United States Patent

Yasuda et al.

[15] **3,672,150**

[45] **June 27, 1972**

[54] DISPLAY DIAL ASSEMBLY FOR TIMEPIECE

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[73] Assignee: **Citizen Watch Company Limited,** Tokyo, Japan

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[30] **Foreign Application Priority Data**

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Nov. 12, 1970 Japan.....45/111594

[52] **U.S. Cl.** .....**58/5,** 58/58, 58/152 R
[51] **Int. Cl.** **G04b 19/24**
[58] **Field of Search**.....58/45, 42.5, 43, 125 B, 126 A, 58/152, 58

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Assistant Examiner—Edith C. Simmons
Attorney—Sughrue, Rothwell, Mion, Zinn & Macpeak

[57] **ABSTRACT**

The present invention relates to a display dial, such as a day calendar display dial, for a timepiece.

The improvement comprises the provision of at least two resilient arms made integral therewith and adapted for easy and positive engagement with a positioning peripheral groove formed on the mounting shaft for the dial.

7 Claims, 13 Drawing Figures

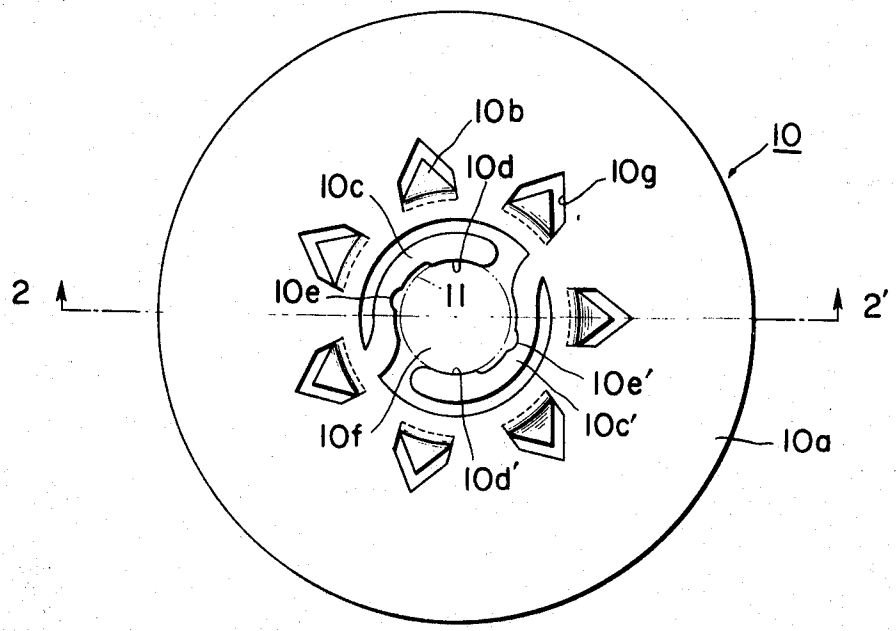


FIG. 1

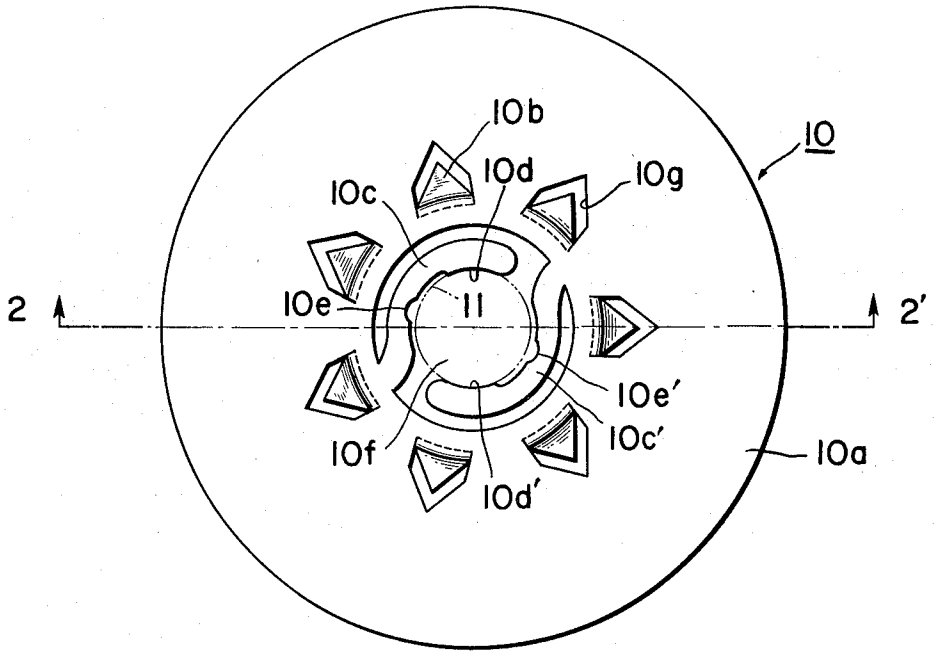


FIG. 2

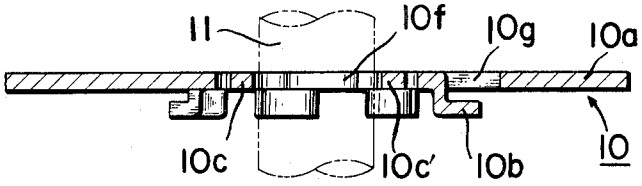


FIG. 3

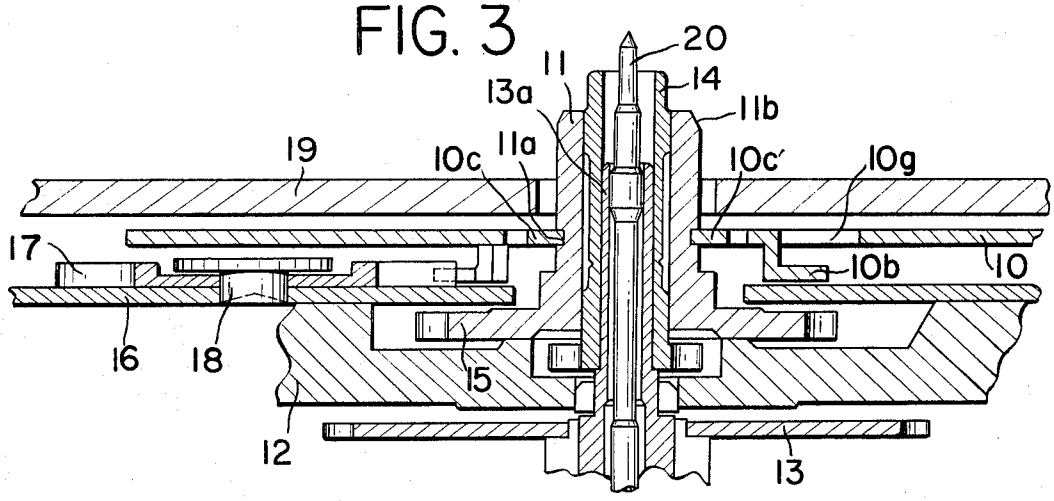


FIG. 4

