March 3, 1942. P. J. McCULLOUGH 2,274,724

CLOCK MECHANISM

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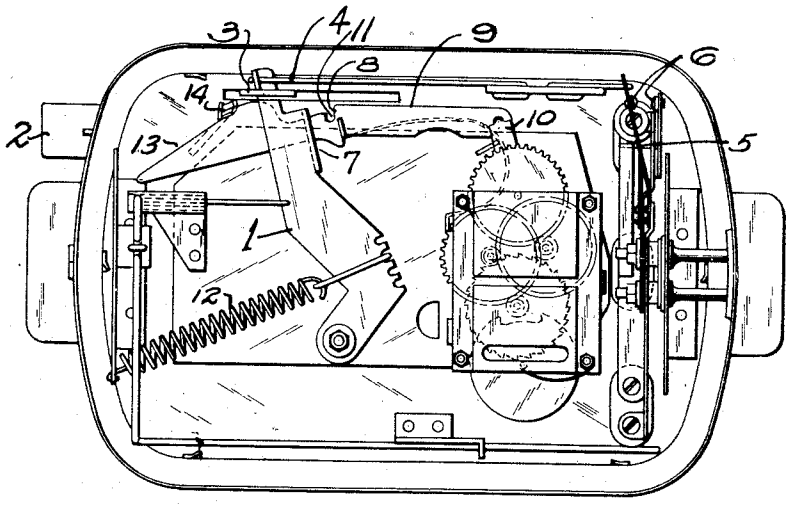


Fig. 1.

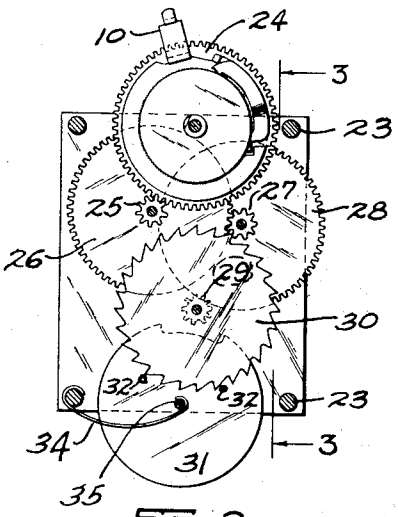


Fig. 2.

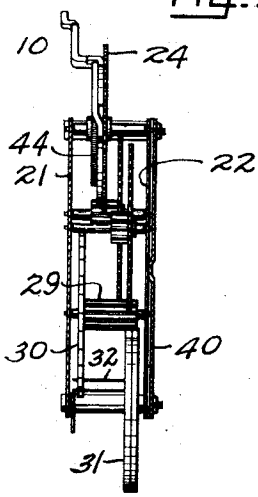


Fig. 3.

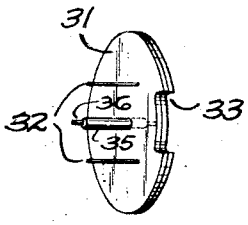


Fig. 6.

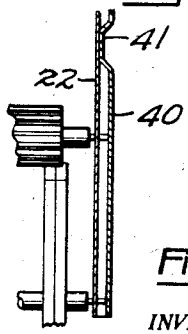


Fig. 5.

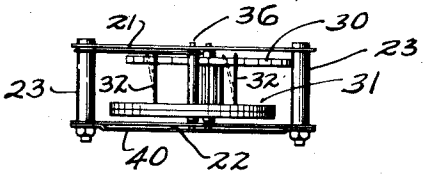


Fig. 4.

