July 2, 1935. G. ROLLNICK ET AL 2,006,410

TAPE MOVING MECHANISM

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Fig. 1.

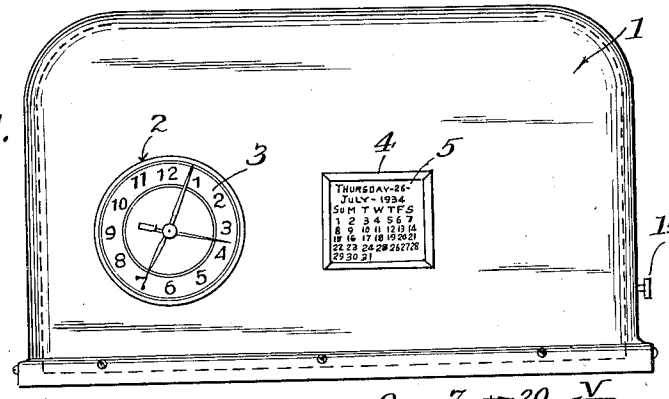


Fig. 2.

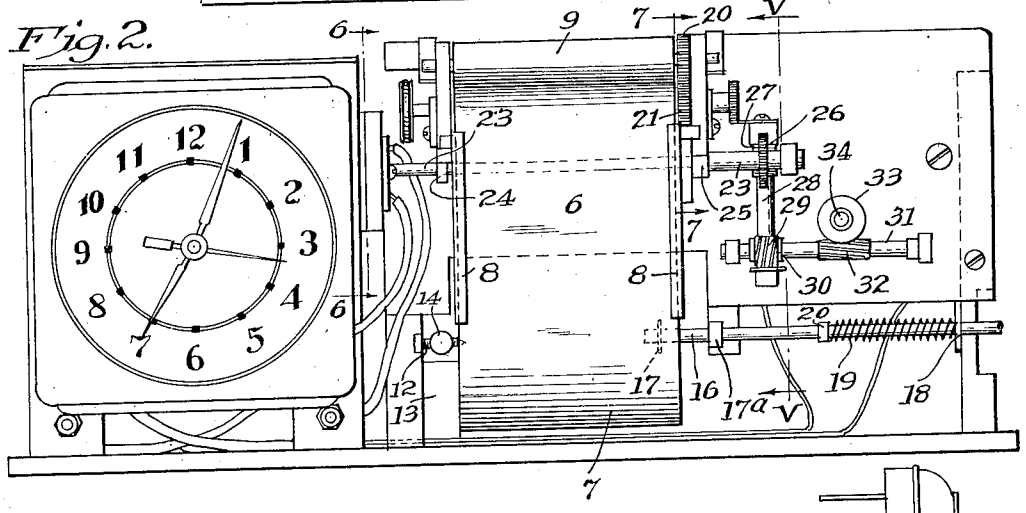
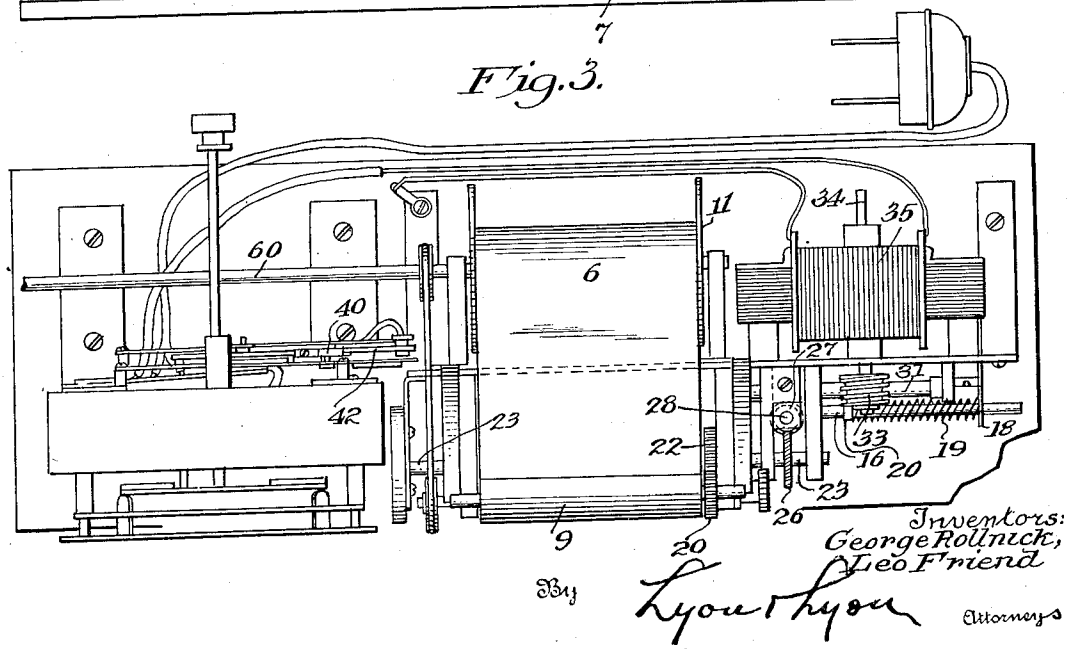