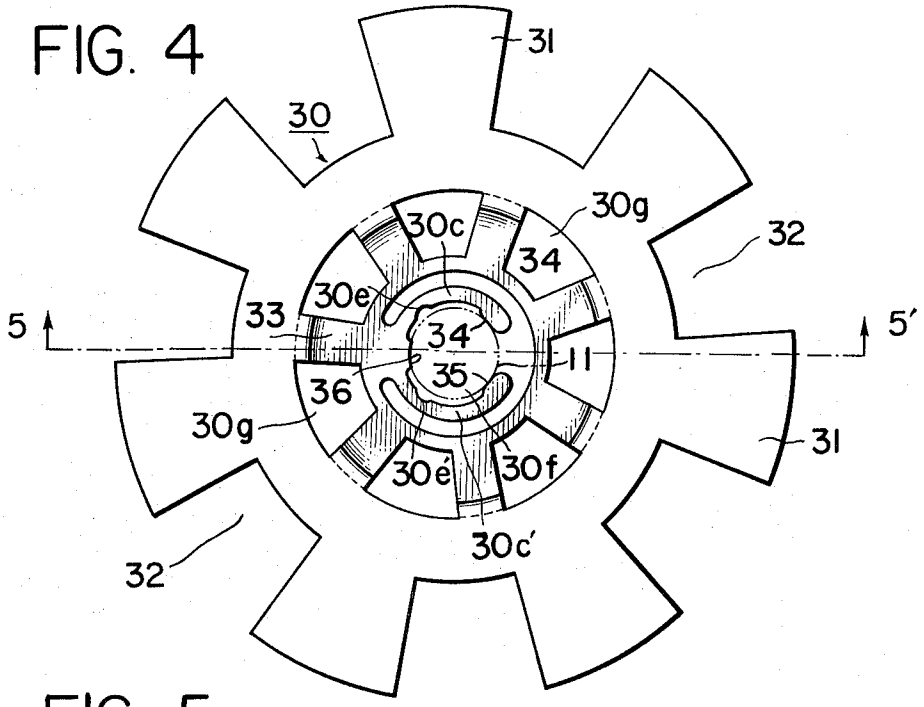


FIG. 5

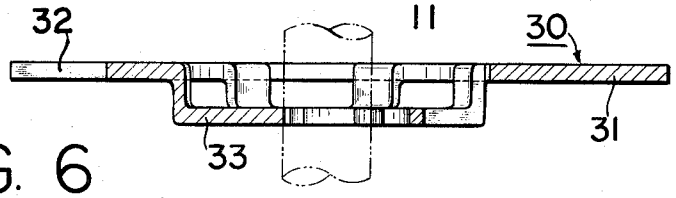


FIG. 6

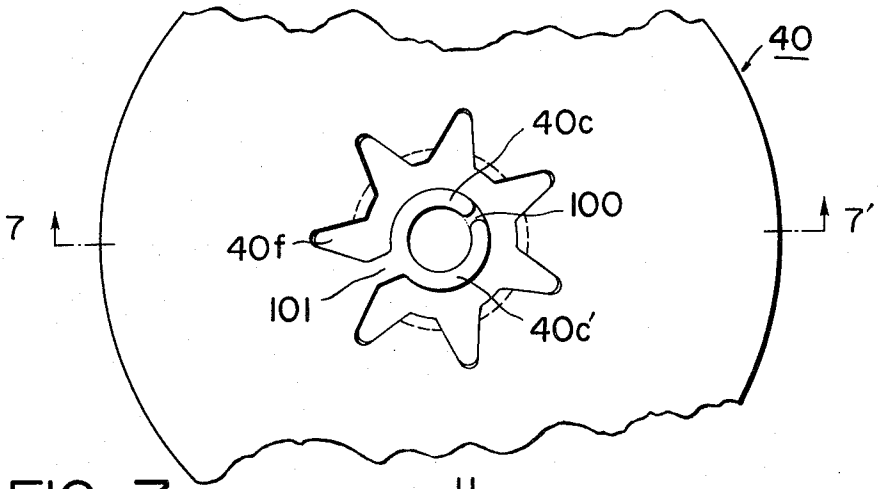


FIG. 7

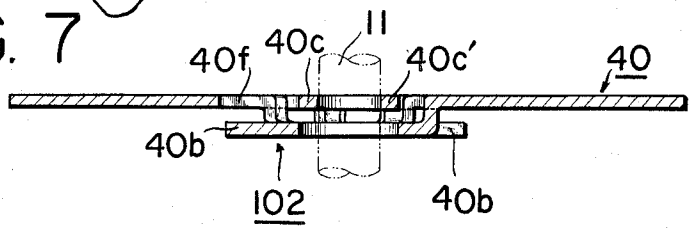


FIG. 8

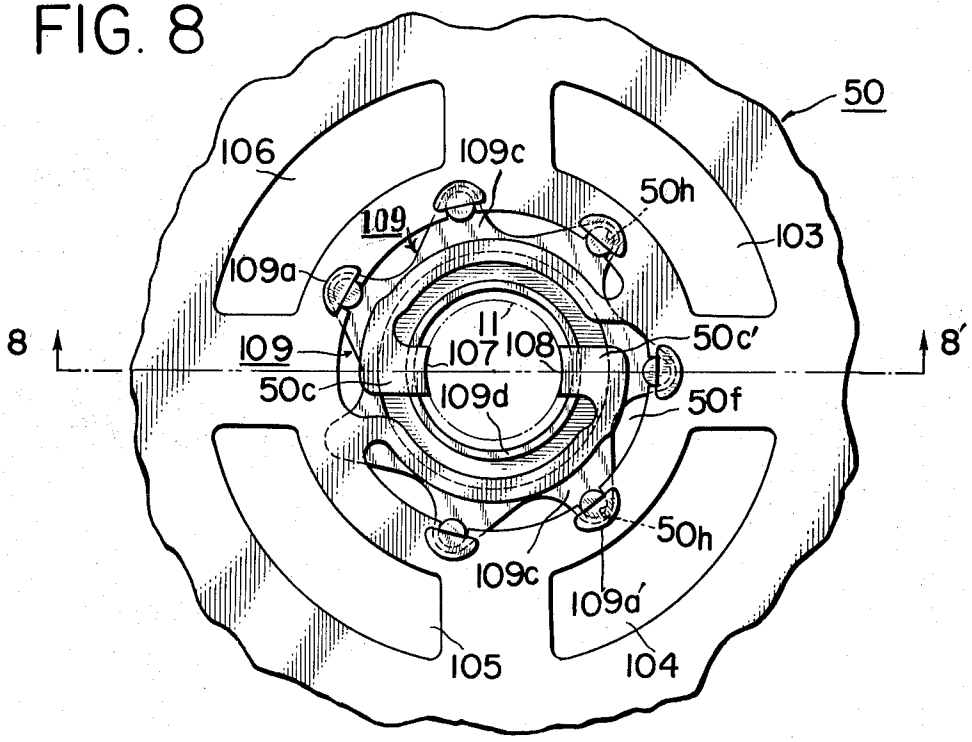


FIG. 9

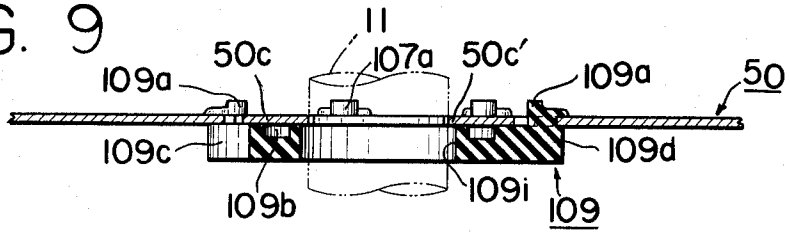


FIG. 12

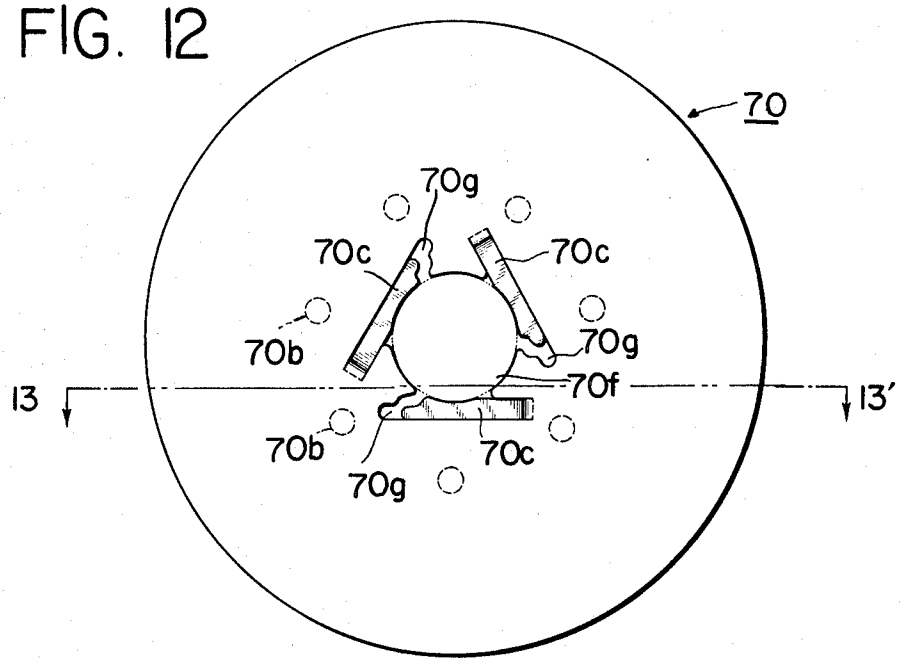


FIG. 13

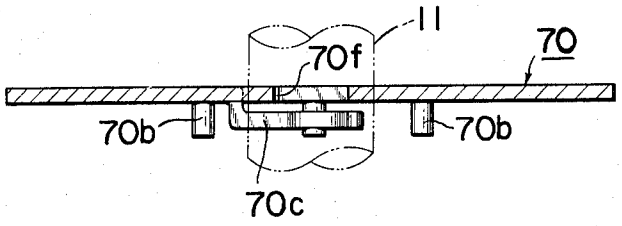


FIG. 10

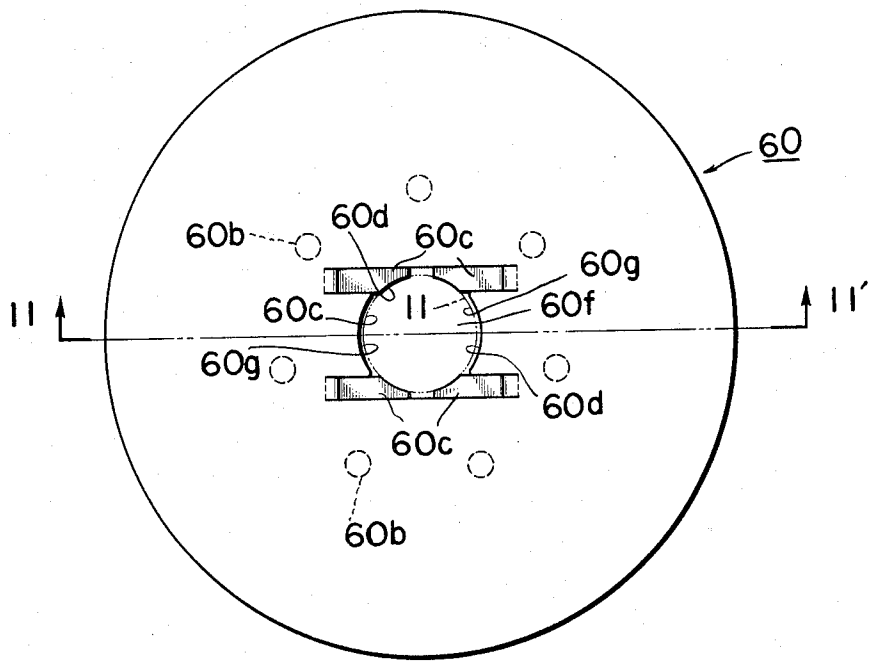
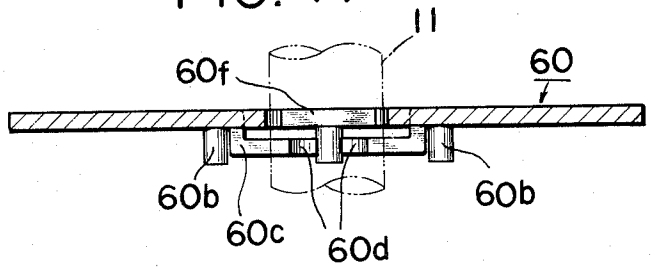


FIG. 11



DISPLAY DIAL ASSEMBLY FOR TIMEPIECE

The present invention relates to a display dial, such as a day calendar display dial, for a timepiece.

It is the main object of the invention to provide a display dial of the above kind which can be easily attached to and detached from a mounting shaft.

A further object of the invention is to provide a display dial of the above kind which is highly easy to manufacture and very cheep in its manufacturing cost.

These and further objects, features and advantages of the invention will become more apparent when reading the following detailed description of several preferred embodiments of the invention by reference to the accompanying drawings.

In the drawings:

FIG. 1 is a plan view of a first preferred embodiment of the invention,

FIG. 2 is a sectional view taken along a section line shown in FIG. 1.

FIG. 3 is an axial section of part of a watch to which the pinion-dial assembly is fitted, said dial serving as a day calender display dial for said watch.

FIGS. 4 and 5 are similar views to FIGS. 1 and 2, showing, however, a preferred second embodiment of the invention.

FIGS. 6 and 7 are similar views to FIGS. 1 and 2, showing, however, a preferred third embodiment of the invention.

FIGS. 8 and 9 are similar views to FIGS. 1 and 2, showing, however, a preferred fourth embodiment of the invention.

FIGS. 10 and 11 are similar views to FIGS. 1 and 2, showing, however, a preferred fifth embodiment of the invention.