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CLOCK MECHANISM

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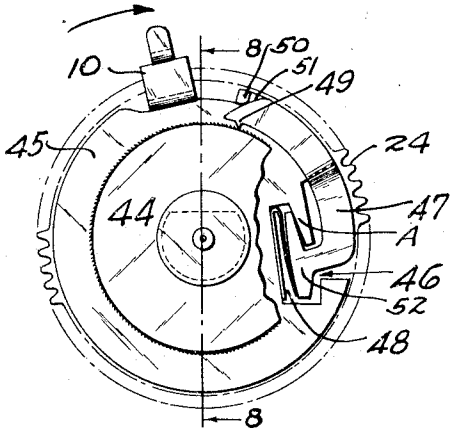


FIG. 7.

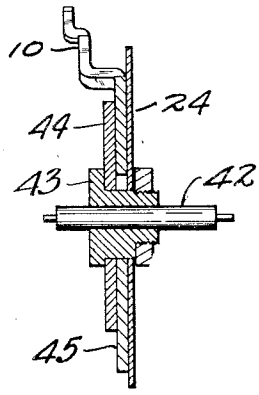


FIG. 8.

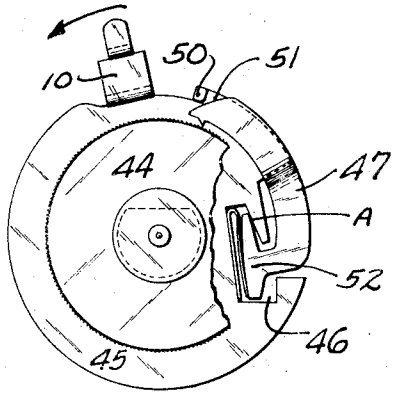


FIG. 9.

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CLOCK MECHANISM

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Application January 2, 1940, Serial No. 312,038

6 Claims. (Cl. 58—117)

This invention relates to timing devices, and more particularly to timing devices adapted for use with electric toasters, cookers and other similar articles wherein the period of the timing device must be changed occasionally depending on the food being prepared.

Clock mechanisms used in such devices usually are noisy due to their necessarily cheap and rugged construction involving relatively heavy springs, scape wheels, and balance wheels, and relatively loosely fitting bearings for the wheel shafts. These difficulties are overcome in more expensive timing devices by providing accurately spaced and fitted jewels or other bearings and tightly enclosing the mechanism for protection from dirt and other foreign matter. Even if this were done in mechanisms of the kind described herein, their rough handling and exposure to dust, bread crumbs, and cooking supplies would tend to reduce the efficiency of the mechanism.

Another difficulty encountered in timing devices of the kind used heretofore for the purpose mentioned above was that the periods of successive operation varied considerably due to the large teeth used on the ratchet wheel of the setting mechanism.

One object of the present invention is to accurately reproduce periods of the same duration for a predetermined setting of the device.

Another object is to provide a quiet operation of a timing device of the class described.

Another object is to simplify the shaft bearing construction and to attain a cheap durable but accurate bearing construction.

Other objects and advantages will be apparent to those skilled in the art from the following description, reference being had to the accompanying drawings in which,

Figure 1 is a bottom view of an electric toaster provided with a timing device constructed according to this invention.

Figure 2 is a top view of the clock mechanism shown in Figure 1 with one frame plate removed and is drawn on an enlarged scale.

Figure 3 is a section on the line 3—3 of Figure 2.

Figure 4 is an end view of the timing device.

Figure 5 is a detail of the spring plate assembly.

Figure 6 is a perspective of the pallets and pallet support constructed according to this invention.

Figure 7 is a detail of the ratchet assembly used in the timing device constructed according to this invention and showing the pawl in engagement with the ratchet wheel.

Figure 8 is a section on the line 8—8 of Figure 7.

Figure 9 is a view of the ratchet assembly similar to that of Figure 7 showing the pawl out of engagement with the ratchet wheel.

