

Dec. 5, 1944.

E. H. JONES

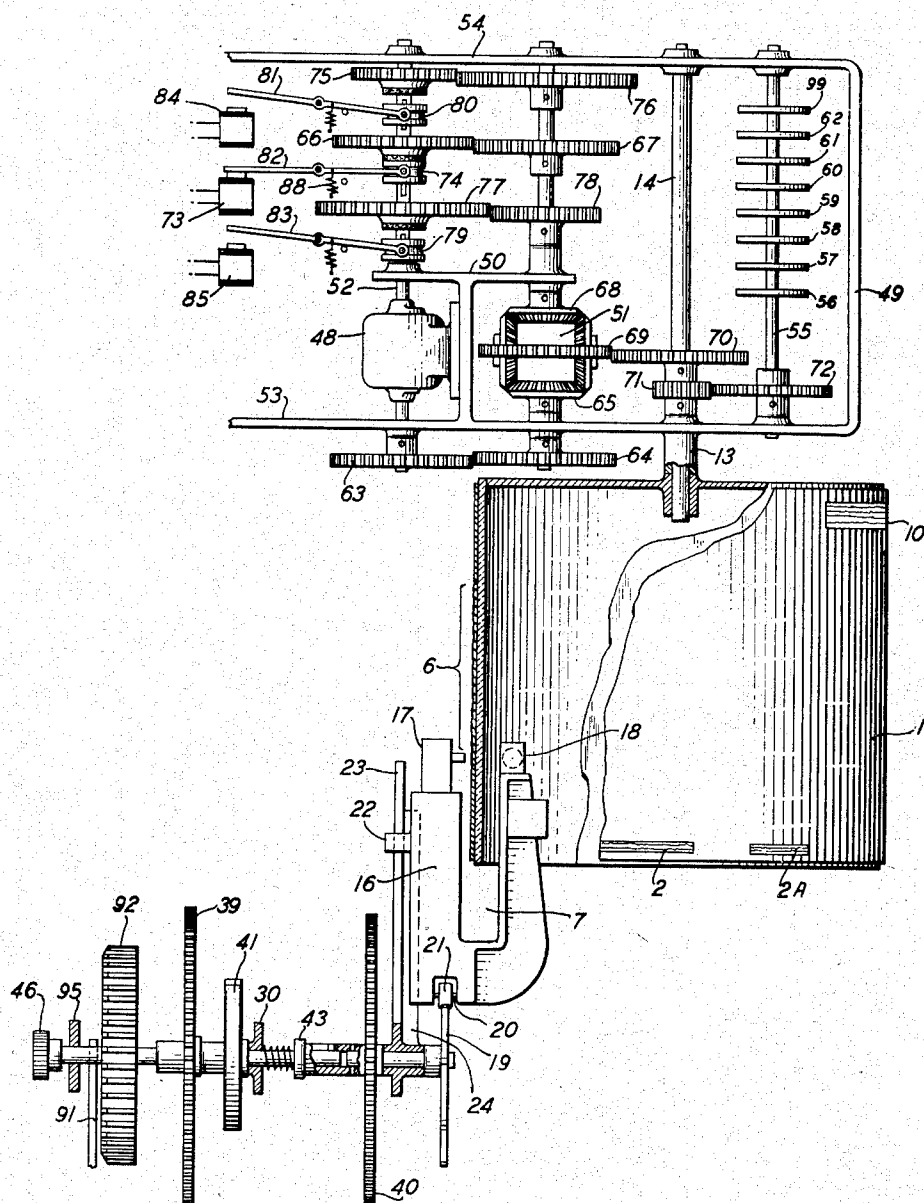
2,364,147

TIME-OF-DAY ANNOUNCING SYSTEM

Filed April 24, 1943

4 Sheets-Sheet 1

FIG. 1



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FIG. 3

