

[54] **TORSION PENDULUM CLOCK**  
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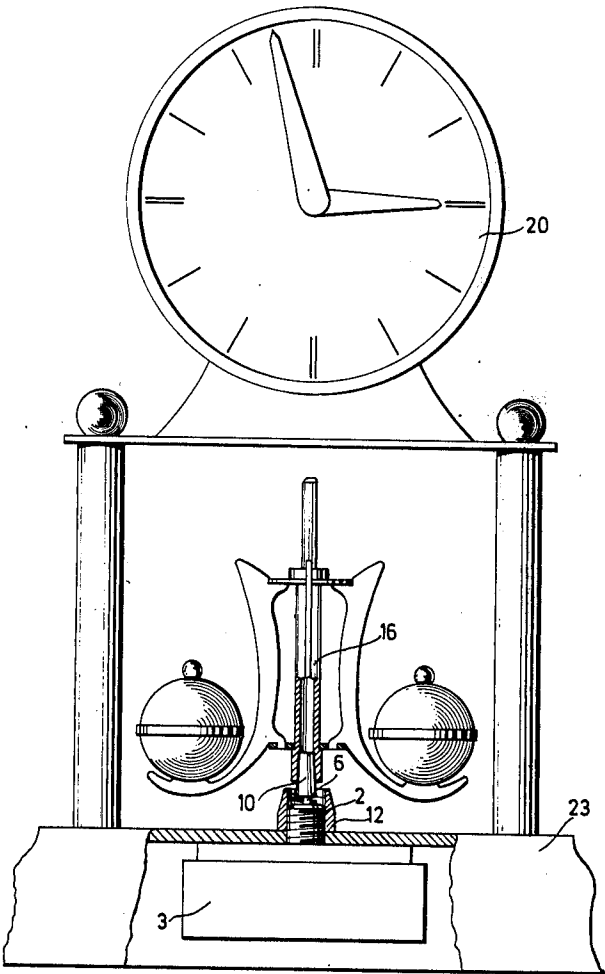
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[58] **Field of Search**..... **58/28 R, 28 A, 29, 30,**  
**58/56, 129, 152 R**

