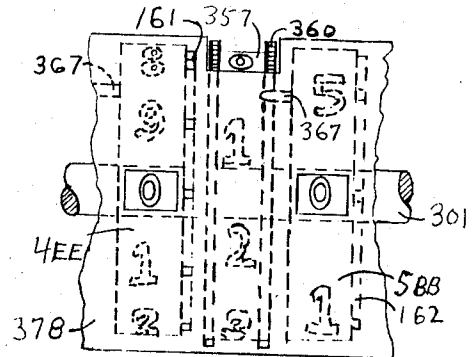


FIG. 46

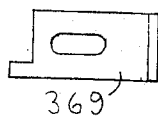
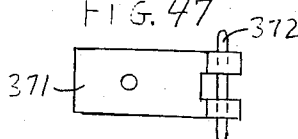
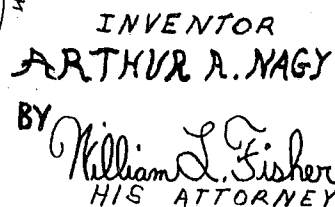
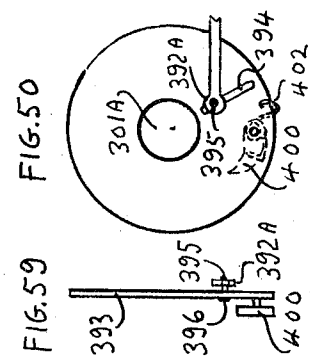
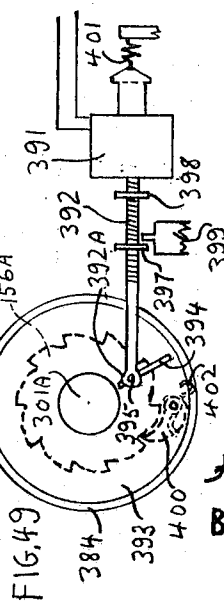
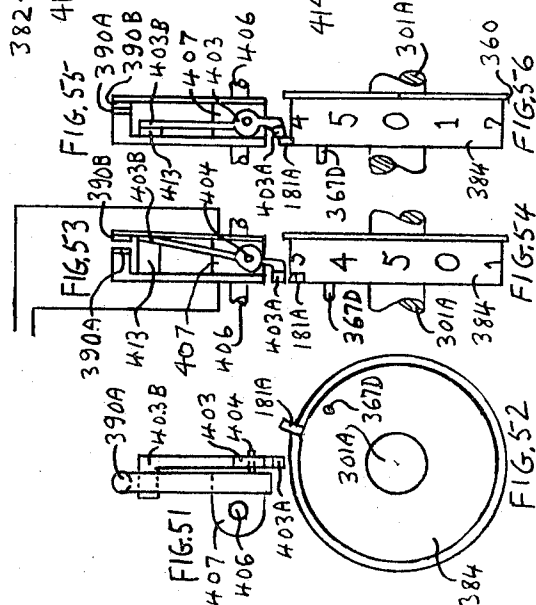
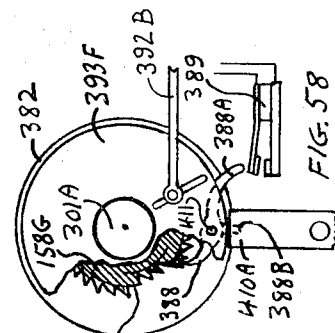
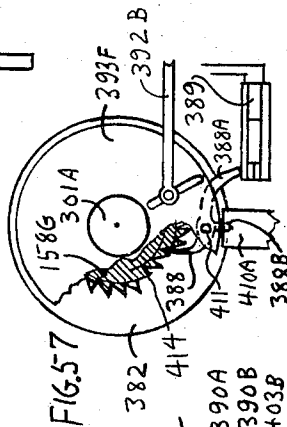
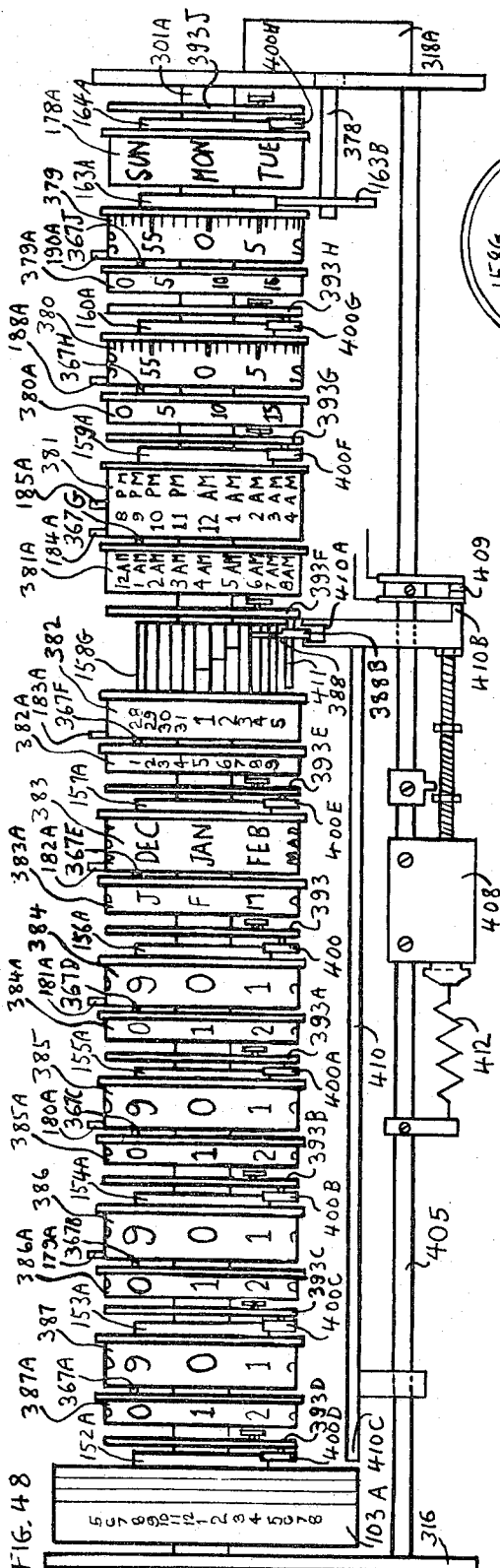


FIG. 47



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ELECTROMECHANICAL SYSTEM

My invention relates to electromechanical systems particularly for horological purposes.

The principal object of my invention is the provision of improvements in electromechanical systems which have useful properties particularly in horology.

The foregoing object of my invention and the advantages thereof will become apparent during the course of the following description, taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a fragmentary front elevational view of a horological instrument embodying my invention;

FIGS. 2 and 3 are, respectively, fragmentary vertical sectional and top plan views of a front portion of said embodiment;

FIGS. 4 and 5 are, respectively, fragmentary vertical sectional views of a modification of friction bearing means used in said embodiment;

FIG. 6 is a fragmentary elevational views of a modified form of ratchet pawl for the day gear used in said embodiment;

FIG. 7 is a fragmentary front elevational view partly in schematic form of a portion of said instrument with parts removed;

FIGS. 8-12 and 17-19 are, respectively, fragmentary views with parts in section illustrating the operation of electrical contacts and trip levers therefor associated with sequentially rotating drums used in said embodiment;

FIGS. 13-15 and 16 are, respectively, side elevational and fragmentary top plan views of said drums and ratchet gears and pawls therefor used in said embodiment;

FIGS. 20-25 are elevational views of laid-out cylindrical surfaces of said drums illustrating spaced apart means thereon;

FIGS. 26 and 32 are, respectively, front and end elevational views of said embodiment with parts cut-away;

FIG. 27 is an elevational view of a laid-out cylindrical surface of a 48-month locator drum used in said embodiment;

FIGS. 28-30 are fragmentary side elevational views with parts in section of said locator drum and the ratchet pawl and locator bar associated therewith;

FIG. 31 is a fragmentary elevational view showing the blank tooth area on said day gear;

FIG. 33 is a fragmentary top plan view of a portion of said embodiment illustrating the operation of said day and locator drums and locator bar associated therewith;

FIG. 34 is an electrical schematic view illustrating the operation of contact pins when in contact with contact bars on said drums;

FIGS. 35 and 36 are, respectively, front and end elevational views with parts in section of electric motor means used in said embodiment; and

FIG. 37 is a schematic diagram with parts in section illustrating the relation between means and auxiliary power sources for use with said embodiment.

Referring to FIGS. 1-37 of the drawings in greater detail 1, 2, 3, 4A, 4B, 4C, 4D, 4E, 5A, 5B, 6, 103 and 178 designate drums which are made of non conductive material, such as hard plastic, and are pressed firmly onto friction bearings, such as friction bearings 319. Drum 4F is an exception as it has no friction bear-

ing and is made fast to and rotates constantly with the shaft 301.

Each said drum, with the exception of drum 4F, has a ratchet gear attached thereto. Said drums rotate sequentially one gear tooth at a time. Said drums except drums 4A, 6, 103 and 178 have trip levers 179-190 (FIG. 7).

Said drums except drums 103 and 178 are provided with spaced apart means which, in the instance, comprise metal bars, such as copper or similar conductive material which are circumferentially and axially spaced apart on the outside cylindrical surface of said drums. Said bars serve as contact areas for contact pins such as 290, 291 (FIG. 2) and are made in varying circumferential lengths and, in the instance, are imbedded into said drums so that they form a smooth surface with the external cylindrical surfaces thereof. The arrangement of said bars, which are designated 7-102, respectively, on said drum is shown in FIGS. 2-25.

When any given contact bar has rotated to its uppermost position on its respective said drum said contact bar is considered to be in the contact area of said contact pins 290, 291 provided the same are axially pre-set for the given contact bar. All said drums rotate in a pre-arranged sequence and said contact pins which have been previously set for an alarm time will not contact with said bars to complete the circuit to the alarm until said contact bars have rotated to their respective positions of contact with all contact pins, in which event said alarm will sound.

Said external cylindrical surfaces of said drums also serve as locations providing time indicia for direct reading of time information as shown in FIGS. 1 and 26. Said numbers, letters, (Jan. through Dec.) and A.M./P.M. should be smooth and level with said surface of said drum and said contact bars. Said numbers, letters and A.M./P.M. designate the actual time and correspond to the alarm setting only at the time of alarm. Said numbers, letters and A.M./P.M. represent on each drum the contact bar which at that instant is in the contact area of said drum, i.e. the uppermost position of said bar on said drum (not necessarily in contact with said pins). Said bar does not contact the pins when the latter are set for another number or time.

The following listed drums are provided with the numbers or letters as set forth below:

1. Lettered month drum; Jan. - Dec.

2. Day drum; 01-31

3. Hour drum; 12 midnight is considered as commencement of A.M.; 12 noon is considered as commencement of P.M.

A.M.

12 to 11 (11 o'clock plus minutes and seconds or from 12 midnight until the 11th hour, 59 minutes and 59 seconds A.M.)

P.M.

12 to 11 (11 o'clock plus minutes and seconds or from 12 noon until the 11th hour, 59 minutes and 59 seconds P.M.)

4A-Year drum 0 to 9 (1st digit in 4 digit number)

4B-Year drum 0 to 9 (2nd digit in 4 digit number)

4C-Year drum 0 to 9 (3rd digit in 4 digit number)

4D-Year drum 0 to 9 (4th digit in 4 digit number)

4E-Minute drum 0 to 9 (2nd digit in 2 digit number)

4F-Second drum 0 to 9 (2nd digit in 2 digit number)

5A-Minute drum 0 to 5 (1st digit in 2 digit number)

5B-Second drum 0 to 5 (1st digit in 2 digit number)
6- A.M./P.M. drum.

The following is the identification of each contact bar on its respective drum together with the actual number or the certain digit in a number which that particular bar represents.