Figure 1 shows the timing mechanism arranged to control the release of a switch opening device which is closed manually at the beginning of a toasting operation. The toaster mechanism, other than the timing mechanism described below, is illustrated and described in a copending application of the present inventor, Serial Number 276,036, filed May 27, 1939, now Patent No. 2,264,093, granted November 25, 1941, and in itself does not constitute the present invention but is illustrated to indicate one field of use of the present invention. It includes a lever 1 movable to the right by downward pressure on a bell crank, one end of which is indicated at 2 and the other end of which is indicated at 3. This movement permits link 4 to move to the right until switch arm 5 has effected contact of buttons 6. Such movement of lever 1 brings flange 7 against an opposing shoulder 8 on a bar 9, and further movement thrusts bar 9 and clock mechanism arm 10 to the right. Such movement has resulted in flange 7 being received in the recess 11 in bar 9. When manual pressure on bell crank 2, 3 has been released, spring 12 pulls lever 1 to the left but the movement is retarded by the clock mechanism until lever 1 is released from bar 9 by the camming action of elements 13 and 14 as described in the above mentioned application.

The clock mechanism forming the subject matter of the present application includes top and bottom plates 21 and 22, spaced apart by posts 23, and a gear train including gear 24, pinion 25, gear 26, pinion 27, gear 28, and pinion 29. A scape wheel 30 moves with pinion 29 and is controlled by a balance wheel 31 (Figures 2 and 6) provided with pallets 32 consisting of long pins of spring material disposed so that their portions spaced substantially from balance wheel 31 engage the teeth of scape wheel 30. Each oscillation of the balance wheel is accompanied by a yielding of the pallets when they strike the scape wheel, so that they constitute balance spring structure, as well as pallets, and their yielding eliminates the usual clicking noise which is characteristic of the hammer-like blow between relatively rigid escapement of elements.

Balance wheel 31 is recessed at 33 (Figure 6) to receive the adjacent portion of pinion 29. The oscillation of the balance wheel will be limited by the ends of its recess 33 striking pinion 29. This will not be a normal action but will occur in the event of any abnormal movement of the balance wheel such as might occur if a manual rotation is attempted which would move the balance wheel beyond the points readily accommodated by the flexing of pallets 32.

A spring 34 has a bow-like contour with arcu-

ate hooks at its ends engaging the balance wheel shaft 35 and one of the frame posts and distorted sufficiently to maintain contact between the shaft spindle 36 and its bearing in the frame plate, one side of which bearing and the arcuate hook forming a permanently close fit for the spindle. This prevents the spindle from vibrating in its bearing under the repeated thrusts in opposite direction resulting from the pallets striking the scape wheel. This effects a further reduction in the noise from the mechanism.

Adjacent frame bottom plate 22 is a thrust bearing plate 40 (Figure 5) having offset portions 41 which space the body of plate 40 slightly from plate 22. The pinion and gear shafts are shouldered near their rear ends and their spindles are journalled in frame bottom plate 22, but the spindles are of such length that their ends engage bearing plate 40 with the shaft shoulders spaced slightly from plate 22, thereby eliminating contact between the frame plate and the shouldered portions of the shafts and reducing friction to a minimum.

It is customary in better clock construction to provide a separate bearing for the end of each shaft and the bearing may be of hardened steel or of a jewel-like element, and each of these bearings must be positioned accurately with respect to the plate which journals the bearing and with respect to the other shafts. With thrust bearing plate 40 and the shouldering of the shafts as described above, the necessity for accurate positioning of individual bearings for the shafts is avoided and the shaft ends will be provided with a thrust bearing wherever they may project through frame plate 22 on which they are journalled. Hence, the arrangement of plates 22 and 40 eliminates friction, facilitates assembly of the mechanism, and avoids the necessity of individual expensive bearings, thereby making possible a quiet, long-lived and accurate mechanism at comparatively low cost. This feature is illustrated and described in applicant's copending application Serial Number 184,544, filed January 12, 1938, now Patent No. 2,233,139, granted on February 25, 1941, and as to this feature the present application constitutes a continuation in part of the earlier filed application.