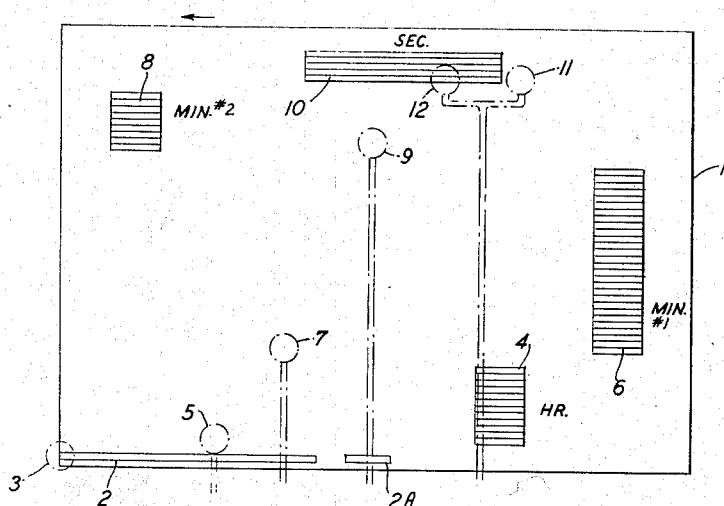
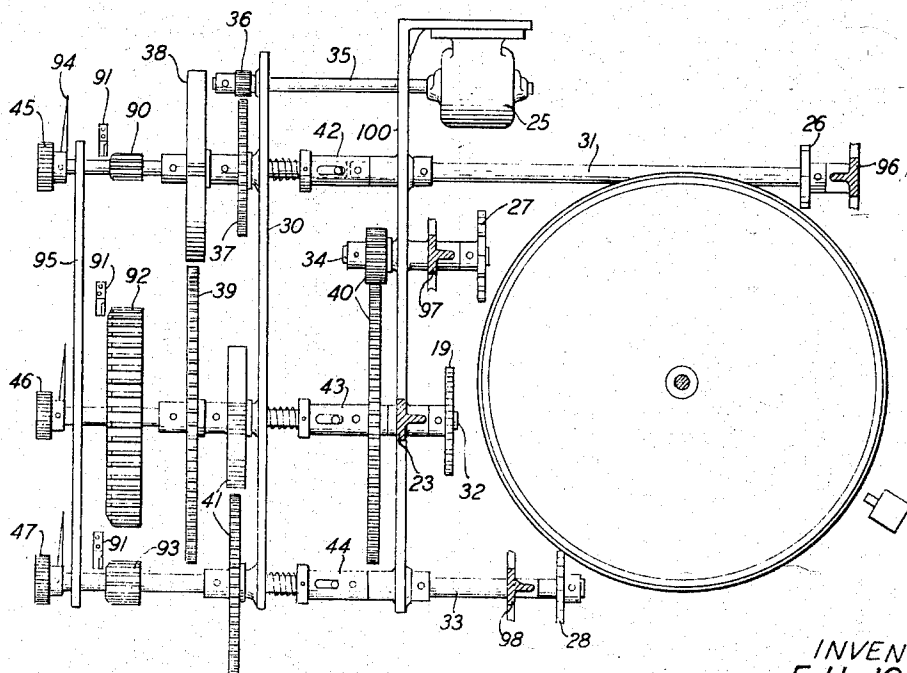


FIG. 2



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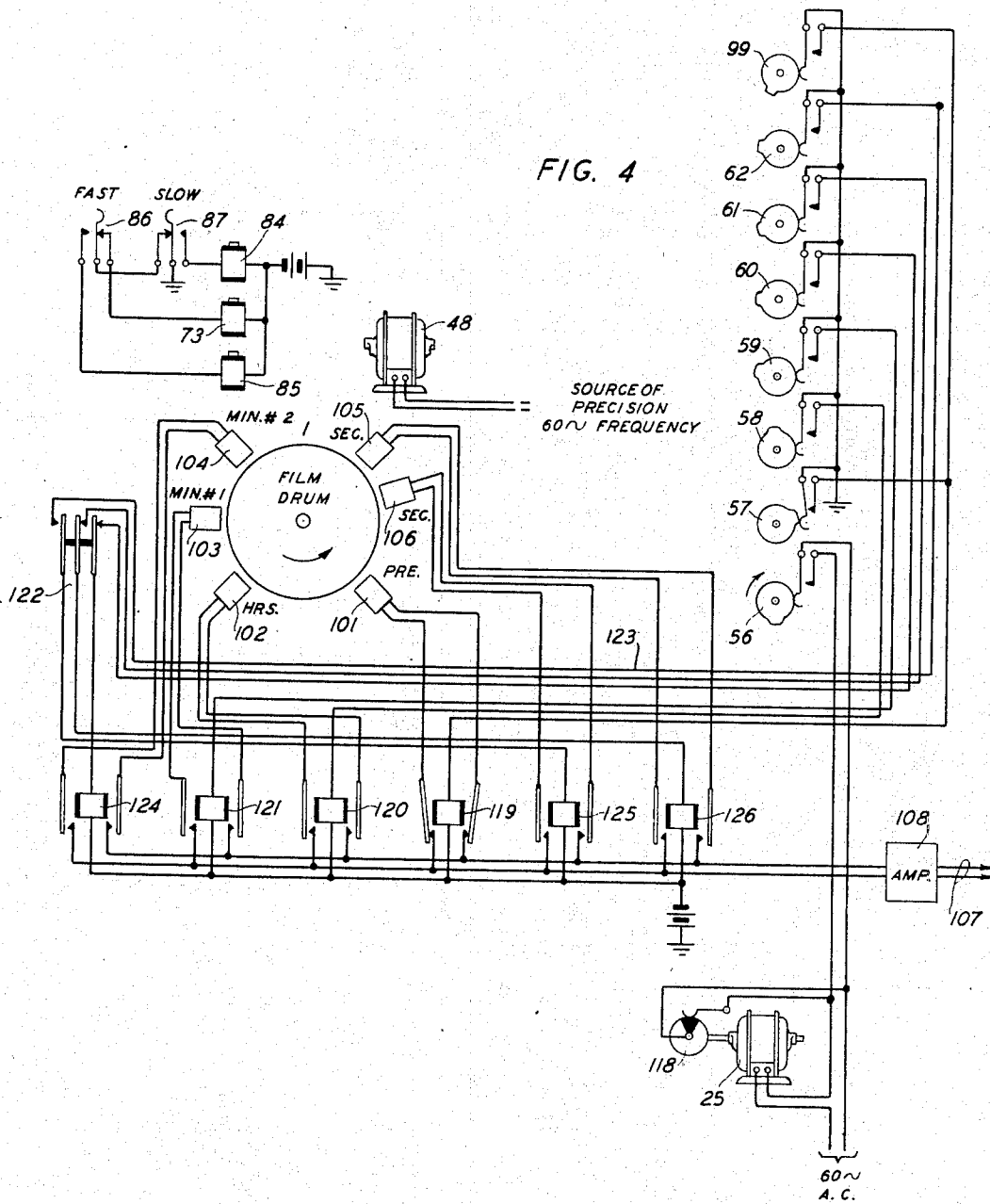
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FIG. 5
HOURS CAM