Fig. 3.



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Fig. 4.

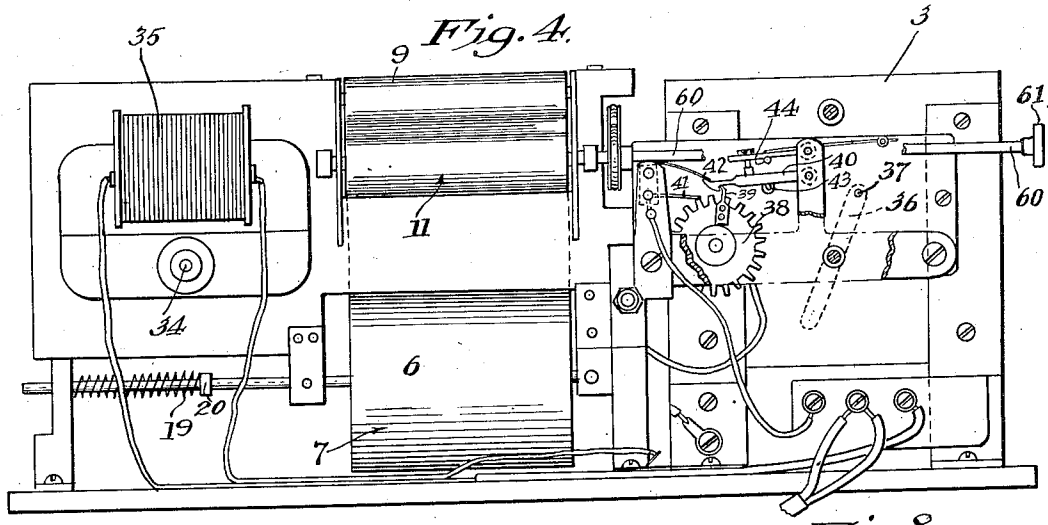


Fig. 5.

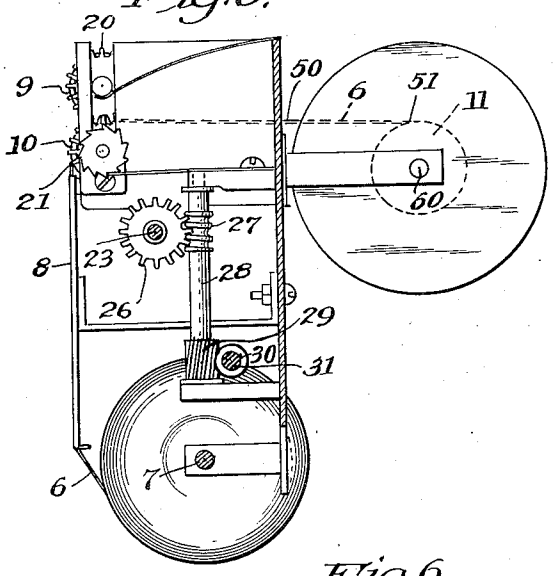


Fig. 8.