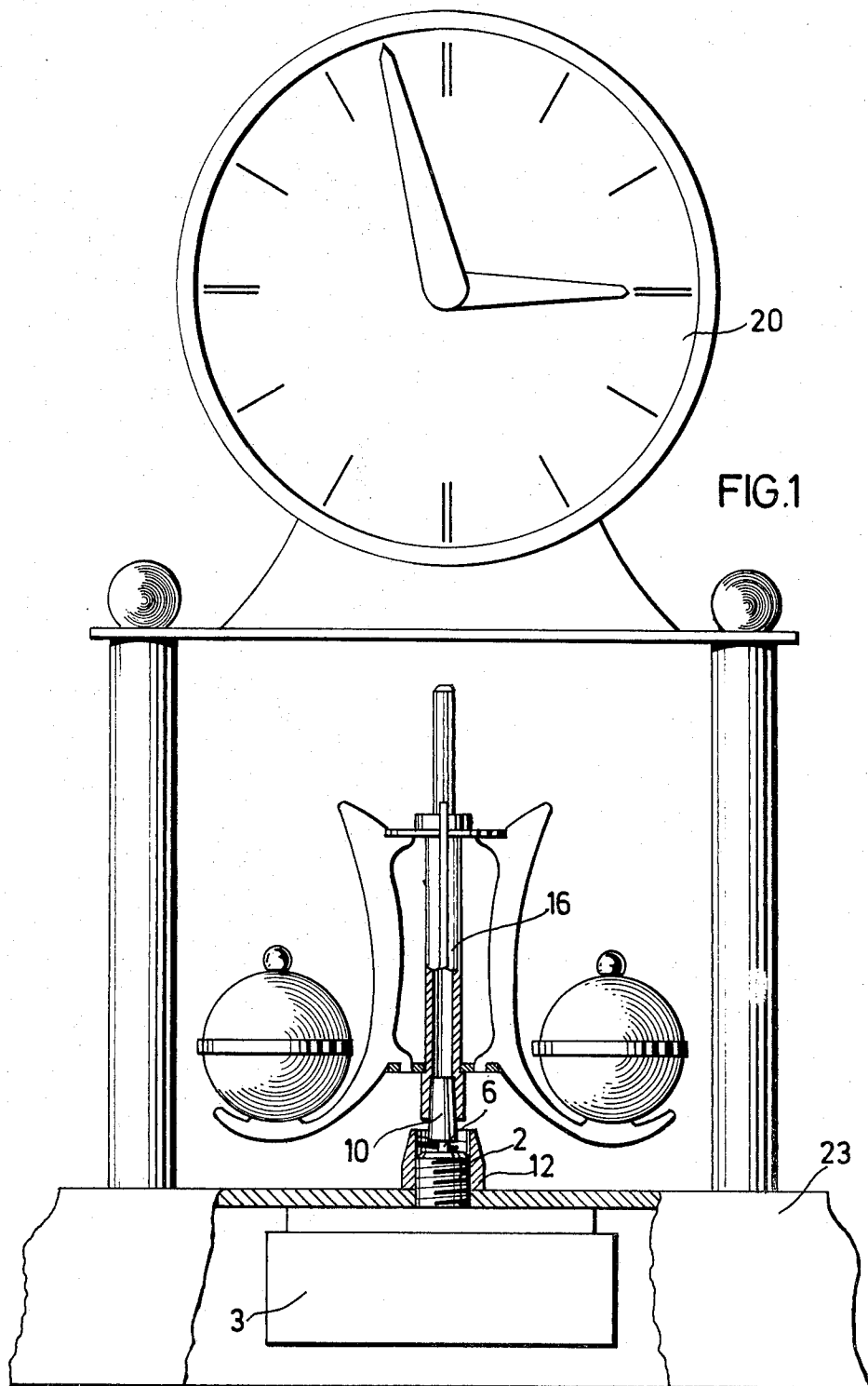
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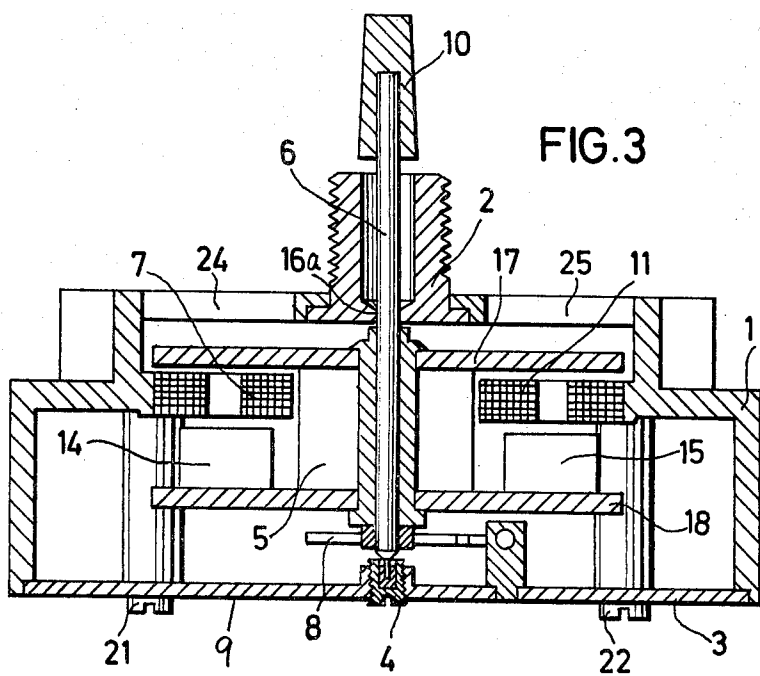
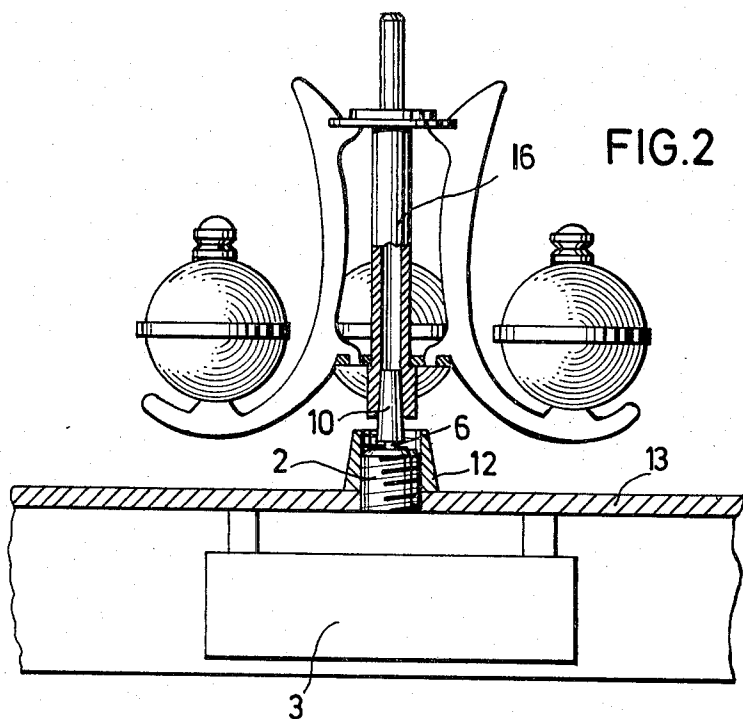
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[57] **ABSTRACT**  
A torsion pendulum clock in which the rotating pendulum performs no regulating functions and is driven by an electrical actuator independent from the clockwork; the actuator is accommodated under the pendulum in a housing in the base of the clock.