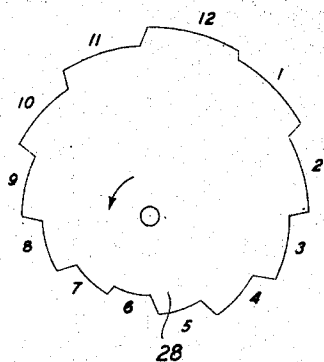


FIG. 6
MINUTES CAM NO. 1

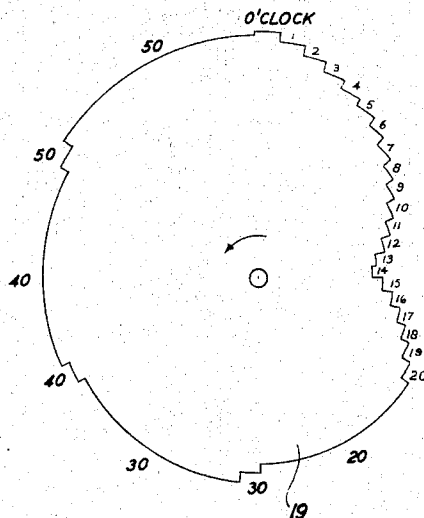


FIG. 7
MINUTES CAM NO. 2

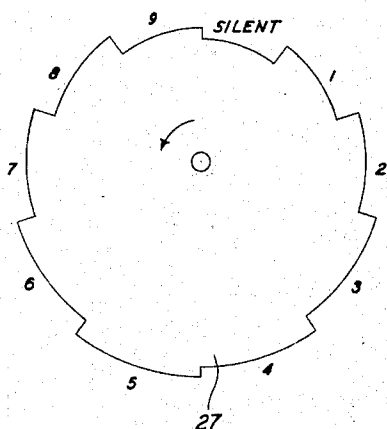
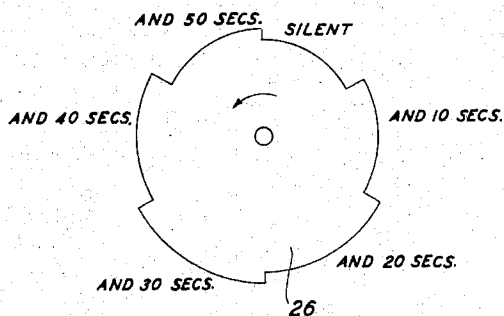


FIG. 8
SECONDS CAM



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2,364,147

TIME-OF-DAY ANNOUNCING SYSTEM

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Application April 24, 1943, Serial No. 484,487

13 Claims. (Cl. 179—6)

This invention relates to time-of-day announcing and has for its object to provide an improved machine for that purpose.

In general, time-of-day announcing has heretofore been performed by an operator who has been provided with an accurate indication of the time.

The mechanical announcement of the time is complicated by the special names applied to the numbers between ten and twenty, as well as by the varying length of the announcement required.

To overcome these and other difficulties, the machine of the present invention has been created.

The basic element of the machine is a drum, constantly driven by a constant speed motor, operating from a source of precision frequency alternating current, so that the motion of the drum is an accurate measure of the time of day.