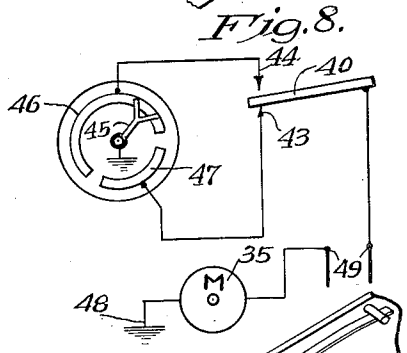


Fig. 9.

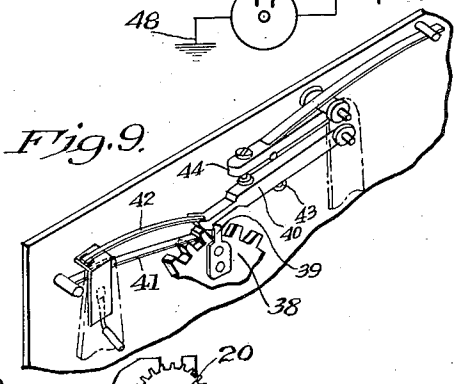


Fig. 6.

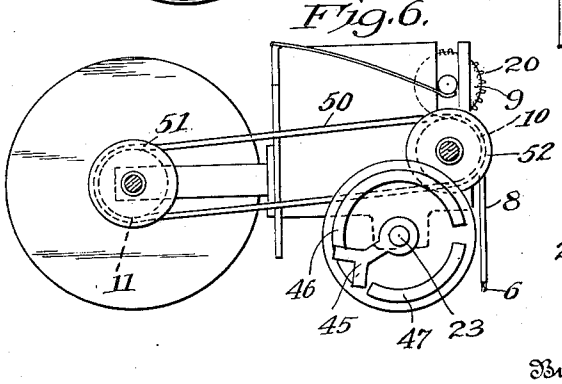
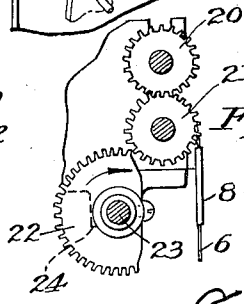


Fig. 7.



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TAPE MOVING MECHANISM

George Rollnick and Leo Friend, Los Angeles, Calif.

Application August 28, 1934, Serial No. 741,806

4 Claims. (Cl. 40—53)

This invention relates to mechanisms for intermittently shifting a tape, or other elongated element, a predetermined distance on each movement and has particular application in automatic calendar mechanisms in which a series of calendars corresponding to successive days of the year are printed on a tape positioned back of a window and the tape shifted automatically at the end of each day to bring a new calendar into registration with the window.

A broad object of the invention is to provide a tape shifting mechanism that is simple and rugged in construction, relatively inexpensive to manufacture, and is accurate and reliable in operation.

Other objects and features of the invention will become apparent from the following detailed description which refers to the drawings.

In the drawings:

Fig. 1 is a front elevational view of a combined clock and automatic calendar in accordance with the invention;

Fig. 2 is a front elevational view of the clock and automatic calendar mechanism removed from the case;

Fig. 3 is a plan view of the mechanism as it appears when removed from the case;

Fig. 4 is a rear elevation view of the mechanism as it appears when removed from the case;

Fig. 5 is a detail view, partly in section, taken in the plane V—V of Fig. 2;

Fig. 6 is a detail view of a portion of the mechanism taken in the plane VI—VI of Fig. 2;

Fig. 7 is a detail view taken in the plane VII—VII of Fig. 2;

Fig. 8 is a schematic diagram of the electrical circuit employed in the mechanism; and

Fig. 9 is a detail perspective view of the contact mechanism actuated by the clock for controlling the movement of the calendar.

Referring first to Fig. 1, we have shown a combination clock and automatic calendar comprising a casing 1 having a window 2, through which the face 3 of a clock appears and a window 4, through which a calendar 5 appears, the clock and calendar mechanisms being contained within the case.