**4 Claims, 3 Drawing Figures**







# 1 TORSION PENDULUM CLOCK

## BACKGROUND OF THE INVENTION

This invention relates to new and useful improvements in torsion pendulum clocks.

Similar torsion pendulum clocks have already been proposed in which the torsion pendulum has the drawback that it is suspended on a highly sensitive pendulum spring which needs very expensive protection. Another drawback is that the clock must be exactly plumb so that the pendulum can swing freely. In this case, a flat, preferably composite wire is suspended on a crossbeam and carries the torsion pendulum. The wire must have a certain elasticity and, in accordance with prior proposals, at least one mild steel part interacts electromagnetically with the actuator mounted in the base. This layout constitutes therefore in substance a torsion pendulum clock. Nonetheless, no clocks are being made according to this proposal because the principle is too difficult to put into practice for the reasons stated. In addition, another serious handicap arises in that the torsion pendulum suspended on an elastic wire necessarily contains mild steel parts which are difficult to combine with the usual ornaments on an oscillating pendulum.

## SUMMARY OF THE INVENTION

The object of the invention is to provide a torsion pendulum clock of the above description eliminating the mentioned disadvantages and having a simple design which ensures both simple assembly and does not depend on the design features of other clocks with a torsion pendulum.

This object is achieved according to the invention in that the torsion pendulum is mounted on a pin protruding out of the actuator. For this purpose the actuator may be a known electronically or contact controlled movement serving merely to propel the pendulum.

Another feature of the invention consists in providing the protruding pin end with a tapered coupling element set on the torsion pendulum. The whole arrangement and assembly is thereby extremely simplified to meet practical requirements. Bearing in mind that the pendulum is not intended to perform regulating functions, it is essential to lay out the means for the support and propulsion in a most simple manner to keep the costs down.

Added to this is the advantage that the pin is supported in the housing only by two points which may be placed quite near to each other and are in fact independent from the position of the housing even when the pin is short. This reduces costs. Another feature is that the actuating unit with the pin is provided with permanent magnet discs between which the electrical coils are placed. Such an electrical drive is very simple and has a capacity favorable and entirely adequate for actuating the torsion pendulum. An additional advantage is that the pin is actuated by a helical spring. Apart from the helical spring, the whole pendulum actuator has virtually only one moving part, viz. the pin itself with the discs and permanent magnets mounted thereon. No other moving parts are needed.