Mounted on the drum are film recordings of the words and phrases making up the elements of a time-of-day announcement. In general each film has an individual scanning device comprising a U-shaped bracket carrying a lamp and lens tube on one leg and a photoelectric cell on the other leg. The bracket embraces the wall of the drum so that, as the drum rotates, light from the lamp passes through the film to act on the photoelectric cell.

In order to position the scanning devices with relation to the film records in accordance with the time of day, each movable scanning device is controlled by a cam and these cams are rotated by a set of motor driven gears which are advanced intermittently under the control of the constant speed motor.

Also controlled by the constant speed motor is a set of cams for regulating the order in which the various scanning devices are to become effective.

In accordance with the present invention means is provided for regulating the speed of rotation of the drum to synchronize the announcements with the time. More specifically, a differential gear train is interposed between the motor and the drum with means for controlling the differential gear to increase or decrease the speed of the drum.

In addition the invention provides for two sets of minutes films with corresponding scanning devices, one of the sets bearing sound tracks for the numbers from one to twenty and those for thirty, forty and fifty. The other set of films bears sound tracks for the digits from one to

nine and means is provided for using this other set of films only when the scanner of the first set is in position to speak the numbers twenty-three, etc. During the first twenty minutes of an hour an auxiliary seconds scanner is made effective so that the announcement may be phrased naturally and also to avoid loss of the seconds announcement.

These and other features of the invention will be more apparent from a consideration of the following description in connection with the drawings in which:

Fig. 1 shows a side view of the film bearing drum with the driving means therefor and one scanning element;

Fig. 2 shows a top view of the drum with the driving gears removed, together with the driving arrangement for the scanning units;

Fig. 3 shows a side view of the drum, developed to show the relative positions of the films thereon and of the scanning units;

Fig. 4 is a circuit diagram;

Fig. 5 shows the hours cam;

Fig. 6 shows the principal minutes cam;

Fig. 7 shows the auxiliary minutes cam; and

Fig. 8 shows the seconds cam.

Fig. 3 is a development of the drum 1 showing the sound track films in place and an indication of the relative normal positions of the scanning devices, each scanning device occupying its lowest position. Film 2 at the bottom of the drum 1 carries the preamble, or introductory phase, and is scanned by the fixed scanning device 3. At a higher level on the drum is the hours film 4, which is scanned by device 5. Still higher is the primary minutes film 6 with its scanning device 7, the secondary minutes film 8 with its scanning device 9 and the seconds film 10 with the corresponding scanning devices 11 and 12. Film 2A, which carries the tone marking the exact time, is located at the same level as the preamble film 2 and is also scanned by device 3.

The drum rotates toward the left as indicated by the arrow and is shown at the moment when the announcement is about to start. On careful inspection it will appear that, at the moment when the preamble film 2 has finished passing its scanning device 3, the hours film 4 approaches scanning device 5, and so on, the drum making two complete revolutions for one complete announcement.

As shown in Fig. 1, drum 1 is mounted on the depending end 13 of a vertical shaft 14 driven by a set of gears which will be described hereinafter. The lower end of the drum is open to per-

mit the entrance and movement of one arm of each scanning device within the drum. In Fig. 1, one such scanning device, namely the primary minutes scanning device 7, is shown, the drum 1 being broken away to show the relationship of the parts.

The scanning device 7 is made up of a U-shaped support 16 which embraces the wall of drum 1 and carries on its outer arm a light source and lens tube mounted in a casing 17. On the inner arm is mounted a photoelectric cell 18 which is positioned in alignment with the optical center of the light and lens tube 17. In the lower end of the support 16 is a slot across which is fixed a pin 20. On the pin 20 is a roller 21, which rides on the cam wheel 19. The support 16 is held in a vertical alignment by a groove in which the web 24 of the vertical support 23 is engaged and is slidably held to the support 23 by the member 22 which embraces the support. Any other convenient form of guide might be employed.

The outline of the primary minutes cam is shown in Fig. 6. This cam as well as the other cams which control the positions of the scanning devices are so designed that during each revolution of the cam, the scanning unit is moved stepwise to its highest position and back to its starting position.

The cams are, accordingly, so cut as to move the scanning device during the first part of the time interval, upward or downward in steps which place the device in position to scan alternate sound tracks and then to return it in steps to scan the tracks previously unscanned. For example, the secondary minutes sound tracks which bear the digits 1 to 9, inclusive, are arranged in the order, 9, 1, 8, 2, 7, 3, 6, 4, 5 and the cam, shown in Fig. 7, is so cut as to advance the corresponding scanning unit upwardly to successively scan the tracks 1, 2, 3, 4 and 5 and to then permit the unit to drop downwardly to successively scan the tracks 6, 7, 8 and 9. It will be seen from Fig. 7 that the step between 4 and 5 and the step after 9 are half the height of the other steps. Therefore, the cam at the first step lifts the scanning unit past the sound track for the digit 9 and opposite the track for the digit 1. Since the fifth step is only half as high as the previous steps, when the scanning unit drops to the sixth step it passes over the track for the digit 4 and remains opposite the track for the digit 6.