FIGS. 12 and 13 are similar views to FIGS. 1 and 2, showing, however, a preferred sixth embodiment of the invention.

Referring now to FIGS. 1 and 2, the first embodiment will be described hereinbelow in detail.

In these figures, numeral **10** represents a display dial in its entirety. This dial **10** represents a front surface **10***a* on which a series of radially arranged display marks or symbols such as names of the calendar days: Monday, Tuesday . . . and the like, when the dial is used as the day calendar display dial in a timepiece.

The dial **10** is formed integrally and rigidly with a plurality of radially arranged pinion teeth **10***b* which have been produced by a pressing and punching job, said teeth being positioned at a different level from that of the dial proper **10**.

The dial **10** is formed with a central opening **10***f* and a pair of substantially concentrically arranged resilient holder arms **10***c* and **10***c'* which are positioned substantially in a rotational symmetry with each other. These arms and the central opening are formed by the said pressing and punching job. These arms **10***c* and **10***c'* are formed each with an inside circular arc shaped edge **10***c* or **10***c'*, respectively, adapted for snugly engaging with the bottom of a circular groove **3***a* of a mounting shaft **3** the cross-sectional outline of which is shown at **3** is shown in FIGS. **1** and **2** by a chain-dotted line, respectively. In practice, however, this shaft **11** is formed into a tube shaft as most clearly seen from FIG. **3**. Each of these resilient arc-shaped arms **10***c* and **10***c'* is formed on its inside periphery with a recess **10***e* or **10***e'*, respectively, which serves for dismantling service by receiving a manual tool tip.

The dial **10** is formed with a plurality of radially arranged perforations **10***g* after the punch-formation of downwardly offset radial pinion teeth **10***b*.

In FIG. **3**, part of a timepiece movement is shown in its axial section. In this movement, the dial **10** is utilized as day calendar display dial.

In this timepiece movement, numeral **12** represents part of a conventional lower plate of the movement; **13** shows a second wheel of the gear train of the movement; **14** represents a cannon pinion. The shaft **11** which has been referred to in the foregoing FIGS. **1** and **2**, constitutes practically the hollow shaft part of a cannon wheel.

Further in FIG. **3**, numeral **16** represents a guard plate which is rigid with the lower plate **12** and positioned slightly above the cannon wheel **15**, so as to prevent any stipping disengagement of the wheel **15** from the position in the timepiece movement.

A day dial drive wheel **17** is rotatably mounted around a pivot **18** fixedly mounted on the guard plate **16**. Numeral **19** represents a conventional time-indicator dial of the timepiece, said dial being shown only partially and said drive wheel **17** being in mesh with said pinion teeth **10***b*.

Numeral **20** represents a conventional second hand arbor which is, as conventionally, rotatably mounted in the shaft of center wheel **13**. The top end of shaft **11** is chamfered at **11***b*.

The members **12, 13, 14, 11; 15, 16, 17, 18, 19** and **20** are of conventional design and arrangement so that no further description of their **1** and and function would be necessary for better understanding of the invention.

The gear-dial assembly **10; 10***b* according to this invention can be manufactured easily on an industrial production scale at a low cost by relying substantially upon the pressing and stamping job and substantially in a single manufacturing step.

When it is intended to fit the aforementioned pinion-dial assembly in position in the timepiece movement as shown in FIG. **3**, the assembly shown in FIGS. **1** and **2** is inserted from upper onto the hollow shaft part **11** by utilizing the central opening **10***f*. At first, the resilient holder arms **10***c* and **10***c'* will be slightly and resiliently expanded outwardly by contact of the respective arc-shaped inner edge parts **10***d* and **10***d'* with the chamfered shaft end **11***b*. By moving slippingly the dial **10** along the outside surface of shaft part **11**, until it comes to the groove **11***a*, the dial can be snapped into the groove by its resilient arms **10***c* and **10***c'*, thus the dial being firmly positioned at the height of the groove **11***a*. Therefore, otherwise possible axial shift of the dial **10** relative to the cannon wheel shaft can be positively prevented and the dial can be accurately positioned at the specifically destined position in the timepiece movement.

For removal of the dial **10** from position, it is sufficient to insert a tool tip from upper through a central dial opening **19***a* into one of the recesses **10***e* or **10***e'* and to exert a slight manual bending moment, so as to expand the resiliently gripping arm **10***c* or **10***c'*, and to slide the dial upward.