Finally, means can be provided to operate the clockwork and the torsion pendulum actuator by the same electric supply. This precludes stoppage of the clockwork while the pendulum continues to rotate. Therefore when the torsion pendulum is seen to oscillate, it

also indicates that the clock functions or at least the battery is not yet exhausted.

Other advantages and particulars of the invention will be disclosed in the following description of two examples of its embodiment with reference to the drawings, wherein:

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows the general arrangement partly in section of one example of the invention;

FIG. 2 is a side view partly in section similar to FIG. 1 but taken across only the torsion pendulum with its actuator; and

FIG. 3 is a section view across the actuator in FIG. 2 in an enlarged scale.

In FIG. 1 a clock is shown with dial 20 in front of a conventional clockwork (not shown). Serving only as an ornament, the torsion pendulum 16 is mounted under the clock and is operated by an actuator 3 in the base 23. The actuator is entirely operably independent from the clockwork. Details of the actuator 3 are shown generally in FIG. 3. The torsion pendulum 16 is, according to the invention, mounted on a pin 6 which extends upwardly from the pendulum actuator 3. A tapered coupling element 10 is fitted on pin 6 on which the torsion pendulum is set with a matching bore. In the illustrated case, actuator 3 is mounted in the clock base 23 by means of a central fixing screw 2 and a cap nut 12. This serves to mount and adjust the actuator separately from the clockwork using only the central fixing screw 2 and nut 12.

Other particulars are shown in FIG. 3. The central actuating pin 6 is only supported at two points, namely, at its bottom with a journaled engagement on a support 4 and at an upper guided engagement 16a in fixing screw 2. In the housing two holes 24 and 25 are provided on opposite sides of screw 2 through which a disc 17 can be seen. Disc 17 and a second disc 18 spaced therefrom are fixed to pin 6 and are provided with permanent magnets 14, 15, and 5. Magnet 5 serves also as a spacer between both discs 17 and 18. Two propulsion coils 7, 11 for the rotor and both discs are fixed to the housing 1 between the discs 17 and 18, the rotor thus being fixed to pin 6.

Under disc 18 a helical spring 8 is provided connected by a suitable fixture with pin 6. The spring develops the return force for the torsion pendulum after each swing.

The electrical coils 7 and 11 are connected to a battery circuit or other source of current which also supplies the clockwork.

A bottom lid 9 is fixed from below by two screws 21, 22 to the housing 1 and carries the already mentioned support 4.

The functioning of clockworks to run the time piece but not the torsion pendulum is basically known. The invention has inter alia the advantage that, as clearly seen in FIG. 1, the whole pendulum actuator 3 is easily mounted in the base 23 of the clock and entirely independent from other assemblies.

Another advantage of the invention is that existing clocks can be provided with additional actuators 3 and a torsion pendulum.

I claim:

1. A torsion pendulum clock comprising
  - a. a base portion,
  - b. a housing on said base portion,

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- c. a support pin having journaled engagement in said housing in vertical relation with an upper portion thereof projecting above said housing,
  - d. drive means in said housing driving said pin rotatably in alternate directions in a torsion pendulum movement,
  - e. an ornamental pendulum seated on the projecting end of said pin and being rotatable with said pin in said torsion pendulum movement,
  - f. and a clockwork mounted on said base portion above said pendulum for displaying time,
  - g. said clockwork having drive means therefor independent of said drive means for said pin.
2. The torsion pendulum clock of claim 1 wherein the journaled support of said pin in said housing comprises a support member in said housing on which said pin is

seated and an upper guide member in said housing rotatably receiving said pin.

3. The torsion pendulum clock of claim 2 including a coupling element mounted on the projecting end of said pin and having a tapered outer surface engageable by said pendulum.

4. The torsion pendulum clock of claim 2 wherein said drive means for said pin comprises a pair of horizontal discs secured on said pin in vertically spaced relation, permanent magnets secured to said discs in the space between said discs, electrical coils supported in said housing operable with said magnets to rotatably drive said pin in one direction, an electric circuit for said coils, and a helical spring connected between said housing and said pin for rotatably driving said pin in the other direction.

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