The above description holds true for the hours cam shown in Fig. 5 and the seconds cam shown in Fig. 8, except that the hours cam has twelve steps and the seconds cam has six steps. The primary minutes cam 19, shown in Fig. 6, also is arranged to move the scanning device so that it scans alternate sound tracks. For the first nineteen minutes of an hour it remains opposite individual sound tracks for the corresponding minutes. During the remainder of the hour there is one sound track for the first minute of each ten-minute interval and a different sound track for the remaining nine minutes, to care for the different inflection used in speaking twenty, for example, as a single word or as part of a compound word, such as twenty-one. During the nine-minute intervals the secondary minutes cam with its corresponding scanning device and sound tracks, supplies the proper units digit for the pronouncement of the minutes. It will be observed that the primary minutes cam starts its cycle from the top where the sound track of the word o'clock is located.

Referring now to Fig. 2, the cams 19, 26, 27 and 28 are driven by shafts which are geared together and driven by a motor 25 which is operated from a source of 60-cycle current or any other commercial source of current. The motor 25 and the shafts 31, 32, 33, 34 and 35 are mounted on any suitable framework comprising panels 100 and 30 and guide rods 23, 96, 97 and 98. The motor drives a shaft 35 on which is mounted a wheel 36 carrying a few teeth which mesh with the teeth of gear wheel 37. The number of teeth on wheels 36 and 37 are so related that each time wheel 36 makes one revolution, wheel 37 is moved through one-sixth revolution to advance the seconds cam 26 from one ten-second position to the next. On shaft 31 is mounted wheel 38 which also has only a few teeth which mesh in turn with the teeth of wheel 39. The number of teeth on wheels 38 and 39 are selected so that wheel 39 makes one-sixtieth of a revolution for each revolution of wheel 38, to advance the minutes cam 32 from one minute position to the next. Shaft 32, by the gears 40, drives shaft 34 and the secondary minutes cam 27, cam 27 making six revolutions for one revolution of cam 32. The intermittent gear 41 advances shaft 33 and the hours cam 28 through one-twelfth of a revolution for each revolution of shaft 32.

During the silent interval at the end of each announcement a circuit is closed, as will be described hereinafter, for motor 25 and shaft 35 is driven through one revolution. Therefore, at each ten-second interval shaft 35 makes one revolution advancing shaft 31 one step at each revolution, so that shaft 31 and cam 26 make one complete revolution in a minute; shaft 32 is advanced one step at the end of each minute, completing one revolution in an hour, at the end of which time shaft 33 is advanced one step, completing its revolution in twelve hours.

Shafts 31, 32 and 33 each are divided into two sections which are normally united by clutch members 42, 43 and 44 interposed therein. Each of the outer sections of these shafts terminates in adjustment knobs 45, 46 and 47, respectively. The knob and clutch members permit disengagement of the intermittent gearing so that the cams may be rotated to positions which correspond to the correct time.

Each shaft is equipped with a guiding ratchet so that the shaft may be positioned correctly when the knobs are released. For example, wheel 90, mounted on shaft 31 has the same number of teeth as cam 26 has steps. When knob 45 is drawn forward, the spring mounted latch 91 slides over the cambered end into a groove on wheel 91. Knob 45 may be turned to the approximately correct position as indicated by pointer 94 on a dial (not shown) mounted on face plate 95. As knob 45 is turned latch 91 guides the positioning of the shaft 31 by the sound produced as it moves from groove to groove. Similar guiding ratchets 92 and 93 are provided for shafts 32 and 33. Wheel 92 will have sixty teeth to correspond to cam 32 and wheel 93 will have twelve teeth to correspond to cam 28.

Returning to a discussion of Fig. 1, the shaft 14 which carries the drum 1 is rotated by means of a synchronous motor 48 which is operated from a source of precision frequency 60-cycle current or an oscillator timed to drive shaft 52 accurately at the rate of twelve revolutions a minute. Supporting the motor 48 and the gearing driven thereby is a U-shaped frame 49. From the base 75 of the frame 49 extends a T-shaped bracket 50.

The base of the motor 48 is fastened to the vertical section of the T while the shaft 52 driven directly by the motor has bearings in both arms 53 and 54 of the frame 49 and in one arm of the bracket 50. Between the other arms of the T bracket 50 and the lower side of the frame 49 is a differential gear train 51. The shaft 14 carrying drum 1 has bearings in arms 53 and 54 of frame 49 and a shaft 55 carrying a set of cams 56 to 62 and 99 also has bearings on arms 53 and 54.