The second embodiment is shown in FIGS. **4** and **5**. In this embodiment, similar parts are denoted with respective same reference numerals, yet each being added with **20** for easier comparison and better and quicker understanding of the invention, regardless, however, of occasional minor configurational difference as well as occasional minor functional difference from those of the foregoing first embodiment.

The display dial **30** has generally a circular disc shape which is formed at its outer periphery with a plurality of or more specifically seven sector-like radial projections **31** and substantially rectangular recesses **32** arranged alternatively one after another. Each projection **31** may bear a day calendar notification, although not shown.

The dial **30** is formed with a plurality of radially arranged openings **30 g** for providing enough material for the press-formation of downwardly off-set positioned, resilient gripper arms **30***c* and **30***c'*. These arms **30***c* and **30***c'* are formed and arranged in a perfectly symmetrical way about a section line **5–5'**.

These resilient gripper arms **30***c* and **30***c'* are concentrically arranged within the area of a central opening **30***f* when seen in the plan view shown in FIG. **4**, the respective root portions of these gripper arms are integral with an off-set inner control disc area **33**. The dial **30** so far shown and described has been fabricated into its final shape by a single pressing and punching job.

The gripper arms **30***c* and **30***c'* are formed with respective tool-tip reception recesses **30***e* and **30***e'* in the similar way as before, but, dispensed with the shaft-gripping arc-shaped edges **30***d* and **30***d'*. In this case, these arms **30***c* and **30***c'* embrace resiliently the mounting shaft, equally shown by chain-dotted line **11** as before. This shaft **11** is embraced in this case at three points **34, 35** and **36**, of which the former two points **34** and **35** are selected at close proximity of the respective arm

tip ends, while the remaining contact point **36** is selected at the common root portion of these gripper arms. It should be noted that in the present embodiment, no pinion teeth such as at **10***b* in the foregoing first embodiment is provided.

The operation of the present embodiment will be self-explanatory by consideration of the foregoing structural description thereof in combination with the whole detailed description on the first embodiment.

The third embodiment is shown in FIGS. **6** and **7**. In this case, similar parts as before are shown by respective same reference numerals, each being, however, attached with **30**.

The display dial in this embodiment is shown at **40** in its entirety. Resilient gripper arms **40***c* and **40***c'* are arranged in the same level to that of main body of the dial **40**. These arms **40***c* and **40***c'* are arranged in a complete circle which is, however, broken at **100**. The common root portion at **101** is made integral with the main body of the dial **40** which has a central opening shown at **40***f* formed substantially into a star.

Gear teeth **40***b* are formed on the punch-out lower disc portion shown generally at **102** and having naturally a star shape corresponding that of the central opening **405**. Projections **40***b* of this star formed by the punched-out lower disc **102** form in combination a plurality of pinion teeth similar to those shown at **10***b* in FIGS. **1–3**.

The display dial **40** fitted and formed with several functional parts so far shown and described has been manufactured by a single pressing and cut-out job on a press.

The function of the present embodiment is substantially similar to that of the foregoing first embodiment.

The fourth embodiment is shown in FIGS. **8** and **9**. In this embodiment, similar constituents are shown with respective same references as those of the first embodiment, yet each being added with **40** for clear identification.

The fourth embodiment of the invention is shown in FIGS. **8** and **9**, wherein similar parts with those of the first embodiment are denoted with respective same reference numerals, yet each being added with **40** for clear identification.

The display **50** is formed with a plurality of radially arranged cutouts **103–106** and a central opening **50***f*. A pair of resilient gripper arms **50***c* and **50***c'* are made integral with the main body of the dial **50**, each of these arms covering a central angle of about **150°** and the free ends of these arms are extending a common diameter of the dial **50** which diameter coincides in FIG. **8** with the section line **8–8'**, the inner extremities of these resilient arms having each a slightly concave gripper edges **107** and **108** adapted for resiliently contacting with the shaft **11** so as to establish a tongue-and-groove connection therewith.

Along the inner peripheral edge defining the central opening **50***f*, there is arranged a plurality of radially arranged recesses **50***h*, each having a semicircular configuration when seen in FIG. **8**, for receiving a pin **107***a* to be described.