- 7-Contact bar which is 0 (1st digit in 2 digit number)
- 8-Contact bar which is 1 (1st digit in 2 digit number)
- 9-Contact bar which is 1 (2nd digit in 2 digit number)
- 10-Contact bar which is 2 (2nd digit in 2 digit number)
- 11-Contact bar which is 3 (2nd digit in 2 digit number)
- 12-Contact bar which is 4 (2nd digit in 2 digit number)
- 13-Contact bar which is 5 (2nd digit in 2 digit number)
- 14-Contact bar which is 6 (2nd digit in 2 digit number)
- 15-Contact bar which is 7 (2nd digit in 2 digit number)
- 16-Contact bar which is 8 (2nd digit in 2 digit number)
- 17-Contact bar which is 9 (2nd digit in 2 digit number)
- 18-Contact bar which is 0 (2nd digit in 2 digit number)
- 19-Contact bar which is 1 (2nd digit in 2 digit number)
- 20-Contact bar which is 2 (2nd digit in 2 digit number)
- 21-Contact bar which is 0 (1st digit in 2 digit number)
- 22-Contact bar which is 1 (1st digit in 2 digit number)
- 23-Contact bar which is 2 (1st digit in 2 digit number)
- 24-Contact bar which is 3 (1st digit in 2 digit number)
- 25-Contact bar which is 1 (2nd digit in 2 digit number)
- 26-Contact bar which is 2 (2nd digit in 2 digit number)
- 27-Contact bar which is 3 (2nd digit in 2 digit number)
- 28-Contact bar which is 4 (2nd digit in 2 digit number)
- 29-Contact bar which is 5 (2nd digit in 2 digit number)
- 30-Contact bar which is 6 (2nd digit in 2 digit number)
- 31-Contact bar which is 7 (2nd digit in 2 digit number)
- 32-Contact bar which is 8 (2nd digit in 2 digit number)
- 33-Contact bar which is 9 (2nd digit in 2 digit number)
- 34-Contact bar which is 0 (2nd digit in 2 digit number)
- 35-Contact bar which is 1 (2nd digit in 2 digit number)
- 36-Contact bar which is 2 (2nd digit in 2 digit number)
- 37-Contact bar which is 3 (2nd digit in 2 digit number)
- 38-Contact bar which is 4 (2nd digit in 2 digit number)
- 39-Contact bar which is 5 (2nd digit in 2 digit number)
- 40-Contact bar which is 6 (2nd digit in 2 digit number)
- 41-Contact bar which is 7 (2nd digit in 2 digit number)
- 42-Contact bar which is 8 (2nd digit in 2 digit number)
- 43-Contact bar which is 9 (2nd digit in 2 digit number)
- 44-Contact bar which is 0 (2nd digit in 2 digit number)
- 45-Contact bar which is 1 (2nd digit in 2 digit number)
- 46-Contact bar which is 2 (2nd digit in 2 digit number)
- 47-Contact bar which is 3 (2nd digit in 2 digit number)
- 48-Contact bar which is 4 (2nd digit in 2 digit number)
- 49-Contact bar which is 5 (2nd digit in 2 digit number)
- 50-Contact bar which is 6 (2nd digit in 2 digit number)
- 51-Contact bar which is 7 (2nd digit in 2 digit number)
- 52-Contact bar which is 8 (2nd digit in 2 digit number)
- 53-Contact bar which is 9 (2nd digit in 2 digit number)
- 54-Contact bar which is 0 (2nd digit in 2 digit number)
- 55-Contact bar which is 1 (2nd digit in 2 digit number)
- 56-Contact bar which is 1 (1st digit in 2 digit number)
- 57-Contact bar which is 0 (1st digit in 2 digit number)
- 58-Contact bar which is 1 (1st digit in 2 digit number)
- 59-Contact bar which is 0 (1st digit in 2 digit number)
- 60-Contact bar which is 1 (1st digit in 2 digit number)
- 61-Contact bar which is 2 in A.M. (2nd digit in 2 digit number)
- 62-Contact bar which is 2 in A.M. (2nd digit in 2 digit number)
- 63-Contact bar which is 2 in A.M. (2nd digit in 2 digit number)
- 64-Contact bar which is 3 in A.M. (2nd digit in 2 digit number)
- 65-Contact bar which is 4 in A.M. (2nd digit in 2 digit number)
- 66-Contact bar which is 5 in A.M. (2nd digit in 2 digit number)
- 67-Contact bar which is 6 in A.M. (2nd digit in 2 digit number)
- 68-Contact bar which is 7 in A.M. (2nd digit in 2 digit number)
- 69-Contact bar which is 8 in A.M. (2nd digit in 2 digit number)
- 70-Contact bar which is 9 in A.M. (2nd digit in 2 digit number)
- 71-Contact bar which is 0 in A.M. (2nd digit in 2 digit number)
- 72-Contact bar which is 1 in A.M. (2nd digit in 2 digit number)
- 73-Contact bar which is 2 in P.M. (2nd digit in 2 digit number)
- 74-Contact bar which is 1 in P.M. (2nd digit in 2 digit number)
- 75-Contact bar which is 2 in P.M. (2nd digit in 2 digit number)
- 76-Contact bar which is 3 in P.M. (2nd digit in 2 digit number)
- 77-Contact bar which is 4 in P.M. (2nd digit in 2 digit number)
- 78-Contact bar which is 5 in P.M. (2nd digit in 2 digit number)
- 79-Contact bar which is 6 in P.M. (2nd digit in 2 digit number)
- 80-Contact bar which is 7 in P.M. (2nd digit in 2 digit number)
- 81-Contact bar which is 8 in P.M. (2nd digit in 2 digit number)
- 82-Contact bar which is 9 in P.M. (2nd digit in 2 digit number)
- 83-Contact bar which is 0 in P.M. (2nd digit in 2 digit number)
- 84-Contact bar which is 0 in P.M. (2nd digit in 2 digit number)
- 85-Contact bar which is 0.
- 86-Contact bar which is 1.
- 87-Contact bar which is 2.
- 88-Contact bar which is 3.
- 89-Contact bar which is 4.

- 90-Contact bar which is 5.
- 91-Contact bar which is 6.
- 92-Contact bar which is 7.
- 93-Contact bar which is 8.
- 94-Contact bar which is 9.
- 95-Contact bar which is 0.
- 96-Contact bar which is 1.
- 97-Contact bar which is 2.
- 98-Contact bar which is 3.
- 99-Contact bar which is 4.
- 100-Contact bar which is 5.
- 101-Contact bar which is A.M.
- 102-Contact bar which is P.M.

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Assuming the alarm has been set and that except for one contact bar, all contact pins are in contact with their respective contact bars which have rotated in normal sequence into their respective contact areas when the last contact bar rotates to a position of contact with its respective contact pins, a circuit is closed (as shown in FIG. 34 in which the bridging of the contact pins by their respective contact bars is represented by switches 275-289) and the pre-set number or A.M./P.M. is made active and said alarm will trigger. Rotation of a particular drum shows what actual number or A.M./P.M. comes up in the visual reading area at the front of the instrument on each one tooth revolution of the respective drum. For visual or actual time reading on the face of the instrument the month drum is printed with the month in letters instead of numbers of the month to provide direct time reading, e.g. December is substituted for 12 on drum 1. Drum 103 has no contact bars and registers number 12 at this time. Also every time a new day registers on drum 2, a new week day (Sun. through Sat.) registers on drum 178 which also has no contact bars.

The following illustrates which numbers are registered on the face of the instrument for direct reading of time for the listed contacts bars.

Month drum 1 shown in FIG. 20 registers as follows:

- Contact bars 7 and 9 are 01 month or Jan.
- Contact bars 7 and 10 are 02 month or Feb.
- Contact bars 7 and 11 are 03 month or Mar.
- Contact bars 7 and 12 are 04 month or April
- Contact bars 7 and 13 are 05 month or May
- Contact bars 7 and 14 are 06 month or June
- Contact bars 7 and 15 are 07 month or July
- Contact bars 7 and 16 are 08 month or Aug.
- Contact bars 7 and 17 are 09 month or Sept.
- Contact bars 8 and 18 are 10 month or Oct.
- Contact bars 8 and 19 are 11 month or Nov.
- Contact bars 8 and 20 are 12 month or Dec.

Day drum 2 shown in FIG. 21 registers as follows:

- Contact bars 21 and 25 are 01 day of month
- Contact bars 21 and 26 are 02 day of month
- Contact bars 21 and 27 are 03 day of month
- Contact bars 21 and 28 are 04 day of month
- Contact bars 21 and 29 are 05 day of month
- Contact bar 21 and 30 are 06 day of month
- Contact bars 21 and 31 are 07 day of month
- Contact bars 21 and 32 are 08 day of month
- Contact bars 21 and 33 are 09 day of month
- Contact bars 22 and 34 are 10 day of month
- Contact bars 22 and 35 are 11 day of month
- Contact bars 22 and 36 are 12 day of month
- Contact bars 22 and 37 are 13 day of month
- Contact bars 22 and 38 are 14 day of month
- Contact bars 22 and 39 are 15 day of month
- Contact bars 22 and 40 are 16 day of month
- Contact bars 22 and 41 are 17 day of month

Contact bars 22 and 42 are 18 day of month
 Contact bars 22 and 43 are 19 day of month
 Contact bars 23 and 44 are 20 day of month
 Contact bars 23 and 45 are 21 day of month
 Contact bars 23 and 46 are 22 day of month
 Contact bars 23 and 47 are 23 day of month
 Contact bars 23 and 48 are 24 day of month
 Contact bars 23 and 49 are 25 day of month
 Contact bars 23 and 50 are 26 day of month
 Contact bars 23 and 51 are 27 day of month
 Contact bars 23 and 52 are 28 day of month
 Contact bars 23 and 53 are 29 day of month
 Contact bars 24 and 54 are 30 day of month
 Contact bars 24 and 55 are 31 day of month

Hour drum 3 shown in FIG. 22 registers as follows:

Contact bars 56 and 61 are 12 midnight (considered here as A.M.)

Contact bars 57 and 62 are 01 hour A.M.

Contact bars 57 and 63 are 02 hour A.M.

Contact bars 57 and 64 are 03 hour A.M.

Contact bars 57 and 65 are 04 hour A.M.

Contact bars 57 and 66 are 05 hour A.M.

Contact bars 57 and 67 are 06 hour A.M.

Contact bars 57 and 68 are 07 hour A.M.

Contact bars 57 and 69 are 08 hour A.M.

Contact bars 57 and 70 are 09 hour A.M.

Contact bars 58 and 71 are 10 hour A.M.

Contact bars 58 and 72 are 11 hour A.M.

Contact bars 58 and 73 are 12 noon (considered here as P.M.)

Contact bars 59 and 74 are 01 hour P.M.

Contact bars 59 and 75 are 02 hour P.M.

Contact bars 59 and 76 are 03 hour P.M.

Contact bars 59 and 77 are 04 hour P.M.

Contact bars 59 and 78 are 05 hour P.M.

Contact bars 59 and 79 are 06 hour P.M.

Contact bars 59 and 80 are 07 hour P.M.

Contact bars 59 and 81 are 08 hour P.M.

Contact bars 59 and 82 are 09 hour P.M.

Contact bars 60 and 83 are 10 hour P.M.

Contact bars 60 and 84 are 11 hour P.M.

Year drums 4A, 4B, 4C, 4D, 2nd digit minute drum 4E and 2nd digit second drum 4F each register as follows:

Contact bar 85 is 0

Contact bar 86 is 1

Contact bar 87 is 2

Contact bar 88 is 3

Contact bar 89 is 4

Contact bar 90 is 5

Contact bar 91 is 6

Contact bar 92 is 7

Contact bar 93 is 8

Contact bar 94 is 9

First digit minute drum 5A and first digit second drum 5B each register as follows:

Contact bar 95 is 0

Contact bar 96 is 1

Contact bar 97 is 2

Contact bar 98 is 3

Contact bar 99 is 4

Contact bar 100 is 5

A.M./P.M. drum 6 registers as follows:

Contact bar 101 is A.M.

Contact bar 102 is P.M.

The description of my invention will be more clear if the different parts of my instrument are described in conjunction with the respective reference numerals assigned thereto which are listed in numerical order hereinafter.

103—Numbered month drum and 48 month locator drum

The drum 103 is a round notched drum with a 48-tooth gear 152 attached. The drum 103 is pressed firmly onto a friction bearing, such as the friction bearing 319. The drum 103 has 48 notches or location areas on the outer cylindrical surface at one side thereof; each location area represents one month in 48 months or 4 years which includes Leap Year which is the reason for the 48-month span. Said drum 103 could be made with only 12 locating areas but would require time correction on Feb. 29 of each Leap Year. 48 month drum 103 eliminates this time correction.

Said location areas which are designated 104-151 are of a depth related to the months represented thereby. Such depth is the distance axially inwardly from right to left as viewed from the front of the drum 103.

Each month location area has a depth directly related to the 4 different gear teeth areas on the day gear 158, viz. gear teeth areas 158A, 158B, 158C and 158D. For example, 105 represents the month of Feb. in Leap Year. When the locating end of the locating bar 304 locates itself in the groove 105 a ratchet pawl 171 automatically locates itself in area 158B which is the section of the gear which has 29 teeth representing 29 days in the month.

Upon changeover from Feb. to Mar. the locator bar 304 locates on the area 106 (representing Mar. with 31 days) of the drum 103. Thus the pawl 171 will be shifted to the location area 158D on the day gear 158 which has 31 teeth or locations. Thus the correct number of days is selected for every month whether the year is Leap Year or not.

Also on the face of the drum 103 and visible from the front of the instrument are numbers representing each month 1-12 which are located 4 times to encircle the drum once. The number showing through the aperture in front of the instrument (FIG. 26) represents the number of the present month in actual time, e.g. if number 12 shows the present month is Dec.

The left side of the drum 103 as viewed from the front of the instrument has an arrow 317 painted or engraved thereon which is visible through the plexiglass left side 316 of the instrument.

The following are the 48 location areas of the drum 103 and the month represented by each such area. Also shown is the gear tooth area of the day gear 158 in which the locating bar 304 automatically locates the pawl 171.