Gear 63, mounted on shaft 52, drives gear 64 which causes gear wheel 65 of the differential gear train 51 to rotate, while normally gear 66 acts on gear 67 to rotate gear wheel 68 of the differential gear train 51. Since gears 63, 64, 66 and 67 have the same number of teeth, gears 64 and 67 rotate at the same speed and the differential gear train 51 rotates at that speed carrying with it gear 69 which in turn acts on gear 70 to rotate shaft 14 and drum 1 whereby drum 1 makes two revolutions in ten seconds. Gear 71 on shaft 14 engages gear 72 which rotates shaft 55 and cams 56 to 62 and 99. Gears 71 and 72 are so related that the drum 1 makes two revolutions to one revolution of cams 56 to 62 and 99 which control the successive steps of the announcement.

Gears 75, 66 and 77 are so mounted on shaft 52 that they are free to rotate independent of the shaft but cannot move lengthwise of the shaft. Three clutch elements 80, 74 and 79 are keyed into slots in shaft 52 so that they rotate with the shaft but may also be moved lengthwise of the shaft. The motion along the shaft is controlled by levers 81, 82 and 83, which levers terminate at one end in pins entering slots in the clutch members and at the other end in armatures for magnets 84, 73 and 85.

The circuits for these magnets are shown in Fig. 4 where it will be seen that magnet 73 is normally energized to attract lever 82 and bring clutch 74 against gear 66 so that gears 66 and 67 are effective to drive gear wheel 68 of the differential gear train 51.

If, for any reason, the time tone on drum 1 varies from the correct time, the drum may be brought back to accuracy by operating key 86 or key 87 according as the drum is fast or slow. The operation of key 86 opens the circuit of magnet 73 permitting spring 88 to withdraw clutch 74 from gear 66. Key 86 closes the circuit of magnet 85 which attracts lever 83, forcing clutch 79 against gear 77 so that gear 77 now rotates with shaft 52. Since gear 77 is larger than gear 78, gear 78 now moves faster than before and the drum is speeded up slightly until it is on time, when key 86 is released. Similarly, key 87 substitutes clutch 80 for clutch 74 and causes the drum to rotate more slowly until accuracy is restored.

Fig. 4 shows the circuits which are employed to control the mechanisms described above. Drum 1 is shown surrounded by the scanning devices 101 to 106 in the relative positions indicated by the operating cams shown in Fig. 2. Motor 25 as set forth above, is the motor which controls the positions of the scanning devices in accordance with the time of day, is driven from an ordinary source of 60-cycle alternating current and is normally at rest. Motor 48 is driven continuously from a precision frequency. When a subscriber wishes the correct time, his line will be connected by any suitable telephone equipment to the line 107 and amplifier 108. The connection may be completed at any point in an announce-

ment, but for convenience it will be assumed that it takes place during the interval between announcements.

The time announcement starts with the closure of the contact of cam 57 which completes a circuit for relay 119. This relay connects the scanning device 101 to the amplifier 108 and the preliminary announcement is made. As the drum continues to rotate, cam 57 opens its contact and cam 58 closes its contact to operate relay 120 and connect the hours scanning device 102 to the output circuit. In turn, cam 59 operates relay 121 and causes the primary minutes announcement to be made. The subsequent action depends on the position of the primary minutes cam 19 of Fig. 6. A supplementary cam (not shown) carried by cam 19 operates contact set 122 while cam 19 moves its scanning device 103 through the positions corresponding to the first twenty minutes.

Assuming first that the time is within the first twenty minutes of the hour, the contact set 122 will be in its alternate position and when cam 60 closes its contact, no circuit is completed for the secondary minutes relay 124. However, cam 62, which closes its contact at approximately the same time as does cam 60, completes a circuit from ground over the contact of cam 62, conductor 123, alternate contact of contact set 122, winding of relay 125 to battery. Relay 125 connects the seconds scanning device 106 to the amplifier 108. The seconds scanning device 106 is set a distance behind device 105 so that it will be in position to scan the seconds sound record earlier in the rotation of the drum and thereby provide a normal interval between the pronouncement of the minutes and the seconds when the secondary minutes record is not used.

After the first twenty minutes of the hour has elapsed, contact set 122 returns to the position shown. In this case, following the pronouncement of the tens digit of the minutes identification, cam 60 closes a circuit over the right contact of contact set 122 for relay 124. Relay 124 connects the secondary minutes scanning device 104 to the amplifier 108 so that the units digit of the minutes record is transmitted. Following this, cam 61 closes the circuit of relay 126 which connects the seconds scanning device 105 to the amplifier to complete the time announcement. Cam 99 now closes, again operating relay 119 to connect scanning device 101 to the output, thereby transmitting the tone which marks the exact time.