Referring now to Figs. 3 and 5, it will be observed that the calendars 5, there being one for each day of the year, are printed successively on a tape 6 which unwinds from a feed spool 7, passes up through channel guide members 8, which overlap the edges of the tape and support the tape in a desired plane back of the window 4, thence between a pair of feed rollers 9 and 10, respectively, and from the feed rollers to a take-up spool 11 which is supported rearwardly of the rollers 9 and 10.

The feed spool 7 is supported at its left end (with reference to Fig. 2) by a stub shaft 12 having a conical point which engages a conical recess in the end of the spool. The shaft 12 is supported in a hole in the frame member 13 and is normally locked in position by a set screw 14. The right end of the spool 7 is supported by a shaft 16 which enters a hole provided therefor in the right end of the spool. To prevent relative rotation between the spool 7 and shaft 16, the latter is provided with a cross pin 17 which engages in grooves provided therefor in the spool end. Shaft 16 is rotatably supported in a journal 17a and also in a journal 18, the end of the shaft projecting through the case 1 and having a knob 15 on the end thereof as shown in Fig. 1. Shaft 16 is normally maintained in the aperture in the spool 7 by a helical spring 19 positioned thereabout and compressed between a collar 20 on the shaft and the inner face of the journal 18. However, the spool 7 may be readily released to permit insertion of a new spool having a new calendar thereon by merely retracting the shaft 16 against the tension of spring 19 sufficiently to withdraw the end of the shaft from the aperture in the end of the spool.

The tape 6 is normally moved upwardly through the guides 8 at the end of each day by the feed rollers 9 and 10 which are automatically actuated at the end of each day. The mechanism for actuating the rollers 9 and 10 comprises a pair of gears 20 and 21 mounted on the ends of the shafts supporting rollers 9 and 10, respectively, which mesh with each other and one of which, namely, gear 21, meshes with a sector gear 22. The sector gear 22 is keyed to a shaft 23 rotatably supported in bearing members 24 and 25, respectively. Shaft 23 also has keyed thereto a worm wheel 26 which meshes with a worm 27 on a shaft 28, which shaft is also provided at its lower end with a worm wheel 29 meshing with a worm 30 on a horizontally disposed shaft 31. Shaft 28 is rotatably mounted at its upper and lower ends in suitable bearing members and shaft 31 is likewise supported at its outer ends in suitable bearing members. Shaft 31 is provided with a worm wheel 32 which meshes with a worm 33 on the shaft 34 of an electric motor 35.

The number of teeth in the sector gear 22 is so chosen relative to the number of teeth in the gears 22 and 21 and the diameter of the rollers 9 and 10 as to shift the tape 6 through the distance

necessary to bring a new calendar into registration with the window 4 in response to one rotation of the sector gear 22 with respect to the gear 21. A mechanism is therefore provided for starting the motor 35 to rotate the sector gear 22 through substantially one complete revolution at the end of each day. This result is achieved by operating the motor 35 under the joint control of the clock 3 and the shaft 23 on which the sector gear 22 is mounted.

Thus referring to Figs. 4 and 9, it will be observed that the hour hand shaft of the clock 3 is provided on its rear end with a crank arm 36 having a crank pin 37 projecting therefrom, which crank pin engages with a tooth of a gear wheel 38 once during each revolution of the hour hand of the clock and shifts the gear 38 the distance between successive teeth thereon. Gear 38 has 24 teeth so that it is intermittently rotated at such intervals as to complete a revolution during 24 revolutions of the hour hand, or in other words, once each 24-hour day. The gear 38 has attached thereto and projecting therefrom (in line with one of the teeth of the gear) a cam 39 which engages, once during each revolution of gear 38, with the end of a contact lever 40 which is insulatingly pivotally supported at its other end. A detent spring 41 is provided to prevent reverse motion of the gear 38 and to act as a friction brake to prevent it moving through a distance greater than the pitch distance each time it is actuated by the crank pin 37. A light leaf spring 42 is also provided for urging the lever 40 toward the cam 39 and for providing electrical connection with the contact lever 40. Lever 40 when in normal position rests against the back contact 43 which is insulatingly supported and when elevated by the cam 39 breaks contact 43 and makes with a top contact 44.