104—Location area of drum 103 which is Jan. locates pawl 171 in area 158D (31 days)

105—Location area of drum 103 which is Feb. locates pawl 171 in area 158B (29 days)

106—Location area of drum 103 which is Mar. Locates pawl 171 in area 158D (31 days)

107—Location area of drum 103 which is Apr. locates pawl 171 in area 158C (30 days)

108—Location area of drum 103 which is May locates pawl 171 in area 158D (31 days)

- 109—Location area of drum 103 which is June locates pawl 171 in area 158C (30 days)
- 110—Location area of drum 103 which is July locates pawl 171 in area 158D (31 days)
- 111—Location area of drum 103 which is Aug. locates pawl 171 in area 158D (31 days) 5
- 112—Location area of drum 103 which is Sept. locates pawl 171 in area 158C (30 days)
- 113—Location area of drum 103 which is Oct. locates pawl 171 in area 158D (31 days) 10
- 114—Location area of drum 103 which is Nov. locates pawl 171 in area 158C (30 days)
- 115—Location area of drum 103 which is Dec. locates pawl 171 in area 158D (31 days)
- 116—Location area of drum 103 which is Jan. locates pawl 171 in area 158D (31 days) 15
- 117—Location area of drum 103 which is Feb. locates pawl 171 in area 158A (28 days)
- 118—Location area of drum 103 which is Mar. locates pawl 171 in area 158D (31 days) 20
- 119—Location area of drum 103 which is Apr. locates pawl 171 in area 158C (30 days)
- 120—Location area of drum 103 which is May locates pawl 171 in area 158D (31 days)
- 121—Location area of drum 103 which is June locates pawl 171 in area 158C (30 days) 25
- 122—Location area of drum 103 which is July locates pawl 171 in area 158D (31 days)
- 123—Location area of drum 103 which is Aug. locates pawl 171 in area 158D (31 days) 30
- 124—Location area of drum 103 which is Sept. locates pawl 171 in area 158C (30 days)
- 125—Location area of drum 103 which is Oct. locates pawl 171 in area 158D (31 days) 35
- 126—Location area of drum 103 which is Nov. locates pawl 171 in area 158C (30 days)
- 127—Location area of drum 103 which is Dec. locates pawl 171 in area 158D (31 days)
- 128—Location area of drum 103 which is Jan. locates pawl 171 in area 158D (31 days) 40
- 129—Location area of drum 103 which is Feb. locates pawl 171 in area 158A (28 days)
- 130—Location area of drum 103 which is Mar. locates pawl 171 in area 158D (31 days) 45
- 131—Location area of drum 103 which is Apr. locates pawl 171 in area 158C (30 days)
- 132—Location area of drum 103 which is May locates pawl 171 in area 158D (31 days)
- 133—Location area of drum 103 which is June locates pawl 171 in area 158C (30 days) 50
- 134—Location area of drum 103 which is July locates pawl 171 in area 158D (31 days)
- 135—Location area of drum 103 which is Aug. locates pawl 171 in area 158D (31 days) 55
- 136—Location area of drum 103 which is Sept. locates pawl 171 in area 158C (30 days)
- 137—Location area of drum 103 which is Oct. locates pawl 171 in area 158D (31 days)
- 138—Location area of drum 103 which is Nov. locates pawl 171 in area 158C (30 days) 60
- 139—Location area of drum 103 which is Dec. locates pawl 171 in area 158D (31 days)
- 140—Location area of drum 103 which is Jan. locates pawl 171 in area 158D (31 days) 65

- 141—Location area of drum 103 which is Feb. locates pawl 171 in area 158A (28 days)
- 142—Location area of drum 103 which is Mar. locates pawl 171 in area 158D (31 days)
- 143—Location area of drum 103 which is Apr. locates pawl 171 in area 158C (30 days)
- 144—Location area of drum 103 which is May locates pawl 171 in area 158D (31 days)
- 145—Location area of drum 103 which is June locates pawl 171 in area 158C (30 days)
- 146—Location area of drum 103 which is July locates pawl 171 in area 158D (31 days)
- 147—Location area of drum 103 which is Aug. locates pawl 171 in area 158D (31 days)
- 148—Location area of drum 103 which is Sept. locates pawl 171 in area 158C (30 days)
- 149—Location area of drum 103 which is Oct. locates pawl 171 in area 158D (31 days)
- 150—Location area of drum 103 which is Nov. locates pawl 171 in area 158C (30 days)
- 151—Location area of drum 103 which is Dec. locates pawl 171 in area 158D (31 days)

Each of the following ratchet gears 152–164 has a certain number of equally spaced teeth. The number of teeth represents the number of increments each drum rotates during one complete revolution of the shaft 301, e.g. drum 1 represents 12 months in a year so the gear 157 has 12 teeth and the drum 1 rotates 1/12 revolution each month. If the contact bars 7 and 17 are located in the contact area of the contact pins the direct time reading on the front face of the drum 1 will read Sept. When the drum rotates one ratchet tooth, contact bars 8 and 18 will thus be rotated into the contact area of the contact pins and then the direct time reading will change from Sept. to Oct.

The ratchet gears on all the other drums work to control the rotation thereof in this same way.

152— 48 Month Ratchet Gear

Said gear 152 which has 48 teeth (for Leap Year) regulates the rotation of the locator drum 103 and rotates one gear tooth each time said drum 2 completes one revolution, i.e. one gear tooth every month. Said gear 152 completes one revolution every four years.

153— Thousands Year Ratchet Gear

Said gear 153 which regulates the rotation of the drum 4A has 10 teeth and rotates 1 gear tooth every 1000 years and completes one revolution every 10,000 years.

154— Hundreds Year Ratchet Gear

Said gear 154 which regulates the rotation of the drum 4B has 10 teeth and rotates 1 gear tooth every 100 years and completes one revolution every 1000 years.

155— Tens Year Ratchet Gear

Said gear 155 which regulates the rotation of the drum 4C has 10 teeth and rotates 1 gear tooth every 10 years and completes one revolution every 100 years.

156— Units Year Ratchet Gear

Said gear 156 which regulates the rotation of the drum 4D has 10 teeth and rotates 1 gear tooth every year and completes one revolution every 10 years.

157— Month Ratchet Gear

Said gear 157 which has 12 teeth regulates the rotation of the drum 1 and rotates 1 gear tooth each time said drum 2 completes one revolution. Said month ratchet gear 157 completes 1 revolution every year.

158— Day Ratchet Gear

Said gear 158 is divided into 6 different sections which are listed as follows:

158A— The area of said ratchet gear 158 which is for a 28 day month.

158B— The area of said ratchet gear 158 which is for a 29 day month.

158C— The area of said ratchet gear 158 which is for a 30 day month.

158D— The area of said ratchet gear 158 which is for a 31 day month.

158E— The area of said ratchet gear 158 which is the travel area for the bottom finger of the pawl 171.

158F— The area of said ratchet gear 158 which is the travel area for the top finger of the pawl 171 at the month location changes when month locator bar 304 is carried to the extreme left of the travel area and rests on top of the month locator drum 103.

Said gear 158 which has a variable number (from 28 to 31) of effective teeth regulates the rotation of the month drum 2 and rotates one gear tooth each time said drum 3 completes one revolution, i.e. one gear tooth every day.

159— Hour Ratchet Gear

Said gear 159 has 24 teeth (12 for A.M.; 12 for P.M.) and rotates 1 gear tooth per hour and completes 1 revolution per day.

160— Tens Minute Ratchet Gear

Said gear 160 has 6 teeth and rotates 1 gear tooth every ten minutes and completes 1 revolution per hour.

161— Units Minute Ratchet Gear

Said gear 161 has 10 teeth and rotates 1 gear tooth every minute and completes 1 revolution every 10 minutes.

162— Tens Second Ratchet Gear

Said gear 162 has 6 teeth and rotates 1 gear tooth every 10 seconds and completes 1 revolution every minute.

163— A.M. and P.M. Ratchet Gear

Said gear 163 has 2 teeth and rotates 1 gear tooth at noon and one gear tooth at midnight and completes 1 revolution every day.

164— Week Day Ratchet Gear

Said gear 164 has 7 teeth and rotates 1 gear tooth per day and completes 1 revolution every week.

165— Ratchet pawl for the 48 month ratchet gear 152

166— Ratchet pawl for the year gear 153

167— Ratchet pawl for the year gear 154

168— Ratchet pawl for the year gear 155

169— Ratchet pawl for the year gear 156

170— Ratchet pawl for the month gear 157

171— Ratchet pawl for the day gear 158

171 AB — Alternate ratchet pawl for the day gear 158

171A— Bottom finger of the pawl 171 which bottom finger 171A is angled so that it always travels in section 158E of the gear 158.

171B — Bottom finger of the alternate pawl 171AB (FIG. 6) which bottom finger 171B has two smaller fingers to straddle the gap in gear 158.

172— Ratchet pawl for the hour gear 159

173— Ratchet pawl for the minute gear 160

174— Ratchet pawl for the minute gear 161

175— Ratchet pawl for the second gear 162

176— Ratchet pawl for the A.M./P.M. gear 163

177— Ratchet pawl for the week day gear 164

Said ratchet pawls 165–177 are used to hold their respective drums stationary until it is time for said drums to rotate. At said time the respective ratchet pawl disengages from its respective gear to allow said drum one gear tooth rotation. Said ratchet pawls are also released to effect time correction. Upon energization of the respective electromagnets the ratchet pawls are disengaged from the respective gears to permit the respective drums to rotate one gear tooth rotation. Upon de-energization of said electro-magnet said pawls are returned to engagement with their respective gears by their respective return springs. Each pawl is provided with a magnetic attraction plate to insure stronger magnetic attraction for its electromagnet and a bottom finger to prevent more than one gear tooth rotation at each segment of revolution.

FIG. 13 shows the upper finger of the pawl 175 engaged with a tooth on gear 162 while the bottom finger is clear of said gear 162. At this point upon energization of the electromagnet 214 the upper finger of the pawl 175 is disengaged from the gear 162 so that the latter rotates one gear tooth rotation whereupon a tooth thereon is stopped by the bottom finger of the pawl 175 which bottom finger engages with the gear 162 simultaneously with disengagement of said upper finger. FIG. 14 shows the upper finger of said pawl 175 completely disengaged from said tooth on said gear 162 while said bottom finger is fully engaged with a tooth on said gear 162.

Said pawl 175 re-engages with the next subsequent tooth on gear 162 in the reverse sequence illustrated by considering first FIG. 14 and then FIG. 13.

Upon lifting of the 48 month ratchet pawl 165 to disengage it from the gear 152 at the month end change said ratchet pawl 165 also lifts up the bar 304.

All of said pawls pivot on the ratchet shaft 302 and except for the axially shiftable pawl 171 are disposed with clearance between the ratchet pawl holders 309A and 309B as illustrated in FIG. 33. Said holders 309A and 309B are fixed to said ratchet shaft 302 by set screws and the holders 309A are grooved to anchor and retain the ratchet pawl return springs 331.

Said ratchet pawl 171 pivots in annular slot on a sliding ratchet holder 308 (FIG. 33) which slides on the shaft 302 and allows said ratchet pawl 171 to be located in different gear areas on the gear 158. The bottom finger 171A of said pawl 171 is angled and axially offset in respect to the upper finger so that regardless of to which area the top part of the pawl 171 is shifted the bottom part of the pawl 171 will always locate in the area 158E. If the bottom finger of the pawl 171 was located in the areas 158A, 158B or 158C, the gear 158 would rotate more than one gear tooth rotation at a time at about mid-month. The return spring 307 for the

pawl 171 is fixed to the shaft 302 via a holder therefor which is fast to said shaft 302.

178— The Lettered Week-Day Drum

Said drum 178 which is lettered Sunday through Saturday shows a different day of the week for each gear tooth rotation. When the hour drum 3 completes one revolution the trip lever 184 thereon closes the contact points 197 and the electromagnet 216 is energized and disengages the pawl 177 from the gear drum 164 allowing said drum 178 to rotate one gear tooth or one week day.

179-190— Trip Levers

Said trip levers 179-190 are made fast to their respective drums and when said drums complete one revolution the respective trip levers cause the corresponding contact points to close which energizes the respective electromagnets which in turn lift the respective pawl and allow the respective drums to rotate one gear tooth, e.g., the trip levers 185 and 186 on the hour drum 3 alternately every 12 hours kick over the A.M. and P.M. drum 6.

191-203— Contact Points

Said contact points 191-203 which are carried on spaced apart spring fingers so as to be held normally open are actuated closed by their respective trip levers as shown in FIGS. 8-19 to energize the corresponding electromagnets.

204-216— Electromagnets

Said electromagnets 204-216 are mounted on a common support and are energized by the closing of said contact points 191-203 to disengage their respective pawls.

217-229— Time Correction Push Button Switches

Said time correction push button switches 217-229 are independent of the alarm system and used in time correction to adjust the drums to correspond with the present or absolute time, e.g. after the clock has stopped (because of a power failure or for any other reason) one of the buttons 217-229 must be pressed and released for each number to be changed. Pressing of a button cuts off power to all said electromagnets 204-216 except the corresponding electromagnet which is energized by actuation of said button, e.g. if the button 217 is pressed and released the drum 103 rotates one gear tooth rotation or one month. This method of time correction in which power is cut off to all the electromagnets except that for the drum being adjusted prevents the next adjacent drum from being rotated during rotation of the drum being adjusted since closing of the respective contacts by the trip lever of the drum being adjusted is ineffective to energize the next adjacent electromagnet.

230-244— Switch Holders

Said switch holders 230-244 are made of plastic or a similar non-conductive material and utilized in the alarm system independently of the visual time reading system. Said switch holders 230-244 are provided with transversely spaced apart pairs of aperture means therein for slidably carrying contact pins 290-291. The front portion of each said switch holder 230-244 carries a spring pointer 297 which indicates one of the indicium of the respective group of spaced apart indicia carried on the frame 296 corresponding to the pre-set alarm position for the respective drum. The rear part

of each said switch holder 230-244 fits into a helical groove on the cam roller 300. Turning of said cam roller 300 moves the respective switch holder to the desired pre-set alarm position. Rotation of the respective drum to a position where its contact pins rest on the property contact bar energizes the alarm circuit provided all of the other pairs of contact pins 290-291 are bridged by the proper contact bar. The connection between the contact pins 290-291 and the proper contact bar is maintained by the flat downwardly pressing springs 298 and 299, respectively, which, while pressing down upon the contact pins 290-291, slide on and maintain contact with the contact plates 259-274 when the switch holders 230-244 are moved to pre-set the alarm.