As the drum continues to rotate, a silent interval intervenes between announcements during which cam 56 momentarily closes the circuit of motor 25. As soon as motor 25 starts, cam 118 closes and maintains the circuit of the motor closed until it completes its revolution. The scanning devices are now ready to make the next time announcement which will differ from the previous announcement by ten seconds. The subscriber may listen to as many announcements as he desires.

What is claimed is:

1. In a time-of-day announcing machine, a drum, a motor for rotating said drum at a predetermined precise speed, films secured to said drum bearing the sound tracks of the hour, minute and fractional minute divisions of the time of day, scanning units for scanning said films, differential gearing interposed between said motor and said drum and means for controlling said gearing to increase or decrease the speed of rotation of said drum with respect to said motor speed for

insuring that the time announcements shall be in accordance with the correct time.

2. In a time-of-day announcing machine, a drum, a motor for rotating said drum at a predetermined precise speed, films secured to said drum bearing the sound tracks of the hour, minute and fractional minute divisions of the time of day, scanning units for scanning said films, differential gearing interposed between said motor and said drum and means comprising a plurality of clutch members for selectively controlling said gearing to increase or decrease the speed of rotation of said drum with respect to said motor speed for insuring that the time announcements shall be in accordance with the correct time.

3. In a time-of-day announcing machine, a drum, a motor for rotating said drum at a predetermined precise speed, films secured to said drum bearing the sound tracks of the hour, minute and fractional minute divisions of the time of day, scanning units for scanning said films, differential gearing interposed between said motor and said drum and means for selectively controlling said gearing comprising a plurality of floating gears of different ratio cooperating with said differential gearing, a plurality of clutch members associated with said floating gears and means to actuate one of said clutch members to drive said differential gearing by means of the associated floating gears to control the speed of rotation of said drum.

4. In a time-of-day announcing machine, a drum, a motor for rotating said drum at a predetermined precise speed, films secured to said drum bearing the sound tracks of the hour, minute and fractional minute divisions of the time of day, scanning units for scanning said films, differential gearing interposed between said motor and said drum and means for selectively controlling said gearing comprising a plurality of floating gears of different ratio cooperating with said differential gearing, a plurality of clutch members associated with said floating gears and means to selectively actuate one of said clutch members to drive said differential gearing by means of the associated floating gears to control the speed of rotation of said drum.

5. In a time-of-day announcing machine, a drum, a motor for rotating said drum at a predetermined precise speed, films secured to said drum bearing the sound tracks of the hour, minute and fractional minute divisions of the time of day, scanning units for scanning said films and means interposed between said motor and said drum for increasing or decreasing the speed of rotation of said drum with respect to said motor speed for insuring that the time announcements shall be in accordance with the correct time, said means comprising a gear on the driving shaft of said drum, a ring gear in mesh therewith and having a pair of idler gears rotatably secured therein, two driving gears in mesh with said idler gears, a pair of gears through which one of said driving gears is permanently coupled to said motor, a plurality of pairs of gears, one pair of which has the same gearing ratio, another pair of which has a greater gearing ratio and another pair of which has a lesser gearing ratio than said last-mentioned pair of gears through which the other of said driving gears may be coupled to said motor and clutch means for rendering any pair of said plurality of pairs of gears effective.

6. In a time-of-day announcing machine, a drum, a motor for rotating said drum, films secured to said drum bearing the sound tracks of

the hour, minute and fractional minute divisions of the time of day, scanning units for scanning said films and means for successively advancing said scanning units in accordance with the change of the time of day to scan selected ones of said sound tracks, said minute films being positioned on said drum in two sets, each set having one of said scanning units associated therewith, one of said sets of films bearing the sound tracks of the minutes announcements "one" to "twenty" inclusive, "thirty," "forty" and "fifty" and the other set of said films bearing the sound tracks of the tens digits "one" to "nine" inclusive, of minutes announcements.

7. In a time-of-day announcing machine, a drum, a motor for rotating said drum, films secured to said drum bearing the sound tracks of the hour, minute and fractional minute divisions of the time of day, scanning units for scanning said films and means for successively advancing said scanning units in accordance with the change of the time of day to scan selected ones of said sound tracks, said minute films being positioned on said drum in two sets, each set having one of said scanning units associated therewith, one of said sets of films bearing the sound tracks of the minutes announcements "one" to "twenty," inclusive, "thirty," "forty" and "fifty" and the other set of said films bearing the sound tracks of the tens digits "one" to "nine," inclusive, of minutes announcements and means under the control of the scanning unit associated with said one set of films to selectively render effective the scanning unit associated with said other set of films.