Numeral **109** represents a star wheel made of a plastic resin material and having a plurality of radial tooth projections **109***c* made integral therewith. This star wheel **109** is formed with a central opening defined a concentric flange **109***d* neighboring to a concentric circular groove **109***b*. On the upper surface of the star wheel **109**, there is formed a plurality of upwardly projecting pins **109***a* arranged in a concentric circle, each of these pins being received in said receiving recesses **50***h*, as was briefly referred to hereinabove, when the star wheel has been assembled together concentrically from below with the display dial **50**.

Upon mechanically assembling the star wheel with the dial as shown, the upwardly projecting end of each of these pins **109***a* is subjected to heat and pressure, so as to provide a flared heat seal connection, as shown at **109***a'*. The star wheel **109** is formed with a center opening **109***i* for passing the shaft **11** with substantial radial idle plays.

As seen from the foregoing, the dial-star wheel assembly provides a highly rigidly united combination by relatively simple and easy manufacturing process. The easy and positive attachment and detachment of the dial-star wheel assembly to and from the shaft **11** can be assured as in the foregoing several embodiments.

The fifth embodiment of the invention is shown in FIGS. **10** and **11** in combination. In this embodiment, similar parts as those of the first embodiment are denoted with respective same reference numerals, each being, however, added with **50** for clearer identification and comparison.

The display dial, generally shown at **60**, is formed with a central opening for allowing to pass a mounting shaft **11** as before. The dial is formed with two pairs of resilient and mutually opposed arms, each having substantially a L-shape when seen in their elevational view shown in FIG. **11**. Each of these arms **60***c* is formed with an arc-shaped contacting edges **60***d* in close proximity of the free end of the arm substantially in an inclined manner and adapted for contacting with the shaft groove which is similar to that shown at **11***a* in the first embodiment, although not specifically shown.

The shaft **11** is positioned by contact with arc-shaped concave edges **60***g* defining substantial part of said center opening **60***f*. As seen main or working part of each of the resilient arms **60***c* is positioned in a downwardly off-set position from the main body of the display dial **60**. A plurality of gear pins **60***b* are radially provided in an concentric manner around the center opening **60***f*, so as to provide practically the function of a pinion. All these constituents, except pinion pins **60***b*, have been formed by a single pressing and cutting-out step on a press, not shown.

The attaching operation of the present dial **60** can be made in the similar manner as before. In order to detatch the dial from engagement with the shaft, a pari of resilient arms **60***c* when seen in the lateral direction to the section line **11–11'** are forcibly expanded by a pencette or the like tool.

The sixth embodiment of the invention is shown in FIGS. **12** and **13**.

In the present embodiment, similar parts to those used in the first embodiment are denoted with respective same reference numerals, each being, however, attached with **60** for easier identification and comparison.

In the present embodiment, three resilient arms **70***c* are formed and arranged substantially tangentially to a center opening **70***f* adapted for reception of a shaft denoted again with the same reference numeral **11**. There are formed three recesses **70***g* in close proximity to the tip ends of the resilient arms **70***c* adapted for reception of a pincette or the like tool used for the disengaging service.

The operation can be easily understood from the foregoing description, especially from that concerning the foregoing fifth embodiment.

In all the foregoing embodiments, the dial can be rotated with slight friction around the shaft when the dial is operated

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A display dial, such as day calendar display dial, for a timepiece having a central bore for detachable reception of a groove shaft, said dial being characterized by the provision of at least two resilient arms made integral with the dial, each of said arm having a concavely curved portion adapted for pressure contact with the bottom of a peripheral groove formed on said shaft.

2. A display dial as claimed in claim **1**, wherein a pair of said resilient arms are arranged in a rotary symmetry to each other.

3. A display dial as claimed in claim **1**, wherein a pair of said resilient arms are arranged in a symmetry to each other.

4 A display dial as claimed in claim **1**, wherein said dial is formed with a concentric and integral pinion teeth made from the same material of the dial.

5. A display dial as claimed in claim **1**, wherein a separate star wheel made of a plastic material is attached firmly to said dial by fusing a plurality of connection pins.

6. A display dial as claimed in claim **1**, wherein said resilient arms are arranged substantially tangentially to said central bore.

7. A display dial as claimed in claim 1, wherein two pairs of said resilient arms are provided, each pair being arranged in line to each other and substantially tangentially to said central bore.

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