259-274— Contact Plates

Said contact plates 259-274 which are attached to a contact plate holder 295 which is made of non-conductive material and insulated from each other are arranged in two transversely spaced rows and are longitudinally spaced apart in each row to accommodate the movement of the switch holders 230-244 and connect the contact pin switches 275-289 in series circuit with the alarm circuit as shown in FIG. 34.

275-289— Contact Pin Switches

Said contact pin switches 275-289 represent the pairs of contact pins 290-291 and the 7-102 various ones of which bridge said pairs of contact switches to give the alarm, such as shown in FIG. 2 for the contact bar 95 which bridges its corresponding contact pins 290-291.

290-291— Contact Pins

Said contact pins 290-291 which are made of metal such as steel are arranged in pairs and slide freely in the holes in the respective switch holders 230-244 and are pressed lightly down on the respective drums by the flat spring connectors 298-299, respectively. When the contact pins 290-291 locate on top of the proper contact bar, a current passes from one pin to the other provided all of the other pins 290-291 are in contact with their respective contact bars in which event the alarm is triggered. When the contact pins 290-291 locate on the respective drum in areas where there are no contact bars a current does not pass from one pin to the other because the body of the drum is made of non-conductive material.

292-293— Support Rods

Said rods 292-293 are transversely spaced apart and slidably support said switch holders 230-244 for movement between their various alarm settings.

295— Contact Plate Holder

Said contact plate holder 295 which is supported on the frame of the instrument by well known means is made of non-conductive material and has contact plates 259-274 affixed to the underside thereof.

296— Frame Plate

Said frame plate 296 is provided with spaced apart series of notches for locating and holding the spring pointers 297 in their respective pre-set alarm settings. Said frame plate 296 is provided with spaced apart series of indicia in the form of vertical lines at the centers of said notches corresponding to said pre-set alarm settings.

297— Spring Pointers

Said spring pointers 297 point to the indicia on the alarm plate 296 and locate in the corresponding notches on the locator plate 296 to lock the respective contact pins 290-291 in their respective pre-set alarm settings.

298-299— Spring Connectors

Said spring connectors 298 and 299 press the contact pins 290 and 291 downwardly upon the drums and also maintain electrical contact, respectively, with the front and rear rows of contact bars 259-274 during movement of the switch holders 230-244.

300— Cam Rollers

Said cam rollers 300 are rotatably carried on the shaft 303 and are manually rotated via a knurled ring 326 fast thereto. Said cam rollers 300 have helical grooves which receive rear portions of the switch holders 230-244 for sliding the latter axially on their shafts 292-293 and are provided with indicia in the form of numbers or letters and facilitate pre-setting the alarm for people who may have difficulty reading the lined scale on the frame plate 296.

301— Power Shaft

Said power shaft 301 is itself driven by electric motor means at a constant speed of 6 rpm and is the power source for all of the moving parts of the instrument including the drums. The drum 4F and the kick back cam 313 are fast to and rotate with the shaft 301. The other drums rotate sequentially from rotation of the drum 4F.

302— Ratchet Pawl Rod

Said ratchet pawl rod 302 supports the ratchet pawls 165-177 for limited pivotal movement. The ratchet pawl 171 pivots on the holder 308.

303— Cam Roller Rod

Said roller rod 303 rotatably carries and supports said cam rollers 300.

304— 48 Month Locator Bar

Said 48 month locator bar 304 interconnects the ratchet pawl 171 for the day drum gear 158 and the 48 month locator drum 103, the position of which locator bar 304 in respect to the drum 103 determines the location of the pawl 171 in respect to the gear 158. Said locator bar 304 carries a finger 304A which engages a ratchet pawl holder 308 and an arm 304B which engages the locating area on the drum 103.

305— Locator Bar Spring

Said locator bar spring 305 has one end fast to a ratchet pawl holder 309B and the other end over an arm of the locator bar 304 and keeps the locator bar 304 pressed down against the locating area on the drum 103 and against the top of the drum 103 at the time of disengagement at the month change. Said spring 305 also yieldably maintains the locator bar 304 pressed axially against the locating area on the drum 103 to keep the pawl 171 in the proper position on the gear 158.

306— Ratchet Pawl Return Spring

Said ratchet pawl return spring 306 has one end fast to a ratchet pawl holder 309A and the other end bent over the upper arm of the ratchet pawl 165 so as to yieldably maintain the latter in engagement with the ratchet gear 152 for the 48 month locator drum 103.

307— Ratchet Pawl Return Spring

Said ratchet pawl return spring 307 has one end fast to a ratchet pawl holder which in turn is fast to the shaft 302 and the other end bent over the upper arm of the ratchet pawl 171 so as to yieldably maintain the latter

in engagement with the ratchet gear 158 for the day drum 2.

308— Ratchet Pawl Holder

Said ratchet pawl holder 308 which is slidably supported on the shaft 302 pivotally supports the ratchet pawl 171. The location of the pawl holder 308 is determined by the location of the locator bar 304 which carries a finger 304A which operates in an annular groove on the holder 308.

309A-309B— Ratchet Pawl Holders

Said ratchet pawl holders 309A and 309B are held axially spaced apart and fast to the shaft 302 by set screws. Each pawl is rotatably mounted on the rod 302 and disposed between said ratchet pawl holders 309A and 309B. The holder 309A is grooved to retain the ratchet return spring 306.

310— Attraction Plate

Said attraction plates 310 are each formed as a lateral projection on the upper arm of the respective ratchet pawl except the pawl 171 to provide a larger attraction mass for the respective electromagnet.

311— Attraction Plate

Said attraction plate 311 which is constructed the same as the attraction plates 310 is formed on the pawl 171.

171A— Lower Arm of the Day Pawl 171

Said lower arm 171A is angled in respect to the upper arm so that it will always be located on the area 158E on the gear 158 regardless of the position to which the upper arm is shifted so that the day drum will not rotate more than one gear tooth at a time.

313— Month Locator Kick Back Cam

Said kick back cam 313 constantly rotates with the shaft 301 to which it is made fast. At each month end change said cam 313 pushes upon the locator bar 304 so that the arm 304B thereon can drop into the proper locating groove on the drum 103. During the remainder of each month the cam 313 rotates over the locating end of said locating bar 304 without touching the same until the next month end change. Said cam 313 is located about three-fourths of a revolution behind drum 4F so as not to extend over the end 304B of said locating bar 304 when the latter is raised at the month end change.

314— Frame Part

Said frame part 314 is located at the lower front end of the instrument and serves to mount the time correction switches 217-229.

316— Frame Plate

Said frame plate 316 which is located on the left end of the instrument is made of see-through material, such as clear plexiglass, so that the left side of the drum 103 can be viewed from the outside of said instrument. Said frame plate 316 serves as a mount for a pivot support for a push lever 334. The drum 103 has an arrow 317 painted or engraved on the left end thereof which is visible through said frame plate 316. Said drum 103 can be pre-set to the proper year and month by pressing and releasing the switch 217 once for each month desired to be changed. Said left side 316 is provided with indicia thereon divided into four quadrants each with each of the 12 months and with every 4th year as shown in FIG. 32. The drum 103 is factory pre-set on the shaft 301 so that if the arrow 317 points to the present month which is in the quadrant containing the present year the

drum 103 will be correctly adjusted for leap year correction. If said arrow 317 points to the present month but is located in the wrong quadrant for the present year then an incorrect number of days will register on the gear 158 for the month of Feb. in Leap Year (28 days instead of 29) and one of the other three years will register a 29 day Feb. instead of a 28 day. When the arrow is set to point to the present month and in the quadrant which contains the present year it need never be re-set. Said instrument will always indicate the correct year, month, day, hour, second, A.M. or P.M. automatically without re-setting regardless of which year or which leap year comes around.

317— Arrow

Said arrow 317 is carried on the left end of the drum 103.

318— Electric Motor Means

Said electric motor means operates at a constant speed under load and has its drive shaft coupled to the power shaft 301 for rotatably driving the same.

319— Friction Bearings

Said friction bearings 319 maintain a constant rotative force on their respective drums. Except for the drum 4F said friction bearings 319 are disposed in the hubs of the other drums and are packed with a heavy lubricant 321 so as to offer resistance in the turning of the outer race of said bearing 319. When the outer race of said bearing 319 which is fast to its respective drum is held stationary, such as when the respective ratchet is engaged to the gear, the inner race turns with the shaft 301 while the projections 302 function like paddles in passing through the heavy lubricant. Upon the release of the respective gear by the respective ratchet, the respective drum instantly rotates and turns against the slight pressure of the respective contact pins 290-291 and against the slight resistance offered by the respective contact point trip levers when the latter close the respective contact points upon completion of the revolution of said drum.

320— Projections on Bearing Races

Said projections 320 are provided on the friction bearings 319 to operate in heavy lubricant so as to provide a yieldable rotative driving force between the races thereof.

321— Heavy Lubricant

Said lubricant 321 is carried between the races of the friction bearings to provide a yieldable rotative driving force therebetween.

322— Notches

Said notches 322 are formed in the frame plate 296 along an edge thereof defining the top wall of an elongated slot through which the spring pointers 297 are visible. Said notches 322 serve to locate and hold in place said spring pointers 297. Each said notch is centered in respect to a line carried on the frame plate 296. Said vertical lines are number or A.M./P.M. lines which indicate by the spring pointers 297 the locations of the respective contact pins and which contact bars on the drums will bridge the corresponding contact pins 290-291. Said notches 322 are a part of the alarm system of said instrument and function independently of the direct time reading system. The alarm settings which can be read off the plate 296 show the time the alarm is set to trigger whereas the time readings on the drums is the absolute or actual time and only at the instant of triggering of the alarm are the two readings identical.

323— Switch Support

Said switch support 323 is fastened by well known means to opposite ends of the instrument and serves as a mount for the contacts 191-203.

324— Contact Support

Said contact support 324 is fastened to the switch support 323 and formed of insulator material to hold the pairs of contacts 191-203 spaced apart.

325— Card Container

Said card container 325 is provided at the rear of the instrument to hold appointment cards. Each date of which one desires to be reminded is written on an appointment card. What is to be remembered at a future time is also marked on each card. The cards are kept in the card container 325 in chronological order according to the dates to be remembered with the first reminder date filed in front. The alarm system of the instrument is set preferably for a time prior to the time or date to be remembered to give ample warning, e.g. if the present date is Dec. 15, 1970 and the date and time to be reminded of is Mar. 2, 1971 at 3:30 P.M. the card may be marked as follows: Dentist appointment; Dr. Smith; for Arthur; Mar. 2, 1971; 3:30 P.M. The alarm may be set for 8:00 A.M. also to serve as a first reminder at which time the card would be replaced in the container and the alarm set for a second reminder, say at 2:30 P.M. or 3:00 P.M. When the alarm is given the front card is checked to ascertain as to what was to be remembered and the card for that particular appointment is then discarded. The alarm is then set for the time or date noted on the next subsequent card. While any number of cards can be filed in the container 325 the alarm is set only for the first card.

326— Knurled Ring

Said knurled ring 326 is provided on each cam roller 300 to facilitate manually turning the same when setting the alarm.

328— Friction Bearing

Said friction bearing 328 is a modified form of friction bearing in respect to the friction bearing 319 and includes an O-ring which fits snugly on the shaft 301 and on the inside diameter of the respective drum. Bushings are press fitted in the respective drum on each side of the O-ring. Said O-ring produces a yieldable rotative force on the respective drum as does the friction bearing 319.

329— Friction Bearing

Said friction bearing 329 is another modified form of friction bearing and includes a plug 329 which is spring pressed against the shaft 301. The spring pressure on the plug 329 may be adjusted by a set screw accessible from the outside cylindrical surface of the respective drum.

330— Bearings

Said bearings 330 are mounted in frame plates at opposite ends of the shaft 301 and rotatably support the same.

331— Ratchet Pawl Return Spring

Said ratchet pawl return spring 331 is associated with the ratchet pawls 166-170 and 172-177 and has one end fast to a ratchet pawl holder which in turn is fast to the shaft 302 and the other bent over the upper arm of the respective ratchet pawl.

334— Push Lever

Said push lever 334 pushes the locator bar 304 to its extreme right position, as viewed in FIG. 33, at each month end change in aid of the kick back cam 313 or

as an alternate thereof. Said push lever 334 is actuated upon energization of the electromagnet 335 at each month end change at the beginning of the upward movement of the locator bar 304 when it is lifted by the pawl 165. When the electromagnet 335 is energized the push lever 334 pivots on the pin 336 and the bar 304 is pushed to its extreme right position, as viewed in FIG. 33. When the drum 103 has completed its one gear tooth revolution at the month end change and the pawl 165 re-engages the gear 152 the electromagnet 335 is de-energized allowing the bar 304 to locate in the proper locating area on the drum 103.

335— Electromagnet

Said electromagnet 335 controls the actuation of the push lever 334 as explained.

336— Pivot Pin

Said pivot pin 336 pivotally supports the push lever 334.

337— Electrical Line

One end of each stator coil connects to an annular contact ring 339 mounted upon and insulated from the shaft 340.

338— Commutator

Said commutator is stationary on the stationary shaft 304 and brushes rotate around commutator 338.

339— Annular Contact Ring

Said annular contact ring 339 serves as a common connector means for said one ends of the stator coils and is connected to one of the power lines. Said contact ring 339 is insulated from the shaft 340 upon which it is mounted.