8. In a time-of-day announcing machine, a drum, a motor for rotating said drum, films secured to said drum bearing the sound tracks of the hour, minute and fractional minute divisions of the time of day, scanning units for scanning said films and means for successively advancing said scanning units in accordance with the change of the time of day to scan selected ones of said sound tracks, said minute films being positioned on said drum in two sets, each set having one of said scanning units associated therewith, one of said sets of films bearing the sound tracks of the minutes announcements "one" to "twenty" inclusive, "thirty," "forty" and "fifty" and the other set of said films bearing the sound tracks of the tens digits "one" to "nine" inclusive, of minutes announcements, and means to render the scanning unit associated with said other set of films ineffective during the time that the scanning unit associated with said one set of films is scanning the sound track "one" to "twenty" inclusive.

9. In a time-of-day announcing machine, a drum, a motor for rotating said drum, films secured to said drum bearing the sound tracks of the hour, minute and fractional minute divisions of the time of day, scanning units for scanning said films and means for successively advancing said scanning units in accordance with the change of the time of day to scan selected ones of said sound tracks, said minute films being positioned on said drum in two sets, each set having one of said scanning units associated therewith, one of said sets of films bearing the sound tracks of the minutes announcements "one" to "twenty" inclusive, "thirty," "forty" and "fifty" and the other set of said films bearing the sound tracks of the tens digits "one" to "nine" inclusive, of minutes announcements, and means for rendering the scanning unit associated with said other set of films ineffective in certain positions of the scanning unit associated with said one set of films.

10. In a time-of-day announcing machine, a drum, a motor for rotating said drum, films secured to said drum bearing the sound tracks of the hour, minute and fractional minute divisions of the time of day, scanning units for scanning said films and means for successively advancing said scanning units in accordance with the change of the time of day to scan selected ones of said sound tracks, said minute films being positioned on said drum in two sets, each set having one of said scanning units associated therewith, one of said sets of films bearing the sound tracks of the minutes announcements "one" to "twenty" inclusive, "thirty," "forty" and "fifty" and the other set of said films bearing the sound tracks of the tens digits "one" to "nine" inclusive, of minutes announcements, a pair of scanning units associated with said fractional minutes film and means to selectively render said last-mentioned scanning units effective.

11. In a time-of-day announcing machine, a drum, a motor for rotating said drum, films secured to said drum bearing the sound tracks of the hour, minute and fractional minute divisions of the time of day, scanning units for scanning said films and means for successively advancing said scanning units in accordance with the change of the time of day to scan selected ones of said sound tracks, said minute films being positioned on said drum in two sets, each set having one of said scanning units associated therewith, one of said sets of films bearing the sound tracks of the minutes announcements "one" to "twenty" inclusive, "thirty," "forty" and "fifty" and the other set of said films bearing the sound tracks of the tens digits "one" to "nine" inclusive, of minutes announcements, means for rendering the scanning unit associated with said other set of films ineffective in certain positions of the scanning unit associated with said one set of films, a pair of scanning units associated with said fractional minutes film and means to selectively render said last-mentioned scanning units effective in accordance with the operative condition of the scanning unit associated with said other set of films.

12. In a time-of-day announcing machine, a drum, a motor for rotating said drum, films secured to said drum bearing the sound tracks of the hour, minute and fractional minute divisions of the time of day, scanning units for scanning said films and means for successively advancing said scanning units in accordance with the change of the time of day to scan selected ones of said

sound tracks, said minute films being positioned on said drum in two sets, each set having one of said scanning units associated therewith, one of said sets of films bearing the sound tracks of the minutes announcements "one" to "twenty" inclusive, "thirty," "forty" and "fifty" and the other set of said films bearing the sound tracks of the tens digits "one" to "nine" inclusive, of minutes announcements, a pair of scanning units associated with the fractional minute film, means normally effective to render the scanning device associated with said one set of minute films, the scanning device associated with said other set of minute films and one of the scanning devices associated with said fractional minute films successively effective, and means to render the scanning device associated with said other set of minute films ineffective and to render the other scanning device associated with said fractional minute films effective following the scanning device associated with said one set of minute films.

13. In a time-of-day announcing machine, a drum, a motor for rotating said drum, films secured to said drum bearing the sound tracks of the hour, minute and fractional minute divisions of the time of day, scanning units for scanning said films and means for successively advancing said scanning units in accordance with the change of the time of day to scan selected ones of said sound tracks, said minute films being positioned on said drum in two sets, each set having one of said scanning units associated therewith, one of said sets of films bearing the sound tracks of the minutes announcements "one" to "twenty" inclusive, "thirty," "forty" and "fifty" and the other set of said films bearing the sound tracks of the tens digits "one" to "nine" inclusive, of minutes announcements, a pair of scanning units associated with the fractional minute film, means normally effective to render the scanning device associated with said one set of minute films, the scanning device associated with said other set of minute films and one of the scanning devices associated with said fractional minute films successively effective, and means to render the scanning device associated with said other set of minute films ineffective and to render the other scanning device associated with said fractional minute films effective following the scanning device associated with said one set of minute films, in accordance with the position of said scanning device associated with said one set of minute films.

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