The contact mechanism, including the back contact 43, the contact lever 40 and the contact 44, functions to start the electric motor 35 at the end of each day in response to closure of the contact lever 40 with the contact 44. To this end, the gear 38 is initially turned into such a position with respect to the setting of the hands of the clock 3 that the cam 39 lifts the lever 40 substantially at midnight of each day.

To stop the electric motor 35, a contact mechanism actuated by the shaft 23 is provided. This mechanism comprises a bifurcated brush 45 mounted on the left end of shaft 23 (with reference to Fig. 2) for rotation therewith and adapted to ride over a pair of arcuate contact segments 46 and 47, respectively. The brush 45 is so oriented with respect to the segments 46 and 47 and the sectoral gear 22 on the other end of shaft 23 that the brush leaves the segment 46 shortly after the sector gear 22 passes out of mesh with the gear 21 and closes on segment 46 shortly before the sector gear 22 again meshes with gear 21.

Referring now to the circuit diagram of Fig. 8, it will be observed that the motor 35 is connected between the frame of the mechanism indicated by the ground symbol 48 and one side of an energizing line 49 (which may be 110-volt light circuit). The other side of the line 49 is connected directly to the contact lever 40. The back contact 43 is connected to the short segment 47 and the upper contact 44 is connected with the long segment 46.

The device operates as follows:

Assume that the sector gear 22 is out of mesh with the gear 21, as shown in Fig. 7, and that the brush 45 is closed on the segment 46 but is out of contact with segment 47, as shown in Fig. 6. Next assume that the time is approximately midnight and that the cam 39 is slowly shifting the contact lever 40 upwardly as gear 38 is rotated by the crank pin 37 on the crank 36 of the hour hand shaft of the clock. When lever 40 closes on the top contact 44, a circuit is completed from ground through the brush 45, the segment 46, the top contact 44 and the contact lever 40 to the energizing line 49, thereby completing a circuit through the motor 35 which begins to rotate, thereby driving the sector gear 22 which, after a short initial rotation, meshes with the gear 21 and rotates the rollers 9 and 10 to shift the tape sufficiently to bring a new calendar into view. (At the same time that the tape is shifted by rollers 9 and 10, the take-up spool 11 is rotated to wind up the slack tape through a flexible belt 50 which couples a pulley 51 on the spool 11 with a pulley 52 on the shaft of the lower roller 10). The motor continues to operate until the sector gear 22 has left the gear 21 and traveled a sufficient distance therefrom to carry the brush 45 clear of segment 46 but into contact with segment 47.

The operation of the mechanism to shift the tape and perform the other functions mentioned requires only a relatively short time and is completed long before the cam 39 has been moved sufficiently to release the contact lever 40. However, after the lapse of an interval of time the cam 39 moves past the projecting end of lever 40, permitting the latter to be snapped into lowermost position against the back contact 43 by the spring 42. Since the brush 45 was left in contact with segment 47, closure of the contact lever 40 on the back contact 43 completes another energizing circuit for the motor through segment 47 and brush 45. The motor thereupon starts and rotates the sector gear 22 into its original position in which the brush 45 is again closed on segment 46 but is carried clear of segment 47. Of course, as soon as the brush 45 leaves the segment 47 the operating circuit for the motor end through the back contact 47 and contact lever 40 is opened, thereby stopping the motor whch does not start again until the closure of the contact lever 40 on the top contact 44 at the end of the next day.

A particular advantage of the mechanism described is that the distance through which the calendar tape is shifted upon each operation is not dependent upon the exact position in which the motor is stopped. This will be readily seen from the fact that the motor is always started and stopped while the sector gear 22 is out of mesh with the gear 21. In other words, after the motor has once been started by closure of the contact lever 40 on the top contact 44, the motor continues to run until the sector gear 22 has moved completely past the gear 21. This is of great practical advantage because it is difficult to devise a simple and practicable contact system that will stop an electric motor exactly in a predetermined position on every operation. Our device shifts the tape the same distance each day to a high degree of accuracy because of the fact that the distance moved is dependent primarily upon the arcuate length of the sector gear 22.