The setting of the mechanism is effected through a novel ratchet assembly associated with gear 24 and detailed in Figures 7, 8, and 9. The gear shaft 42 carries a hub 43 non-rotatably mounting gear 24 and a ratchet wheel 44. A disc 45 is rotatable on hub 43 and has the radial arm 10 connected to setting arm 9 (Figure 1). Disc 45 has a recess 46 which receives one end of a pawl 47 and a spring 48 which thrusts the pawl into the position shown in Figure 7 in which it pivots about the point A to bring its toe 49 into contact with the teeth of ratchet wheel 44. These teeth are so very small that the pawl toe would slide over them, notwithstanding the thrust of spring 37, but for a camming action provided by a lug 50 on disc 45 which opposes the inclined end face 51 of the pawl. Recess 46 is longer than the pawl base 52 and when lever 1, bar 9, arm 10, and disc 45 are moved to the right in Figure 1, which is to the left in Figures 7 and 9, the play of pawl base 52 in recess 46 permits lug 50 to move away from pawl face 51 (Figure 9) and the pawl may ride over the ratchet teeth.

Upon movement of disc 45 in the opposite direction, under the pull of spring 12, lug 50 engages pawl face 51 (Figure 7), to thrust pawl toe 49 tightly against the ratchet teeth on wheel 44, and arm 10, cam disc 45, pawl 47, and wheel 44 move as a unit to drive the clock mechanism and permit the gradual movement of bar 9 and lever 1 to the left until they are disengaged by elements 13 and 14 and switch 5, 6 is opened.

The above described structure attains the objects set forth in the introductory portion of this specification and results in a rugged, cheaply constructed clock mechanism which is so quiet as to be almost inaudible and which has a long useful life notwithstanding rough handling and other disadvantageous conditions under which clocks must work when used in the types of equipment mentioned.

What is claimed is:

1. In a clock escapement mechanism, a scape wheel, a pinion by which said scape wheel is driven, and a balance wheel provided with yielding pallets for engaging said scape wheel, the periphery of said balance wheel being provided with a recess to receive a portion of said pinion, and the ends of said recess being arranged to oppose said pinion to limit the oscillation of said balance wheel.

2. In a clock escapement mechanism, a scape wheel, a pinion by which said scape wheel is driven, and a balance wheel correlated with said scape wheel, the periphery of said balance wheel being provided with a recess to receive a portion of said pinion, and the ends of said recess being arranged to oppose said pinion to limit the oscillation of said balance wheel.

3. A clock escapement mechanism comprising a scape wheel and a balance wheel, said balance wheel being provided with a pallet formed of a straight piece of wire with one end secured to said balance wheel and the other end disposed to engage said scape wheel, said wire being of spring material so that its unsecured end yields upon contact with said scape wheel, there being means positively limiting the extent of oscillatory movement of the balance wheel before the spring wire is deformed sufficiently to affect its elasticity.

4. A clock escapement mechanism comprising a scape wheel, there being a pinion fixed thereto, and a balance wheel provided with a pallet disposed to engage said scape wheel, said pallet being constructed to yield upon contact with said scape wheel, there being a rigid element on said balance wheel arranged to engage said pinion upon abnormal yielding of the pallet.

5. In a clock escapement mechanism, a scape wheel, a balance wheel, a shaft mounting the latter, a bearing member journalling said shaft, and a spring having an arcuate hook portion partially surrounding said shaft, said spring being tensed to thrust the concave face of said hook portion against said shaft and to thrust the latter against the opposing side of said bearing.

6. In a clock escapement mechanism, an oscillatory balance wheel, and structure comprising a scape wheel and a pinion by which said scape wheel is driven and a mounting for said wheel and pinion, said balance wheel being provided with yielding contact elements coacting with the scape wheel whereby step by step rotation of the scape wheel is effected, said structure and balance wheel having opposing elements positively limiting the extent of oscillatory movement of the balance wheel before the yielding contact elements are deformed sufficiently to affect their elasticity.

PAUL J. McCULLOUGH.