340— Stationary Shaft

Said stationary shaft 340 is fixed to the frame 350. The stator cores and the commutator 338 are pressed to said shaft 340. The follower 349 rotates on the shaft 304.

341— Spring Connector

Said spring connector 341 wipes against the rotating contact bar 342 and connects one of the power lines thereto.

342— Rotating Contact Bar

Said contact bar 342 is insulated from the gear 343 on one face of which it is mounted but is electrically connected to the brushes 344.

343— Gear

Said gear 343 is rotatably mounted upon said shaft 340 and is driven by a small motor 346. Said gear 343 in turn carries the brushes 344 around the commutator 338.

344— Commutator Brushes

Each of said commutator brushes 344 covers a commutator segment corresponding to a magnetized area on the stator 351. In the instance there are 6 brushes to correspond with 6 attraction plates 349A. The brushes 344 are radially slidable in respect to the shafts on which they are carried which shafts are fast to the inside face of the gear 343.

346— Small Constant Speed Motor

Said motor 346 is mounted upon the frame 350 and drives the gear 343 and the brushes 344 carried thereby. Said motor 346 determines the r.p.m. and direction of the follower 349 and its speed is independent of the load on the follower 349.

348— Constant Speed Motor

Said constant speed motor 348 can be used in place of the conventional constant speed motor 318 and is

described, *infra*, in connection with the operation of my invention.

349— generally designates the follower which is rotatably mounted upon the shaft 340 but held axially fast thereto by well known means and includes attraction plates 349A and follower end 349B.

349A— Attraction Plates

Circumferentially spaced apart attraction plates of the follower 349. Said plates 349A and the outer driving end 349B as well as the inner end (which is partially extended inside of the stator) are integrally joined.

349B— Follower End

Said follower end 349B is coupled to the power shaft 301 to rotatively drive the same.

350— Frame

Said frame 350 serves as a stationary support for the shaft 340 which is fixedly secured in the frame 350 and as a mount for the small constant speed motor 346.

351— Stator

Each section of said stator 351 comprises an iron core and a coil wound independently and connected to the commutator 338 and the bar 339. Said stator 351 provides a rotating magnetic field for the follower 349 to follow and thus produces a rotating magnetic field which is not affected by the world load on the follower 349. The magnetic field will maintain its constant speed of rotation around said armature 351 regardless of the world load on the follower 349.

352— Electrical Line

The other end of each stator coil connects to the commutator 338 by an electrical line 352.

353— Moveable Contact

Said moveable contact 353 is connected to one of the terminals of the auxiliary power source indicated, in the instance, as a battery. The other terminal of the auxiliary power source is connected to one of the electrical feed lines for the electrical motor 318 (or 348). An electromagnet 355 is wired in series with one of the main electrical feed lines for the motor 318 (or 348) and maintains open the switch constituting the contacts 353 and 354 to keep the auxiliary power source out of circuit. When the regular power which energizes the electromagnet 355 is turned on said contact points 353 and 354 are separated and my instrument derives its electrical power from the regular power source. Upon cutting off of the regular power source the electromagnet 355 is de-energized so that it releases said point 353 which instantly makes contact with the stationary point 354 thus connecting the auxiliary or battery power.

354— Stationary Contact

Said stationary contact 354 is connected to the other of the electrical feed lines for the electrical motor 318 (or 348).

355— Electromagnet

Said electromagnet 355 is wired in series with one of the main electrical feed lines for the motor 318 (or 348) and operates upon the moveable contact 353 to hold it open in respect to the stationary contact 354.

356— Brush Hold Down Springs

The brush hold down springs 356 yieldably maintain the respective brushes 344 against the commutator 338.

In operation of my invention, said instrument records the absolute or actual time as shown in FIG. 26 in that the month is shown in numerical notation 12 the year — 1970 the month is also shown as Dec.

the day — 31
 the hour — 11
 the minutes — 59
 the seconds — 59
 the correct one half of each day — P.M. and the
 week day — Thu.

In FIG. 26 it is noted that the alarm setting coincides with the actual time reading signifying that the alarm is energized at the particular instant flashing a signal light and/or sounding a buzzer.

The push button switches 217-229 are actuated to correct the actual time reading for any reason, e.g., after said instrument has stopped as during an electric power failure. Once set, said instrument requires no correction regardless of the number of days in the month or even on account of the occurrence of Leap Years.

The date and time are registered for visual reading of actual time on the faces of the drums 103, 4A, 4B, 4C, 4D, 1, 2, 3, 5A, 4E, 5B, 4F, 6 and 178. Sequential rotation of said drums registers the changing of time in seconds, minutes, hours, months and years without requiring re-setting or correction for any reason including the passing of Leap Years.

Considering the visual or actual time reading the above drums 103, 4A, 4B, 4C, 4D, 1, 2, 3, 5A, 4E, 5B, 4F, 6 and 178 have gears 152-164, respectively, attached thereto and the following elements associated therewith respectively:

ratchets 165-177
 electromagnets — 204-216
 contact points — 191-203
 contact trip levers 179-190
 time correction switches — 217-229

and identical friction bearings each of which in one form thereof is designated 319

The following is a description of the sequential rotation of said drums in the order and manner in which they rotate to show the actual time reading. The second drum 4F rotates with the shaft 301 which is rotatably driven at a constant speed by the conventional constant speed motor 318 or by my electrical motor 348. Upon completion of each revolution (10 seconds) of the drum 4F, the trip lever 190 closes the contacts 203 which energizes the electromagnet 214 thus releasing the pawl 175 which releases the gear 162 and permits the second drum 5B to rotate 1/6th of a revolution. On completion of each revolution of the drum 5B (1 minute) the trip lever 189 closes the contacts 202 to energize the electromagnet 213 which raises the pawl 174 to release the gear 161 and the drum 4E rotates 1/10th of a revolution. Upon the completion of a revolution (ten minutes) of the drum 4E, the trip lever 188 closes the contacts 201 to energize the electromagnet 212 and raise the pawl 173 to release the gear 160 which permits the drum 5A to rotate 1/6th of a revolution. Upon completion of a revolution of the drum 5A (1 hour) the trip lever 187 closes the contacts 200 to energize the electromagnet 211 which raises the pawl 172 to release the gear 159 which permits the hour drum 3 to rotate 1/24th of a revolution. Upon one-half of a revolution (12 hours) of the hour drum 3, the trip lever 186 closes the contacts 199 to energize the electromagnet 215 which raises the pawl 176 to release the gear 163 which permits the AM/PM drum 6 to rotate one-half of a revolution from A.M. to P.M. Upon completion of a revolution (24 hours) of the hour drum 3, the trip levers

184 and 185 close the contacts 197, 198 and 199, respectively. Closing of the contacts 199 energizes the electromagnet 215 and raises the pawl 176 to release the gear 163 which permits the AM/PM drum 6 to rotate a second one-half of a revolution from P.M. to A.M. Closing of the contacts 197 energizes the electromagnet 216 which raises the pawl 177 to release the gear 164 and the week day drum rotates 1/7th of a revolution or one week day. Closing of the contacts 198 energizes the magnet 210 which raises the pawl 171 to release the gear 158 which permits the day drum 2 to rotate 1 gear tooth or 1 day. Upon completion of a revolution (28, 29, 30 or 31 days) of the day drum 2, the trip lever 183 closes the contacts 195 and 196. Closing of the contacts 195 energizes the electromagnet 204 which raises the pawl 165 to release the gear 152 which permits the 48 month drum 103 to rotate 1/48th of a revolution or one month. Releasing of the gear 152 by the pawl 165 lifts the 48 month locator bar 304 to disengage said bar 304 from its location in drum 103. After the pawl 165 re-engages with the gear 152 the kick back cam pushes said locator bar 304 back and causes said bar to drop into a new month location on the drum 103. Location of said bar 304 determines the location of the pawl 171 on the gear 158. Closing of the contacts 196 energizes the electromagnet 209 which raises the pawl 170 to release the gear 157 which permits the 12 month drum 1 to rotate 1/12th of a revolution or one month. Upon completion of a revolution (one year) of the 12 month drum 1, the trip lever 182 closes the contacts 194 and energizes the electromagnet 208 which raises the pawl 169 to release the gear 156 which permits the units year drum 4D to rotate 1/10th of a revolution or one year. Upon completion of a revolution (10 years) of the units year drum 4D, the trip lever 181 closes the contacts 193 and energizes the electromagnet 207 which raises the pawl 168 to release the gear 155 which permits the tens year drum 4C to rotate 1/10th of a revolution or 10 years. Upon completion of a revolution (100 years) of the tens year drum 4C, the trip lever 180 closes the contacts 192 and energizes the electromagnet 206 which raises the pawl 167 to release the gear 154 which permits the hundreds year drum 4B to rotate 1/10th of a revolution or 100 years. Upon completion of a revolution (1000 years) of the hundreds year drum 4B, the trip lever 179 closes the contacts 191 and energizes the electromagnet 205 which raises the pawl 166 to release the gear 153 which permits the thousands year drum 4A to rotate 1/10th of a revolution or 1000 years. The thousands year drum 4A can rotate one full revolution or 10,000 years.

My instrument is a combination clock and calendar having long-range alarm capabilities as compared to the alarm range of the standard alarm clock or timer. One use of said instrument is as a reminder mechanism in the way similar to the use of a standard alarm clock, but this is where the similarity ends and the alarm range capabilities of my instrument continues. My instrument can be used as a reminder for a date or time any time in the future. The range of said instrument is 10,000 years. The alarm portion of said instrument can be quickly and easily set as a reminder for dates or appointments to be remembered which might otherwise be forgotten. Said instrument can be set to alarm at or shortly before said time. The alarm can be set as a reminder for birthdays, anniversaries, dates, doctor or dentist appointments, PTA meetings, drivers' license

renewal dates, teenage dates, club meetings or the like.

Considering now the alarm function of the instrument, the cards stating the necessary information regarding the date to be reminded of may be filed in the container portion 325 at the rear of said instrument in chronological order.

The reminding date on the first card only is set on the instrument by positioning the contact pin switches 230-244 to give an alarm. When the pre-set alarm time set on said instrument coincides with the absolute or actual time the alarm is triggered and the card is read and then discarded. The alarm is then set for the time noted on the next subsequent card.

My instrument can be operated by any constant speed motor geared down to produce a low constant speed output preferably 6 rpm, but to insure such constant speed output the constant speed motor 348 shown in FIGS. 35 and 36 is used to drive the shaft 301. In the use of said motor 348 the shaft 301 is made fast to the portion 349B of the follower 349 which portion 349B rotates with said follower 349. The attraction plates 349A are made to chase respective magnetic fields which are caused to rotate around the stator 351 by current fed to the stator coils by the plurality of rotating brushes 344 which act upon the commutator 338 to simultaneously magnetize a plurality of individual areas of the stator 351 which areas rotate therearound as the brushes 344 rotate around the commutator 338.

FIGS. 38-40 and 45 are, respectively, side elevational, fragmentary front elevational and top plan with parts in section, and front elevational views of a modified form of alarm system used in embodiments of my invention;

FIGS. 42-41 are, respectively, side elevational and fragmentary front elevational with parts in section views of a modified form of rotatable support means for alarm drums used in embodiments of my invention.

FIGS. 43-44 and 46-47 are, respectively, fragmentary side elevational and top plan views of a modified form of ratchet gear movement controlling means;

FIG. 48 is a front elevational view with parts removed of a modified form of horological instrument embodying my invention;

FIGS. 49-52 and 53-56 and 59 are, respectively, end elevational and top plan and front elevational views of time drum moving means used in said modified form of embodiment;

FIGS. 57 and 58 are side elevational views with parts cut-away and in section of a day drum moving means used in said modified form of embodiment.

Referring to FIGS. 38-47 of the drawings in greater detail, the same shows in FIGS. 38-40 and 45, a modified form of an alarm system; in FIGS. 41-42, a modified form of rotatable support means for alarm drums; and in FIGS. 43-44 and 46-47, a modified form of ratchet gear movement controlling means.

The descriptions of said modifications are described in conjunction with the respective reference numerals assigned thereto which are listed hereinafter.

357 — Circular Disks

said circular disks 357 are formed of non-conductive material and rotate on said shaft 301 when individually actuated by one's finger tips applied to knurled edges 360 of said disk 357. The numbering on each such disk corresponds to its respective absolute time drum, e.g., said disk 357 corresponds to the numbering on second drum 5BB and when disk 357 is set at "0" the reading

which is visible on the drum 5BB when the alarm is energized is also 0.

357A — Modified Forms of Circular Disks

Said circular disks 357A are similar to said disks 357 and each is supported for rotation by three circumferentially spaced apart rollers 366, 366A and 366B which are supported for rotation by stationary axles 365, 365A and 365B, respectively.

358, 359 and 358A, 359A — Contact Rings

Said contact rings 358, 359 and 358A, 359A are formed of conductive material and bonded to said circular disk 357 and 357A, respectively. Each said contact ring 359 and 359A carries a contact arm 359B and 359C, respectively, which is moveable toward and away from said disks 358 and 358A, respectively, for closing and opening, respectively, an electrical circuit.

360 and 360A — Knurled Edges

Said knurled edges 360 and 360A are provided on opposite peripheral edges of said disks 357 and 357A, respectively, to facilitate their manual finger tip turning to any desired rotational position.

361, 362 — Contact Fingers

Said contact fingers 361, 362 are provided with in-turned ends which are spring pressed against said contact rings 358 and 359, respectively, and serve as electrical conductors and also as brake means to prevent the respective disk 357 from rotating except when the latter is manually rotated.