Obviously, the circuit connections may be modified so that the short segment 47 is connected to the top contact 44 and the long segment 46 is connected to the bottom contact 43, the only difference in the operation being that

the calendar is not shifted until the contact lever **40** closes on the back contact **43** following its initial closure on the top contact **44**.

We prefer to employ an electric clock actuated from the same lighting circuit as that employed to drive the motor **35**. However, this is not essential and a spring motor driven clock may be employed equally well.

To permit setting of the calendar, the shaft **60** of the take-up spool **11** is extended through the left side of the case and a knob **61** provided on the end of the shaft, as shown in Fig. 1. By turning the knob **61**, the calendar tape may be advanced. Likewise, by turning the knob **15**, connected to the feed spool **7**, the tape may be retracted.

Although the invention has been described in detail with reference to an automatic calendar, the application of the tape moving mechanism to other fields will be apparent to those skilled in the art, and the invention is therefore to be limited only as set forth in the appended claims.

We claim:

1. A mechanism for intermittently shifting a tape through a fixed predetermined distance comprising a feed roller to drive the tape, a gear positively coupled to the roller for simultaneous rotation therewith, a sector gear positioned to mesh with said first gear for driving the latter, said sector gear being normally in a position of rotation out of mesh with said first gear, and means for intermittently rotating said sector gear through approximately one revolution whereby said roller is rotated through exactly the same arc on each movement independent of the exact arc of rotation of the sector gear during that movement.

2. In a device of the type described, a mechanism for feeding the tape through a fixed predetermined distance comprising a feed roller adapted to drive said tape, a gear positively coupled to said roller for simultaneous rotation therewith, a sector gear positioned to mesh with said first gear for driving the latter, said sector gear being normally in such position of rotation that it is out of mesh with said first gear, an electric motor positively coupled to said sector gear for rotating it, means for energizing said motor to rotate said sector gear past said first gear to drive the latter through a fixed distance determined by the peripheral length of said gear sector, an energizing circuit for said motor, switch means for closing said energizing circuit and other switch means responsive to rotation of said sector gear for opening said circuit in response to rotation of said sector gear past said first gear.

3. In a device of the type described, a mechanism for feeding the tape through a fixed predetermined distance comprising a feed roller adapted to drive said tape, a gear positively coupled to said roller for simultaneous rotation therewith, a sector gear positioned to mesh with said first gear for driving the latter, said sector gear being normally in such position of rotation that it is out of mesh with said first gear, an electric motor positively coupled to said sector gear for rotating it, means for energizing said motor to rotate said sector gear past said first gear to drive the latter through a fixed distance determined by the peripheral length of said gear sector, means for energizing said motor including a source of current, a master switch having a back contact, a front contact and a movable contact normally closed on said back contact, and an auxiliary switch means actuated in response to movement of said sector gear for completing a circuit from said source through said motor to said front contact and movable contact of said master switch while said sector gear is in driving relation with said first gear and for completing a second circuit from said source through said motor to said back contact and movable contact of said master switch while said sector gear is out of mesh with said first gear.

4. In a device of the type described, a mechanism for feeding the tape through a fixed predetermined distance comprising a feed roller adapted to drive said tape, a gear positively coupled to said roller for simultaneous rotation therewith a sector gear positioned to mesh with said first gear for driving the latter, said sector gear being normally in such position of rotation that it is out of mesh with said first gear, an electric motor positively coupled to said sector gear for rotating it, means for energizing said motor to rotate said sector gear past said first gear to drive the latter through a fixed distance determined by the peripheral length of said gear sector, means for energizing said motor including a source of current, a master switch having a pair of contacts and a third contact movable into contact with either contact of said pair of contacts, and auxiliary switch means actuated in response to movement of said sector gear for completing a circuit from said source through said motor to said third contact and one of said pair of contacts of said master switch while said sector gear is in a predetermined portion of its arc of rotation greater than and including that portion of its arc in which said sector gear is in mesh with said first gear, and for completing a second circuit from said source through said motor to said third contact and the other of said pair of contacts, respectively, of said master switch while said sector gear is in a portion of its arc of rotation connecting and overlapping the ends of said predetermined portion.

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