363 — Insulator Body

Said insulator body 363 serves as a mount for said spring fingers 361 and 362 and insulates them from each other. Said insulator body 363 is made fast to a shaft 364. 364 — Shaft

Said shaft 364 serves as a mount for said insulator bodies 363.

365, 365A and 365B — Axle Shafts

Said axle shafts 365, 365A and 365B which are supported by suitable stationary structure are equally circumferentially spaced apart and serve as mounts for rollers 366, 366A and 366B, respectively.

366, 366A and 366B — Rollers

Said rollers 366, 366A and 366B rotate on said axle shafts 365, 365A and 365B, respectively, for rotatably supporting the respective disk 357A and are each provided with flanges on opposite ends thereof for holding said disk 357A.

367 — Trip Arms

Said trip arms 367 are made fast to the respective absolute time drums as shown for the drum 5BB in FIGS. 39 and 45 and each projects laterally for actuating the respective arm 359B or 359C between open and close positions when said absolute time drum rotates to alarm position.

368 — Electromagnets

Each said electromagnet 368 is energized at the proper time in the sequential rotation of the respective absolute time drums as shown in FIG. 7 and when energized pulls a stop plate 369 rearwardly to a non-stop position and at the same time via a pivot lever 373 pushes a stop plate 370 to a stop position.

369, 370 — Stop Plates

Said stop plates 369, 370 are each bent at right angles and slotted for sliding movement and have normal stop and non-stop positions.

371 — Stationary Plates

Said stationary plates 371 are each provided with an aperture in the main body thereof through which a fas-

tener 375 extends and with two spaced apart ears at its rear-end having concentric apertures therein.

372 — Pivot Pins

Said pivot pins 372 are disposed in said concentric apertures in said ears of said stationary plate 371.

373 — Pivot Levers

Said pivot levers 373 are each rotatably carried on the respective pivot pin and are disposed between said ears of said stationary plates 371 and has upper and lower arms operative against said stop plates 369 and 370, respectively.

374 — Return Springs

Said return springs 374 each has one end wrapped about a pin fast on a bracket 376 and its other end operative against the lower end of said stop plate 370 to push the same against the lower arm of said pivot lever 373.

375 — Fasteners

Said fasteners 375 each extends through the apertures on said stop plates 369 and 370 and through said stationary plate 371 and is threadably engaged with said bracket 376.

376 — Brackets

Said brackets 376 are each supported by a shaft 377 extending therethrough and carries said stop plates 369 and 370 and said stationary plate 371 between spaced apart arms thereof. Said bracket 376 holds said return spring 374.

377 — Shaft

Said shaft 377 is comparable to said ratchet pawl rod 302 and supports said bracket 376 which is made fast thereto by a set screw as shown.

In operation of said modified form of alarm system alarm drums each as constructed in accordance with the alarm drum 358 is made fast to the shaft 301 so that it ordinarily rotates therewith but the fingers 361 and 362 hold the same fast against rotation so that the alarm drum remains in a fixed position wherever set at the desired alarm setting. When the adjacent absolute time drum reaches a corresponding position of rotation to that at which the alarm drum is set said trip arm 367 moves the contact member 359B to close position in respect to the contact plate 358 and closes the alarm circuit for the respective alarm drum. In the case of the alarm drum 357A the same does not have to be held against rotation since no rotary driving force is applied thereto as said drum 357A is rotatably supported by the circumferentially spaced apart rollers 366, 366A and 366B as before described and remains in a fixed position until such time as said drum 357A is set to the desired alarm setting. The contact member 359C is closed in respect to the contact plate 358A by the trip arm 367 on its adjacent absolute time drum.

In operation of said ratchet gear controlling means shown in FIGS. 43-44 and 46-47 the stop plate 369 normally holds the respective ratchet gear against rotation as shown for the ratchet gear 161 in FIGS. 43 and 44. Upon energization of the electromagnet 368 the stop plate 369 is retracted and simultaneously the stop plate 370 is extended so that the extent of rotation of the ratchet gear 161 is limited to one gear tooth. Following de-energization of the electromagnet the stop plate 369 is pushed into stop position by the action of the turn spring 374 so as to maintain the respective ratchet gear stationary until the aforesaid steps are repeated upon energization of the electromagnet 368 a subsequent time.

Referring to FIGS. 48-58 of the drawings in greater detail, the same shows a modified form of a horological instrument embodying my invention which is described in conjunction with the respective reference numerals assigned thereto which are listed hereinafter.

301A — Stationary Shaft

Said stationary shaft 301A is made fast to said frame 316 and supports said absolute time and alarm drums and said 48 month locator drum 103A for rotation thereon. Said shaft 301A also supports pivot plates 393, 393A-H, 393J for partial rotation thereon.

318A — Electric Motor Means

Said electric motor means 318A which may be a conventional constant speed motor or the constant speed motor 348 operates at a constant speed under load and has its drive shaft coupled to the gear 163A for rotatably driving the same at a constant speed.

367A — 367H, 367J — Trip Arms

Said trip arms 367A-367H, 367J are comparable to said trip arm 367.

378 — Motor Shaft

Said motor shaft 378 is driven by said electric motor means 318A and carries said gear 163B thereon.

379, 379A — Second Drums

Said second drums 379, 379A are, respectively, absolute time and alarm drums and are numbered consecutively from 0 to 59. Each said absolute time drum except drum 379 is rotated on said shaft 301A one gear tooth segment of rotation at a time by its respective ratchet gear. Each said absolute time drum except drums 178A and 387 carry at least one trip lever fast thereon. Hour drum 381 carries two such trip levers 184A and 185A. Each said alarm drum is manually rotatable on said shaft 301A to any 360° rotational position.

380, 380A — Minute Drums

Said minute drums 380 and 380A are, respectively, absolute time and alarm drums and are numbered consecutively from 0 to 59. 381, 381A — Hour Drums

Said drums 381 and 381A are, respectively, absolute time and alarm drums and are numbered consecutively from 12 a.m. to 11 a.m. and from 12 p.m. to 11 p.m.

382, 382A — Day Drums

Said day drums 382 and 382A are, respectively, absolute time and alarm drums and are numbered consecutively from 1 to 31.

178A — Weekday Drum

Said weekday drum 178A is an absolute time drum and is suitably lettered to show the days of the week.

383, 383A — Month Drums

Said month drums 383 and 383A are, respectively, absolute time and alarm drums and are suitably lettered to show the months of the year.

384, 384A — Units Year Drums

Said units year drums 384 and 384A are, respectively, absolute time and alarm drums and are numbered consecutively from 0 to 9.

385, 385A — Tens Year Drums

Said tens year drums 385 and 385A are, respectively, absolute time and alarm drums and are numbered consecutively from 0 to 9.

386, 386A — Hundreds Year Drums

Said hundreds year drums 386 and 386A are, respectively, absolute time and alarm drums and are numbered consecutively from 0 to 9.

387, 387A — Thousands Year Drums

Said thousands year drum 387 and 387A are, respectively, absolute time and alarm drums and are numbered consecutively from 0 to 9.

388 — Ratchet Pawl

Said ratchet pawl 388 which, via a pin 411, is pivotally carried on and moves with said pivot plate 393F has a trip end 388A which operates upon points of a switch 389 and has a pawl end operative upon said ratchet gear 158G to push the same one gear tooth rotation at a time and another end 388B which is engaged by a month locator part 410A by which said pawl 388 is moved axially in respect to said shaft 301A.

389 — Switch

Said switch 389 energizes the respective solenoid for the solenoid plunger 392 to index via the ratchet gear 158G the day drum 382 one gear tooth rotation at a time until the pawl end 388 is located in the gear tooth corresponding to the first day of the next subsequent month. Said switch 389 which is actuated only at 28, 29 and 30 day month end changes is wired in parallel with the particular contacts 390A and 340B actuated at the end of every 24 hours by the trip lever 184A on the hour drum 381.

390A, 390B — Switch Contacts

Said switch contacts 390A and 390B are, respectively, stationary and moveable contacts each of a delayed action mechanism shown in FIGS. 51-56. Each said switch contact 390B is carried on the free end of a flexible arm supported by the respective non-conductive body 407.

391 — Solenoids

Said solenoids 391 each actuates a plunger 392 to index a ratchet gear one gear tooth rotation at a time.

392 — Plungers

Said plungers 392 are solenoid plungers of the solenoids 391 and each has a threaded portion and an end 392A pivotably connected to a pin 395.

392B — Plunger

Said plunger 392B is a solenoid plunger of a solenoid like each of the solenoids 391 and is constructed like each of the plungers 392.

393, 393A-393E, 393G-393H, 393J — Pivot Plates

Said pivot plates 393, 393A-393E, 393G-393H, 393J are pivotally supported on said shaft 301A and are pivoted by said plungers 392.

393F — Pivot Plate

Said pivot plate 393F is pivotally supported on said shaft 301A and is pivoted by said plunger 392B.

394 — Slots

Said slots 394 are provided in the respective pivot plates and accommodate said pins 395 so that the positions of the plunger ends 392A may be adjusted in respect to said pivot plates.

395 — Pivot Pins

Said pivot pins 395 are made fast to the respective pivot plate by respective lock nuts 396 and extend through said respective slots 394.

396 — Lock Nuts

Said lock nuts 396 are each recessed into the respective pivot plate so as not to protrude therefrom and locks the respective pin 395 to said pivot plate.

397, 398 — Stops

Said stops 397 and 398 are each threadably engaged on the threaded portion of the respective plunger 392 and act in conjunction with a respective stop bar 399 to regulate the length of travel of the respective plunger 392.

399 — Stop Bars

Said stop bars 399 are suitably mounted on said frame 316 and each acts in conjunction with the respective stops 397 and 398 to regulate the length of travel of the respective plunger 392.

400, 400A-400H — Ratchet Pawls

Said ratchet pawls 400, 400A-400H which are pivotally carried on and move with said pivot plates 393, 393A-393E, 393G-393H, 393J, respectively, are operative upon ratchet gears 156A-152A, 157A, 159A, 160A and 164A, respectively, to push the same one gear tooth rotation at a time.

401 — Tension Springs

Said tension springs 401 each return the respective plunger 392 to its retracted position upon de-energization of the respective solenoid 391.

402 — Holding Springs

Said holding springs 402 each holds the respective pawl in engagement with the respective ratchet gear.

403 — Pivot Arms

Said pivot arms 403 each pivots on a pin 404 and has a trip end 403A by which said pivot arm is actuated and a presser end 403B which acts upon a sponge rubber member 413.

404 — Pivot Pins

Said pivot pins 404 which pivotally support the respective pivot arms 403 are each fast to and supported by a respective nonconductive body 407.

405 — Shaft

Said shaft 405 which is fast to said frame 316 stationarily supports a solenoid 408 and slidably supports a month locator bar 410.

406 — Shaft

Said shaft 406 is made fast to said frame 316 and holds said non-conductive bodies 407 fast thereon.

407 — Non-Conductive Bodies

Said non-conductive bodies 407 are fast to and supported by said shaft 406 and each supports the respective switch contacts 390A and 390B.

408 — Solenoid

Said solenoid 408 is energized by the action of a trip lever 183A on said day drum 382 when the same completes 31 gear teeth rotations.

409 — Switch Contacts

Said switch contacts 409 are normally open and made to close at each month end change by said locator bar 410 to energize the respective solenoids 391 for the 48 month locator drum 103A and for the month drum 383.

410 — Month and Locator Bar

Said month end locator bar 410 is moveable on said shaft 405 and fast to the plunger of said solenoid 408 has a pawl moving portion 410A, a switch closing portion 410B and a month end locating portion 410C.

411 — Pin

Said pin 411 is fast to said pivot plate 393F and pivotally supports said pawl 388 so that the same moves with said pivot plate 393F.

412 — Tension Spring

Said tension spring 412 returns the solenoid plunger of said solenoid 408 to its retracted position upon de-energization of said solenoid 408.

413 — Sponge Rubber Members

Said sponge rubber members 413 are affixed to said presser ends 403B and operate to delay opening of the respective switch contacts 390A and 390B.

414 — Flat on Ratchet Gear 158G

Said flat 414 is located in the 28 day month gear area on said ratchet gear 158G and is disposed behind the raised 28 day gear tooth on said ratchet gear 158G but its height is equivalent to the root of each of the 31 raised gear teeth on said ratchet gear 158G. There are four other such flats (not shown) behind the 29 and 30 day gear teeth, respectively.

103A — Modified form of 48 Month Locator drum 103

Said drum 103A is constructed with said locator notches 104–151 and is supported for rotation on said shaft 301A and is numbered consecutively from 1 to 12 four successive times.

152A — 48 month ratchet gear; 48 teeth; rotates drum 103A

153A — 0 1000's year ratchet gear; 10 teeth; rotates drum 387

154A — 100's year ratchet gear; 10 teeth; rotates drum 386

155A — 10's year ratchet gear; 10 teeth; rotates drum 385

156A — units year ratchet gear; 10 teeth; rotates 384

157A — month ratchet gear; 12 teeth; rotates drum 383

159A — hour ratchet gear; 24 teeth; rotates drum 381

160A — minute ratchet gear; 60 teeth; rotates drum 380

163A — second gear; 60 teeth; rotates drum 379

164A — day ratchet gear; 7 teeth; rotates drum 178A

158G — Day ratchet gear

Said ratchet gear 158G has 31 raised gear teeth and also different gear teeth areas to accommodate 28, 29, 30 and 31 day months and controls the rotation of said day drum 382. Said gear 158G in its 28 day gear teeth area is provided with 28 raised gear teeth and two lowered teeth forming three lowered roots corresponding to the 29th, 30th and 31st days of a month; in its 29th day gear teeth area with 29 raised gear teeth and one lowered tooth forming two lowered roots corresponding to the 30th and 31st days of a month; in its 30 day gear teeth area with 30 raised gear teeth and with no lowered tooth but having one lowered root corresponding to the 31st day of a month; and in its 31 day gear teeth area with 31 raised gear teeth and no lowered gear and not having any lowered roots. Said ratchet gear 158G has three flats, one in each of its 28, 29 and 30 day gear teeth areas, behind the 28th, 29th and 30th gear teeth, respectively. As shown in FIGS. 57 and 58 for the 28 gear tooth area the flat 414 is behind the 28 day gear tooth and ahead of three lowered roots as shown therein. Said three lowered roots will be hereinafter referred to as the first, second and third lowered roots. In the 29 day gear teeth area its respective flat is behind the 29 day gear tooth and ahead of only two lowered roots, being the second and third lowered roots. In the 30 day gear teeth area its respective flat is behind the 30 day gear tooth and ahead of only one lowered root, being the third lowered root. In the 31 day gear teeth area there is no flat and no lowered root and the 31 day gear tooth is immediately adjacent the 1st day gear tooth for the successive month. The crest of each such lowered gear tooth has a height equal to the root of each of the 31 gear teeth on said ratchet gear 158G which latter height is the same height also as that of said three flats.

163B — Gear

Said gear 163B is made fast to said motor shaft 378 and transmits power therefrom to said gear 163A.

179A–185A, 188A, 190A — Trip Levers

Said trip levers 179A–185A, 188A, 190A act upon the respective trip ends 403A to close the respective contacts 390A and 390B.

In operation of the modified form of a horological instrument shown in FIGS. 48–58, said electric motor means 318A rotates said shaft 378 which in turn rotates, via said gears 163B and 163A, said second drum 379 at one revolution per minute. Upon completion of each revolution of said second drum 379 the trip lever 190A carried thereon actuates the corresponding trip end 403A which compresses said member 413 causing the corresponding contacts 390A and 390B to close which energizes the corresponding solenoid 391 whereupon its plunger 392 is pushed to its extended position to rotate said pivot plate 393H which moves the pawl 400G to index said ratchet gear 160A and the minute drum 380 one gear tooth rotation. Upon completion of each revolution of the minute drum 380 the trip lever 188A actuates the corresponding trip end 403A which ultimately energizes the corresponding solenoid 391 and indexes said ratchet gear 159A and said hour drum 381 one gear tooth rotation as before described. Upon completion of each revolution of the hour drum 381 the trip levers 184A and 185A actuate the corresponding trip ends which ultimately energize, respectively, the corresponding solenoid 391 and the solenoid for the solenoid plunger 392B to index, respectively, said ratchet gears 164A and 158G and said day drum 382 and said weekday drum 178A each one gear tooth rotation.

Near the end of each revolution of said day drum 382 the pawl 388 locates onto the respective flats and into lowered roots on said ratchet gear 158G as follows:

In a 28 day month at midnight of the 27th day the pawl end of the pawl 388 locates onto the flat 414 behind the 28th day tooth and remains there until midnight of the 28th day and thereupon the trip lever 185A on the hour drum 381 actuates the trip end 403A to energize the respective solenoid for the solenoid plunger 392B to rotate said ratchet gear 158G one gear tooth rotation and immediately the pawl end of said pawl 388 locates in succession into the first through the third lowered roots whereupon said trip end 388A closes the switch 389 three successive times and energizes its respective solenoid for the solenoid plunger 392B three successive times to rotate said ratchet gear 158G three successive lowered root rotations making a total of four gear teeth rotations in all. The solenoid for the plunger 392B remains energized for a given time due to the delayed action mechanism described (or any standard delayed action mechanism) to allow said ratchet gear 158G to rotate one gear tooth rotation so that upon de-energization of said solenoid the pawl end of said pawl 388 is located in the proper gear tooth on said ratchet gear 158G, particularly in the proper lowered root thereon. Said switch 389 cannot be closed when the pawl end of said pawl 388 is on the flat 414 or in any one of the 31 raised teeth on said ratchet gear 158G. When said ratchet gear 158G rotates four total gear teeth rotations the pawl end of said pawl 388 locates in the next raised gear tooth behind the third lowered root which raised gear tooth is the first day gear tooth of the next month.

In a 29 day month at midnight of the 28th day the pawl end of said pawl 388 locates onto the flat behind the 29th day tooth and remains there until midnight of the 29th day and thereupon the trip lever 185A on the hour drum 381 actuates the trip end 403A to energize the respective solenoid for the solenoid plunger 392B to rotate said ratchet gear 158G one gear tooth rotation and immediately the pawl end of said pawl 388 locates in succession into the second and third lowered roots whereupon said trip end 388A closes the switch 389 two successive times and energizes its respective solenoid for the solenoid plunger 392B two successive times to rotate said ratchet gear 158G two successive lowered root rotations making a total of three gear teeth rotations in all. When said ratchet gear 158G rotates three total gear teeth rotations the pawl end of said pawl 388 locates in said next raised gear tooth which is the first day gear tooth of the next month.

In a 30 day month at midnight of the 29th day the pawl end of said pawl 388 locates onto the flat behind the 30th day tooth and remains there until midnight of the 30th day and thereupon the trip lever 185A on the hour drum 381 actuates the trip end 404A to energize the respective solenoid for the solenoid plunger 392B to rotate said ratchet gear 158G one gear tooth rotation and immediately the pawl end of said pawl 388 locates in succession into the third lowered root whereupon said trip end 388A closes the switch 389 one time and energizes its respective solenoid for the solenoid plunger 392B once to rotate said ratchet gear 158G one lowered root rotation making a total of two gear teeth rotations in all. When said ratchet gear 158G rotates two total gear teeth rotations the pawl end of said pawl 388 locates in said next raised gear tooth which is the first day gear tooth of the next month.

In a 31 day month at midnight of the 30th day the pawl end of said pawl 388 falls into the next raised gear tooth (31 day gear tooth) and remains there until midnight of the 31st day and thereupon the trip arm 185A on the hour drum 381 actuates the trip end 403A to energize the respective solenoid for the solenoid plunger 392B to rotate said ratchet gear 158G one gear tooth rotation and immediately the pawl end of said pawl 388 locates in the next gear tooth which is the first day gear tooth of the next month. Each time when the ratchet gear 158G completes 31 gear teeth rotation (at each month end change whether the month is a 28, 29, 30 or 31 day month) the trip lever 183A on the day drum 382 acts via the trip end 403A and the contacts 390A and 390B to energize the solenoid 408 which moves the locating portion 410C off the 48 month locator drum 103A and shifts the pawl 388 to the extreme right and closes the contacts 409 which energizes two solenoids 391 to index, respectively, said ratchet gears 157A and 152A and said month drum 383 and said month locator drum 103A one gear tooth rotation. Said solenoid 408 remains energized for a given time due to the delayed action as described (or any standard delayed action mechanism) to allow said locator drum 103A to rotate one gear tooth rotation so that upon de-energization of said solenoid 408 said portion 410C is located in the proper notch of the 48 notches on said locator drum 103A corresponding to the number of days in the next subsequent month.

Upon completion of each revolution of the month drum 383 the trip lever 182A actuates the corresponding trip end 403A which ultimately energizes the corre-

sponding solenoid 391 and indexes said ratchet gear 156A and said units year drum 384 one gear tooth rotation. Upon completion of each revolution of the units year drum 384 the trip lever 181A actuates the corresponding trip end which ultimately energizes the corresponding solenoid 391 and indexes said ratchet gear 155A and said tens year drum 385 one gear tooth rotation. Upon completion of each revolution of said tens year drum 385 the trip lever 180A actuates the corresponding trip end 403A which ultimately energizes the corresponding solenoid 391 and indexes said ratchet gear 154A and said hundreds year drum 386 one gear tooth rotation. Upon completion of each revolution of said hundreds year drum 386 said trip lever 179A actuates the corresponding trip end 403A which ultimately energizes the corresponding solenoid 391 and indexes said ratchet gear 153A and said thousands year drum 387 one gear tooth rotation.

Alarm drums 379A-387A are associated with said absolute time drums 379-387, respectively. Said alarm drums 379A-387A can be constructed the same as said disks 357 or 357A and disposed about said stationary shaft 301A. If the disks 357 are used the fingers 361 and 362 are not required to perform a braking function since said disks 357 would not rotate. Each of said alarm drums 379A-387A is manually rotated to the desired alarm setting. Each circuit of said alarm drums 379A-387A may include a manually operated stay on-off switch in series circuit with the respective alarm switches 359B or 359C/358, 358A so that one or more of said alarm drums may be de-activated to vary the time range over which my alarm system is operative. Upon each revolution of the hour drum 381, for example, the trip arm 367G thereon activates the respective moveable contact 359B or 359C to close in respect to the contact ring 358 or 358A at the alarm setting to which the respective alarm drum 381A was previously manually rotated and a like action takes place with the other absolute time and corresponding alarm drums such that when the circuits of all said alarm drums 379A-387A are closed by the action of said trip arms 367J, 367H-367A, respectively, upon contact members 359B or 359C to make the latter contact said contact ring 358 or 358A the alarm is activated to flash a signal light and/or sound a buzzer at the time corresponding to the pre-set alarm settings for said alarm drums 379A-387A.

It will thus be seen that there has been provided by my invention improvements in electromechanical systems particularly useful in horology in which the object hereinabove set forth, together with many thoroughly practical advantages, has been successfully achieved. While preferred embodiments of my invention have been shown and described it is to be understood that variations and changes may be resorted to without departing from the spirit of my invention as defined by the appended claims.

The following are examples of such variations and changes:

a. Said pairs of contact pins 290, 291 may be replaced by a single upwardly spring-biased pin which may be provided with a magnetic bottom end which will be magnetically attracted to the respective contact bars 7-102 and ride upon them to close a switch for the particular contact bar as the respective drum rotates. When all the magnetic pins are attracted by the pre-selected respective contact bars all switches are closed

to complete a circuit and current passes from one switch to the other to trigger the alarm.

b. Each said metal contact bar may be disposed in a groove having ramps at the forward and rearward ends thereof. In this arrangement each pair of switch pins 290-291 is replaced by a single downwardly spring-biased pin having a hemispherical bottom end which travels on the respective said ramps and groove to close a switch for the particular contact groove as the respective drum rotates. When all the pins are located in the pre-selected respective grooves the alarm is triggered as before described.

c. Said pairs of pins 290-291 and their respective holders 230-244 may be replaced by pairs of downwardly spring-biased pins in stationary holders which do not move axially in respect to said shaft 301. Each pair of pins would correspond to one of the required digits of each numbers place and all of the pins for a given drum would ride on the outside surface thereof so that each pair of pins is capable of being bridged by its corresponding contact bar at a predetermined rotational position of the respective drum. Said pair of pins would be electrically connected in an electrical circuit similar to that shown in FIG. 34 except for that each pair of pins would be a normally open alarm selection switch which would be closed manually during the setting of the alarm as the desired digit for each numbers place is selected. Then as the drums rotate sequentially only the pairs of pins corresponding to the selected digits are able to make a circuit through their respective alarm selection switches and then at the pre-selected advance position of the drums the bridging of such pairs of pins completes a circuit which includes such bridged pairs of pins in series circuit with each other to trigger the alarm as before described.

d. Each pair of pins 290-291 would be replaced by a single pin and all such pins would be carried on a common holder instead of individual holders for each pair thereof. Said pins would have no individual up or down movement but all would be commonly downwardly spring-biased against the respective drums. Each pin would be adjustable as to number location as to pre-setting the alarm setting. Said drums would be provided with grooves of the same length and width as said respective contact bars. When all said pins are disposed over the pre-selected respective grooves the common holding means for said pins drops downwardly which movement is utilized to close a switch to trigger the alarm. Immediately thereafter said common holding means is actuated upwardly to raise the pins so that the drums can continue to rotate.

e. Said drums except drums 103 and 178 would be provided with radially projecting fins in the same locations and of the same lengths and widths as said contact bars 7-102 and instead of said contact pins an edge-punched card is used having slots punched inwardly from the lower edge thereof large enough to project over the projecting fins. Said slots are punched in accordance with the pre-selected alarm setting, somewhat as in the manner as said contact pins are pre-set to the desired alarm setting. Said card would be held in a downwardly spring-biased card holder so that the punched slots thereon would be positioned in the same relative alarm settings as the pins 290-291. As the drums rotate in normal sequence the fins thereon would line up in the slots on said card similarly as the pins 290-291 line up with said contact bars 7-102.

When all edge-punched slots on said card are in line with said pre-selected respective fins the card drops downwardly which movement is utilized to close a switch to trigger the alarm.

f. If instances where extreme precision is required the trip lever 190A on the second drum 379 can be arranged to break a light beam (thereby dispensing with the contacts 390A-390B and related mechanical structure) so as to break an electric circuit of an electric eye so any possible error from the action of any mechanical parts is eliminated.

g. Said constant speed motor 346 may be replaced by a variable speed motor when it is desired to use the electrical motor means 348 for applications other than a constant speed application in which case said motor means 348 would be a variable speed constant torque motor means, the torque output of which would not diminish with its speed output, as is the case with present day variable speed motors since the power to the stator coils of the stators 351 remains constant.

h. A day number drum or three such drums may be provided to register the number of days which have elapsed each year. If a single day number drum is provided it would be consecutively numbered from 1-366 and its rotation would be controlled by the hour drum so that at the end of each 24 hours it would complete 1 segment of rotation. At the end of each consecutive 12 months as may be sensed by the consecutive notches on the 48 month locator drum or by a comparable mechanism the control by the hour drum would be overridden and at each year end change for a non-leap year said day number drum would be rotated so as to move from registering 365 days to 1 day and at each year end change for a leap year said day number drum would remain under control of said hour drum so as to rotate one segment of rotation. If three day number drums are provided they would be sequentially rotated commencing with a units drum consecutively numbered from 0-9, the rotation of which would be controlled by the hour drum so that at the end of each 24 hours it would complete 1 segment of rotation and it in turn would control a tens drum consecutively numbered from 0-9 which in turn would control the rotation of a hundreds drum consecutively numbered from 0-3. At the end of each consecutive 12 months as may be sensed by the consecutive notches on the 48 month locator drum or by a comparable mechanism the control of the hour drum and of the units and tens day number drum would be overridden and at each year end change for a non-leap year all three said day number drums would be simultaneously rotated so as to move from registering 365 days to 001 days and at each year end change for a leap year they would be simultaneously rotated so as to move from registering 366 days to 001 days.

i. My instrument could be used to remotely energize direct reading signs such as on outdoor billboards as by lighting up banks of lights so as to illuminate individual letters or numbers of such size as can be seen from whatever distance is desired. Such signs would tell the viewer, in addition to the hour and minute of the day, the number of seconds, whether it is A.M. or P.M., the particular day of the week, the day of the month, the month of the year and whatever other time information is desired to be illuminated. This could be accomplished by providing each time drum with a trip arm similar to the trip arm 367 and by providing an adjacent

stationary drum similar to the alarm drums shown in FIGS. 38-40 but which stationary drum would have equally circumferentially spaced apart switches, each made up of a moveable contact arm 359B and a separate stationary contact plate similar to the plate 358. The circumferentially spaced apart switches on each stationary drum would be insulated from each other. The moveable contact arms like the arms 359B and the corresponding stationary contact plates would be electrically connected to separate banks of lights so arranged as to illuminate time information corresponding to the time information on the time drum, as for example, the digits 0-9 which would be sequentially illuminated in accordance with the rotation of the respective drum.

j. The alarm system of my instrument can be used in connection with the operation of machinery or vehicles by being associated with sequentially rotating counting drums which may count, for example, units of production or hours of operation in the case of machinery or distance traveled in the case of vehicles for effecting a desired result after a predetermined number of units are counted, such as terminating a given operation or giving off an alarm for reminder purposes. Alarm drums the same as shown in FIGS. 38-40 would be provided corresponding to the sequentially rotating counting drums and each alarm drum would have alarm positions corresponding to the number of digits on the respective counting drum. Each alarm must be arranged to have its respective switch 359B, 358 closed by a trip arm similar to the trip arm 367 upon completion of each revolution of the respective counting drum at the point thereof corresponding to the pre-selected said gears carrying said trip arms and said alarm drums would be rotatable on a shaft separate from and disposed parallel to the shaft rotatably carrying the counting drums alarm setting. These trip arms can be provided on gears side by side with the alarm drums which mesh with the gears rotatably driving the counting drums. When all of the switches on the alarm drums are closed corresponding to the pre-selected alarm setting a circuit is completed and current passes from one switch to the other to energize the alarm. In this way a vehicle owner, for example, can set my alarm system to a predetermined future odometer reading in respect to the present odometer reading on the particular vehicle to energize a light or buzzer to remind the owner in respect to any given maintenance operation. In the case of machinery my alarm system can terminate an operation or give off an alarm at a given production count or after a given number of revolutions per minute or hours of operation.

k. My instrument can be used in connection with the operation of sequentially rotating counting or time drums as described in paragraph j) above in another way which employs sequentially rotating time drums of my system, e.g. time drums 384-387 as combined alarm and time or counter drums but without their corresponding alarm drums. Said drums would be arranged on a common shaft, so that one of the end drums thereof would have its respective ratchet gear replaced by a driving gear which meshes with a gear on one of the end drums of the production counting or time drum in such a way that the drums of my system rotate in the opposite direction of the time or counting drums. Said end drum of my system would be constructed in re-

lation to its driving gear so that the two would rotate together at all times but said end drum would have adjusted rotational positions in respect to its driving gear corresponding, for example, to the number of digits thereon. Of course the other drums of my system together with their respective ratchet gears would each be independently rotatable on said shaft. The drums of my system would each be provided with trip levers like the trip levers 179-190 and with normally open switch contacts like the switch contacts 191-203. At the time that the time or production counting drums are each set at zero the drums of my system are set to register with alarm number corresponding, for example, to the number of units of production. As the units of production are counted by the time or production counting drums the drums of my system automatically show the number of units yet to be produced. At the time that the time production or counting drums reach the preselected alarm number the drums of my system each register zero, whereupon all of the switch contacts are closed by their respective trip levers to complete a circuit to trigger the alarm as before described for effecting a desired result or for remainder purposes. In this arrangement where the drums of my system are used as combined alarm and time or counter drums and are driven backwards by power train means driven by time or production counter drums the respective ratchet gears 156A-153A and the solenoids 391 may be replaced by conventional means such as are used to rotate sequentially the time or production counting drums.

What I claim is:

1. A horizontal instrument comprising at least two time drums, means rotatably supporting said drums, motor means associated with said drums so that each is rotatably driven and so that one drum controls the rotation of the other drum, said other drum having a ratchet gear associated therewith for rotatably driving the same, electromagnet means energized upon each revolution of said one drum, and means actuated by said electromagnet means and operative upon said ratchet gear to produce only one gear tooth rotation thereof and a corresponding rotation of said other drum upon each energization of said electromagnet means, a trip lever carried by said one drum, and a pair of normally open electrical contacts actuated to close position by said trip lever upon each revolution of said one drum for energizing said electromagnet means, a pawl moveable upon each energization of said electromagnet means and operative upon said ratchet gear for effecting one gear tooth rotation thereof at a time.

2. A horological instrument as claimed in claim 1, a manually operated switch means corresponding to said other drum having one position closing a circuit in series circuit with said pair of electrical contacts, said switch means also having another closed position opening said series circuit to disable said pair of electrical contacts and closing another circuit in parallel circuit with said electromagnet means to energize the same to permit rotation of said other drum under manual control for time setting or correction.

3. A horological instrument as claimed in claim 1, a delayed action mechanism associated with said pair of electrical contacts, said delayed action mechanism including means actuated by said trip lever which main-

tain said pair of electrical contacts closed for a predetermined time interval following closing thereof.

4. A horological instrument as claimed in claim 3, said delayed action mechanism including a pivot arm actuated by said trip lever carrying compressible means which is compressed upon such actuation of said pivot arm.

5. A horological instrument comprising at least two time drums, means rotatably supporting said drums, motor means associated with said drums so that each is rotatably driven and so that one drum controls the rotation of the other drum, said other drum having means associated therewith which divides each revolution thereof into segments of rotation and revolving one segment of rotation for each revolution of said one drum, means constituting a direct read-out calendar clock and being provided with indicia of units of time for giving direct reading of time information, said one drum being a day drum and said other drum being a month drum, means for controlling the rotation of said day drum so that it completes one revolution at the end of each month irrespective of the number of days therein, leap year notwithstanding, and means for rotating said month drum 1/12th of a revolution for each revolution of said day drum, said day drum having a day ratchet gear associated therewith which has different gear teeth areas thereon corresponding to 28, 29, 30 and 31 day months, a day pawl operative upon selected ones of said gear teeth areas on said day ratchet gear for controlling the rotation of said day drum, and means for moving said day pawl at each month end change so that it is located in the respective gear tooth area on said day ratchet gear according to whether the next subsequent month is a 28, 29, 30 or 31 day month, a 48 month locator drum having 48 consecutive means associated therewith corresponding to 48 consecutive month end changes, said day drum pawl axially slidable in respect to said day drum ratchet gear, and means responsive to one of said 48 consecutive means operative upon said day drum pawl at each month end change for axially sliding the same to the proper gear teeth area on said day drum ratchet gear.

6. A direct read-out calendar clock as claimed in claim 5, said 48 month locator drum having means for manually setting its rotated position, said 48 month locator drum having four different rotated positions for manual setting or correcting of the same, said four different rotated positions corresponding to four different groupings of years having reference to leap years.

7. A horological instrument comprising at least two time drums, means rotatably supporting said drums, motor means associated with said drums so that each is rotatably driven and so that one drum controls the rotation of the other drum, said other drum having means associated therewith which divides each revolution thereof into segments of rotation and revolving one segment of rotation for each revolution of said one drum, means constituting an alarm system for said instrument including electrical alarm means for giving off an alarm, a rotatably supported alarm drum corresponding to each time drum, normally open electrical switch means including a moveable contact arm thereof carried on each alarm drum, each alarm drum manually rotatable to a preset alarm position corresponding to an advance rotational position of the respective time drum, a laterally projecting trip arm associated with each time drum, each alarm drum disposed adjacent its corresponding trip arm so that the respective contact arm thereon is actuated by said trip arm once upon each revolution of said time drum to close the respective electrical switch means, said alarm means being energized upon simultaneous closing of all said electrical switch means.

8. A horological instrument having an alarm system as claimed in claim 7, each time drum having direct read-out indicia on the circumference thereof, and each alarm drum having direct read-out indicia on the circumference thereof identical to that on its corresponding time drum.

9. A horological instrument having an alarm system as claimed in claim 7, means constituting a direct read-out calendar clock and being provided with indicia of units of time for giving direct reading of time information over a span of time, an hour drum, a day drum and a month drum, the rotation of said hour drum controlling the rotation of said day drum and the rotation of said day drum controlling the rotation of said month drum, said alarm drums capable of being set at alarm settings which cover the range of hours, days and months so that said instrument can be pre-set to give off an alarm for a reminder over at least a year range.

10. A direct read-out calendar clock having an alarm system as claimed in claim 9, a 48 month locator drum having 48 consecutive means associated therewith corresponding to 48 consecutive month end changes, said 48 month locator drum controlling the rotation of said day drum at each month end change.

11. A direct read-out calendar clock having an alarm system as claimed in claim 10, said 48 month locator drum having means for manually setting its rotated position, said 48 month locator drum having four different rotated positions for manual setting or correcting the same, said four different rotated positions corresponding to four different groupings of years having reference to leap years.

12. In a horological instrument having an alarm system as claimed in claim 7, means for holding a plurality of appointment cards pertaining to said alarm settings.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,766,728 Dated October 23, 1973

Inventor(s) ARTHUR A. NAGY

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 22, line 2, "O" should read -- "0" -- .

Signed and sealed this 30th day of July 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,766,728

Dated October 23, 1973

Inventor(s) Arthur A. Nagy

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 19, "Figs. 2-25" should read -- Figs. 20-25 --.
Column 3, line 25, "Contact bar which is 6 (2nd digit in 2 digit number)" should be preceded by the numeral -- 30 --;
line 31, "9-Contact bar" should read -- 39-Contact bar --; line 46, "01" should read -- 61 --; line 47, "62-Contact bar which is 2 in A.M." should read -- 62-Contact bar which is 1 in A.M. --
line 48, "6-" should read -- 63 --; line 64, "84-Contact bar which is 0 in P.M." should read -- 84-Contact bar which is 1 in P.M. --. Column 10, line 29, "elctromagnet" should read -- electromagnet --; line 58, "uppr" should read -- upper --. Column 13, line 47, after "end" insert -- bent --. Column 15, line 6, "29 should be in regular rather than bold face type; line 31, "302" should read -- 320 --. Column 18, line 18, "samll" should read -- small --; Column 19, line 61, "one-hlaf" should read -- one-half --. Column 20, line 44, "100" should be in regular rather than bold face type.

Column 22, line 33, "364 -Shaft" should be a line by itself.
Column 24, line 40, "381, 381A - Hour Drums" should be a line by itself. Column 25, line 21, "340B" should read -- 390B --.
Column 26, line 52, after "410" insert -- which --. Column 27, line 16, after "153A" cancel "0"; line 22, after "rotates" insert -- drum --; lines 36, 39, 59, and 64 the number's 28, 29, 31, and 31, respectively, should be in regular rather than bold face type; line 49, "30gear" should read -- 30th gear --; line 54, after "roots" insert a period (.). Column 28, line 31, "respecitvely" should read -- respectively --; line 40, "28" should be in regular rather than bold face type; line 63, "31" should be in regular rather than bold face type. Column 29, line 13, "5wo" should read -- two --; line 19, "29" should be in regular rather than bold face type; line 23, "304A" should read -- 403A --. Column 32, line 1, "siad" should read -- said --. Column 33, line 33, after "pre-selected" cancel "said" and insert the following: -- alarm setting. Said --; line 29, between "alarm" and "must" insert -- drums --; line 37, cancel "alarm setting"

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,766,728 Dated October 23, 1973
Inventor(s) Arthur A. Nagy Page - 2

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

line 39, "gers" should read -- gears --; line 60, cancel the comma (,). Column 34, line 32, "tme" should read -- time --; line 35, "horizontal" should read -- horological --; line 37, "mans" should read -- means --. Column 36, line 6, "dong" should read -- ding --; line 50, "hving" should read -- having --.

Signed and sealed this 14th day of May 1974.

(SEAL)

Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents