

Feb. 6, 1951

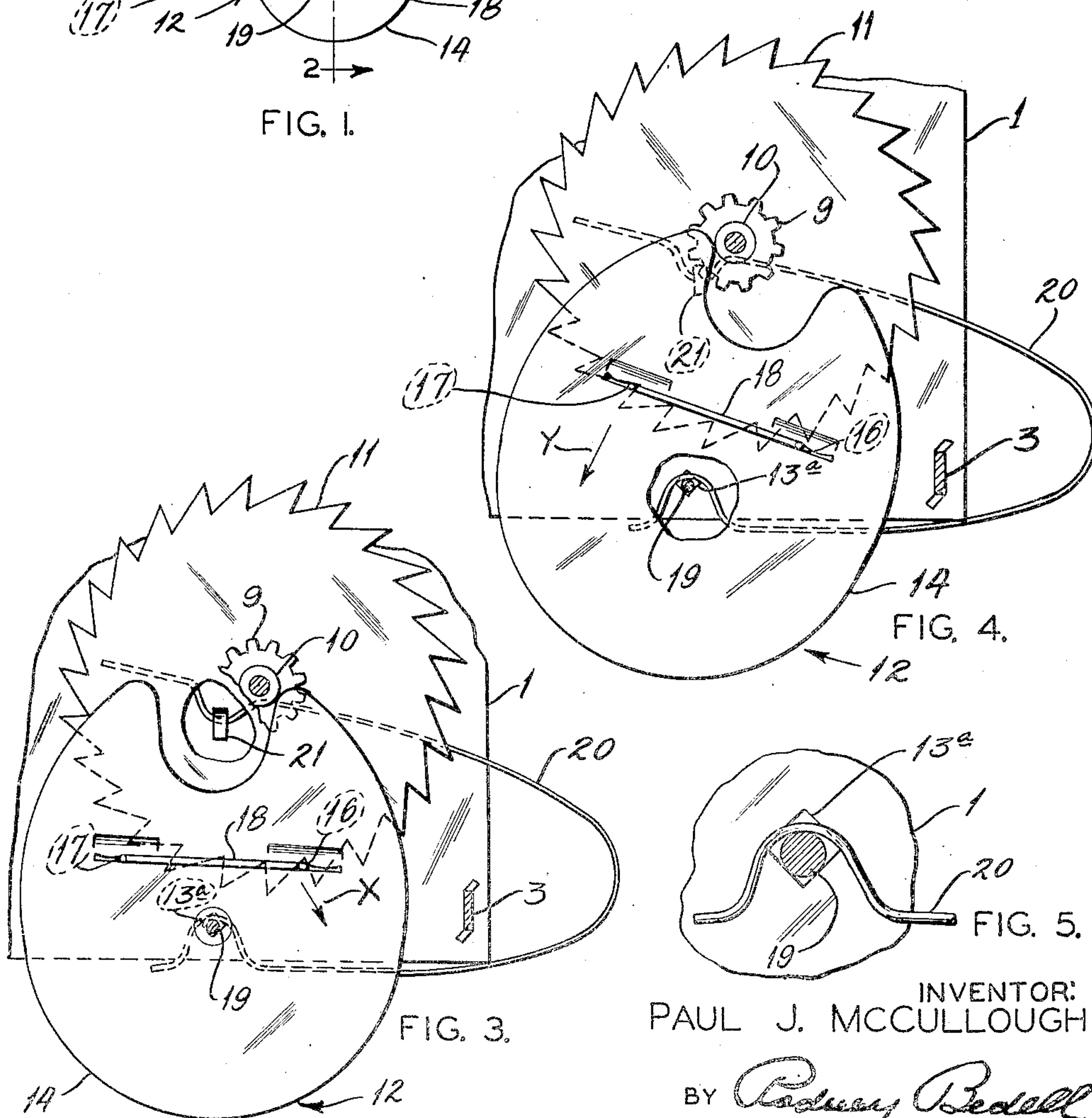
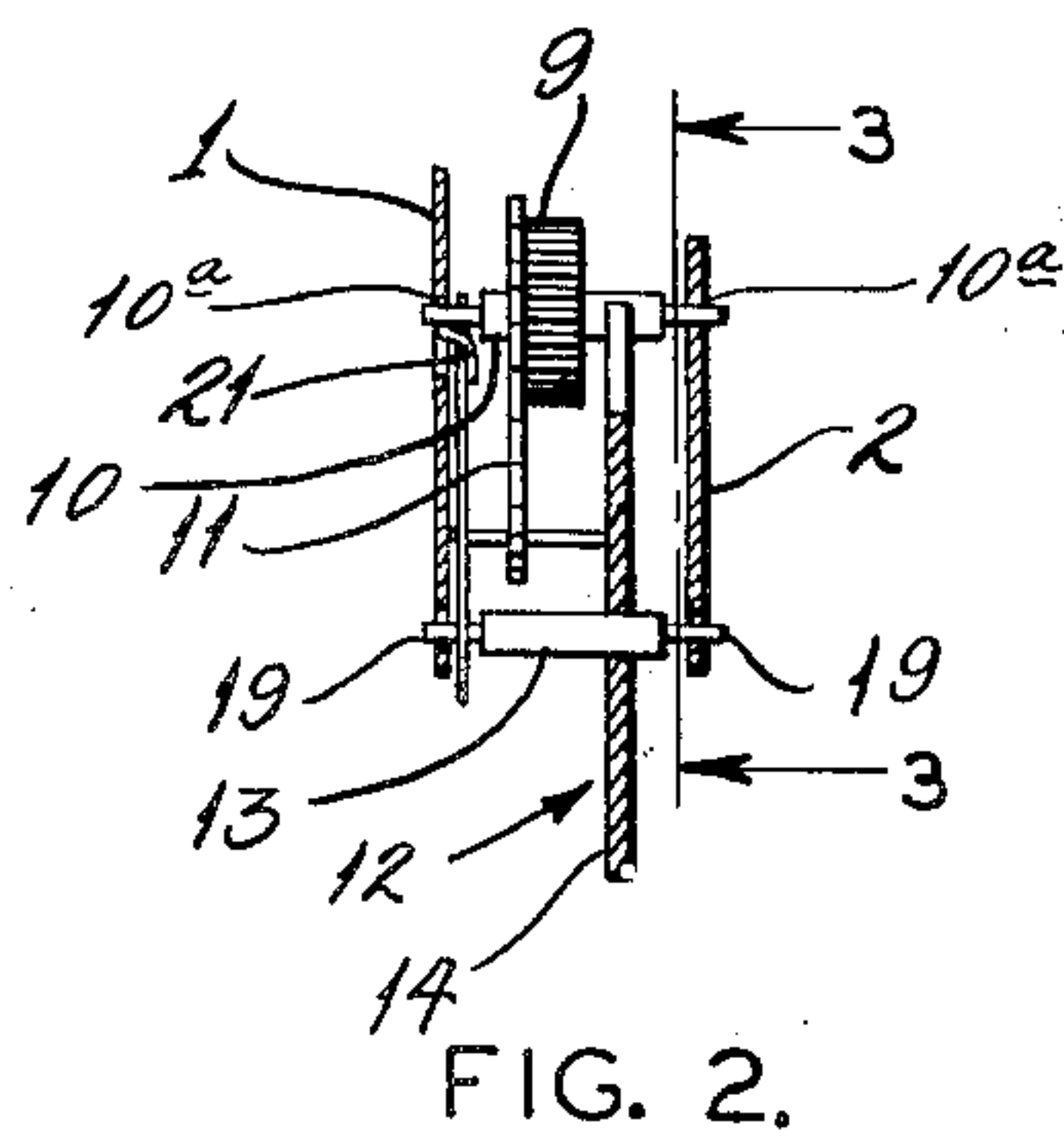
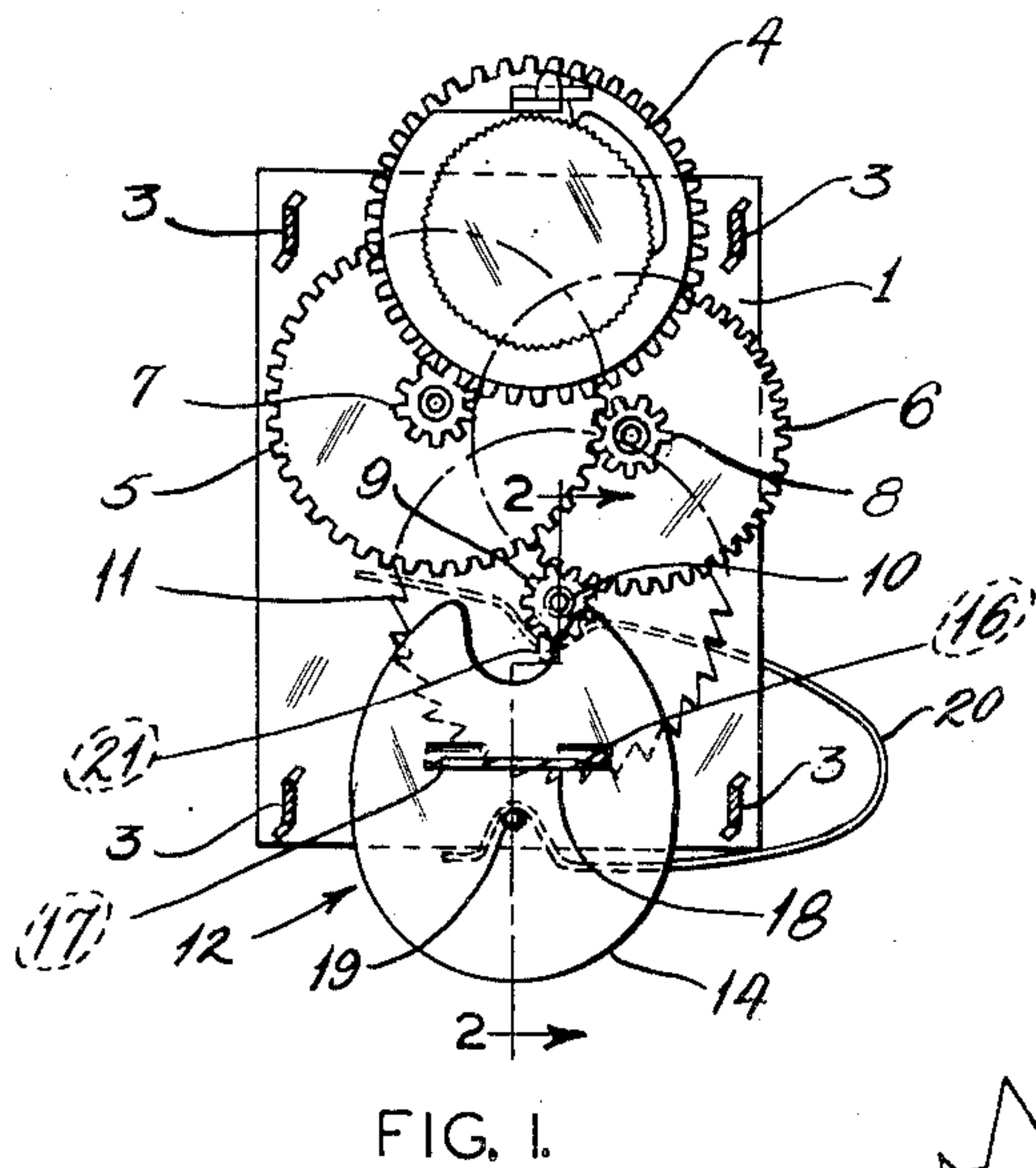
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2,540,828

CLOCK BALANCE ESCAPEMENT DEVICE

Filed Nov. 15, 1947

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

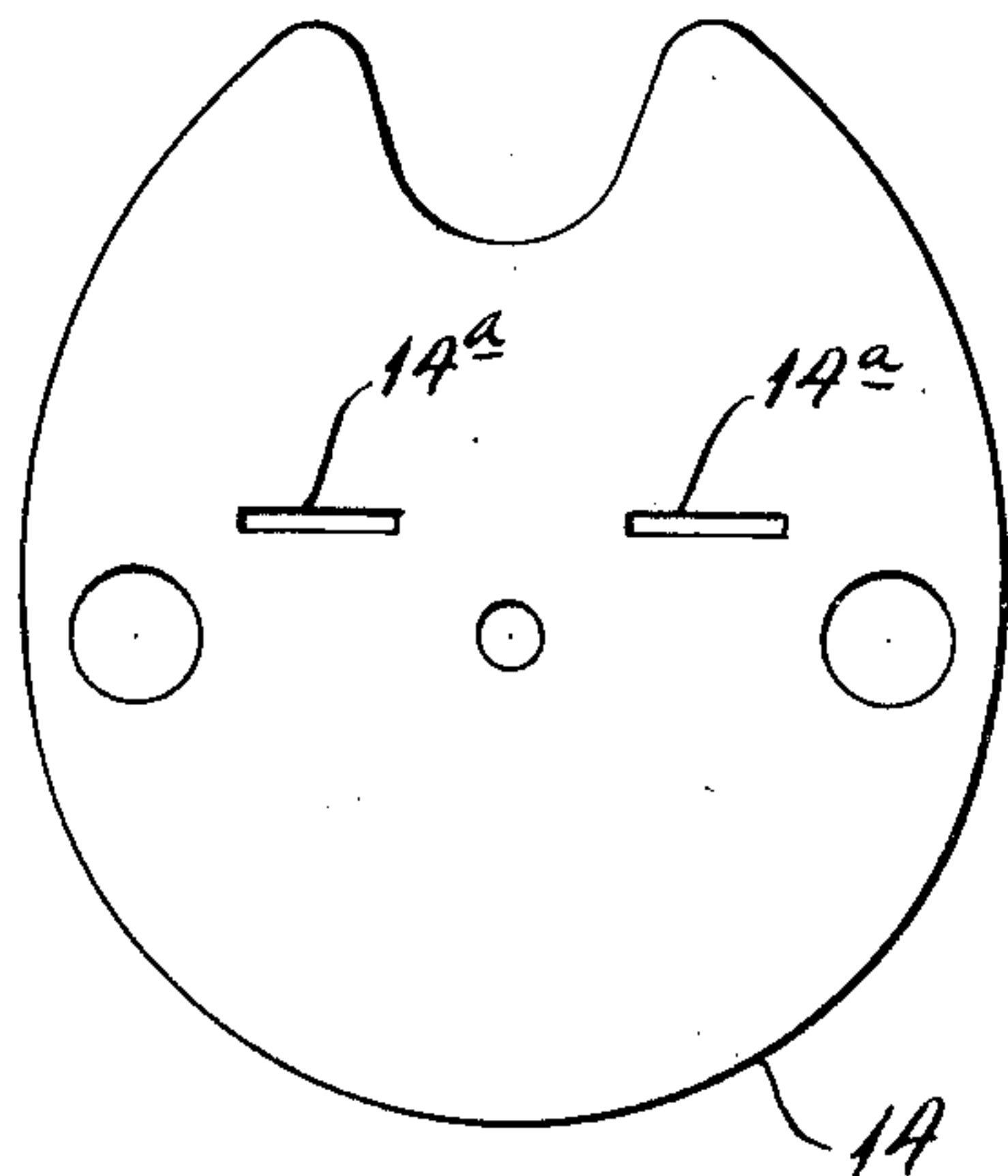


FIG. 8.

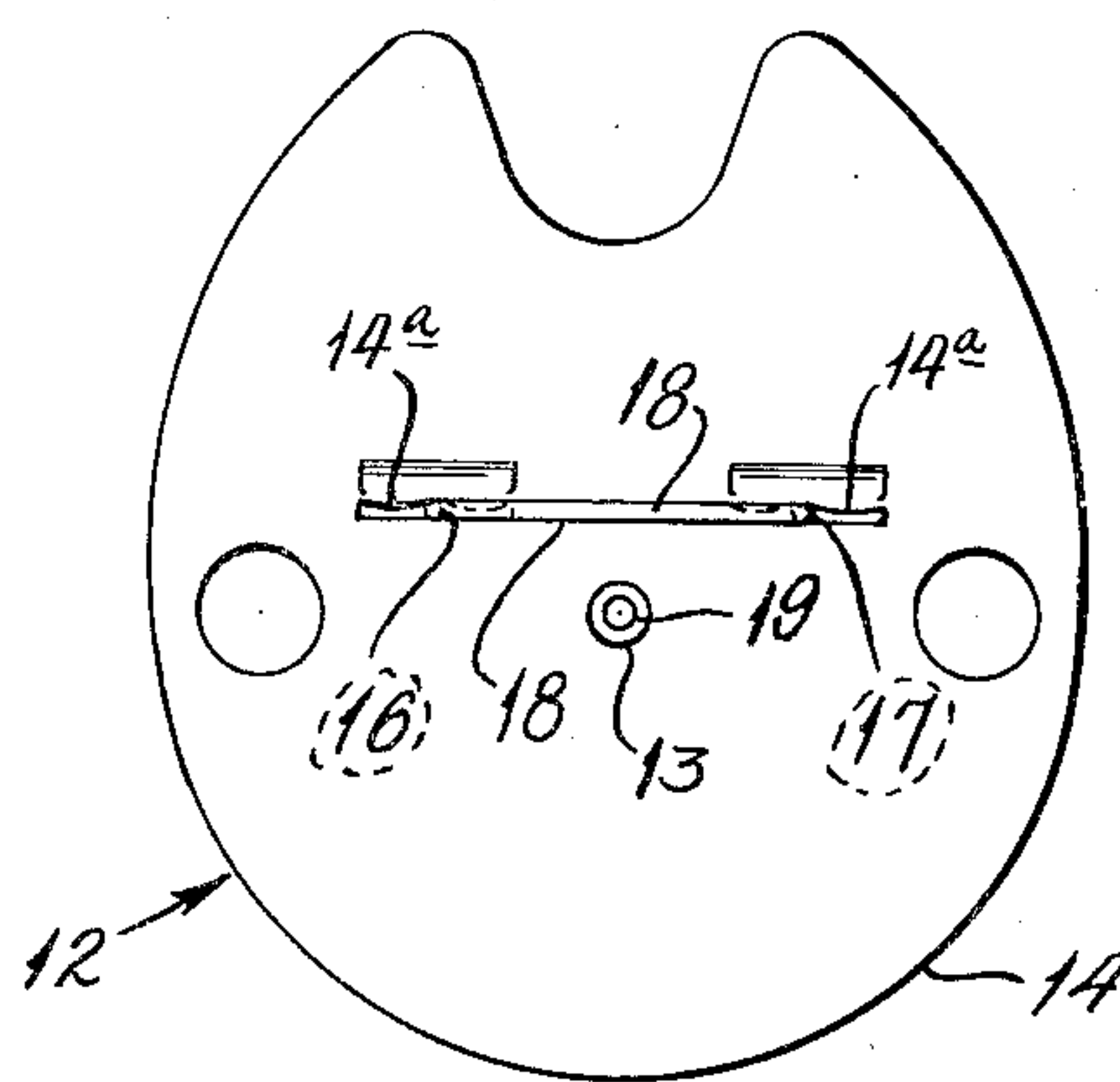


FIG. 7.

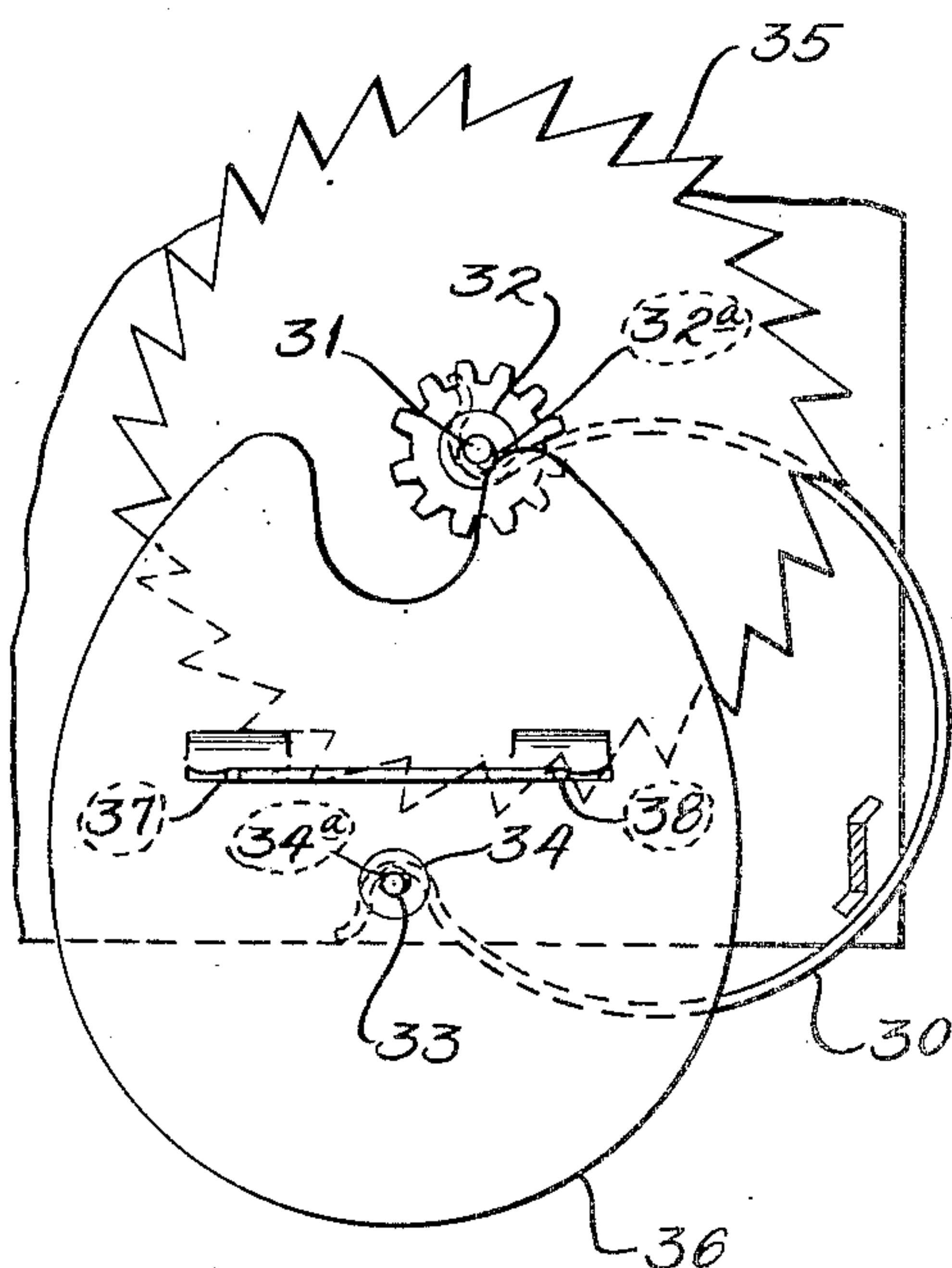


FIG. 9.

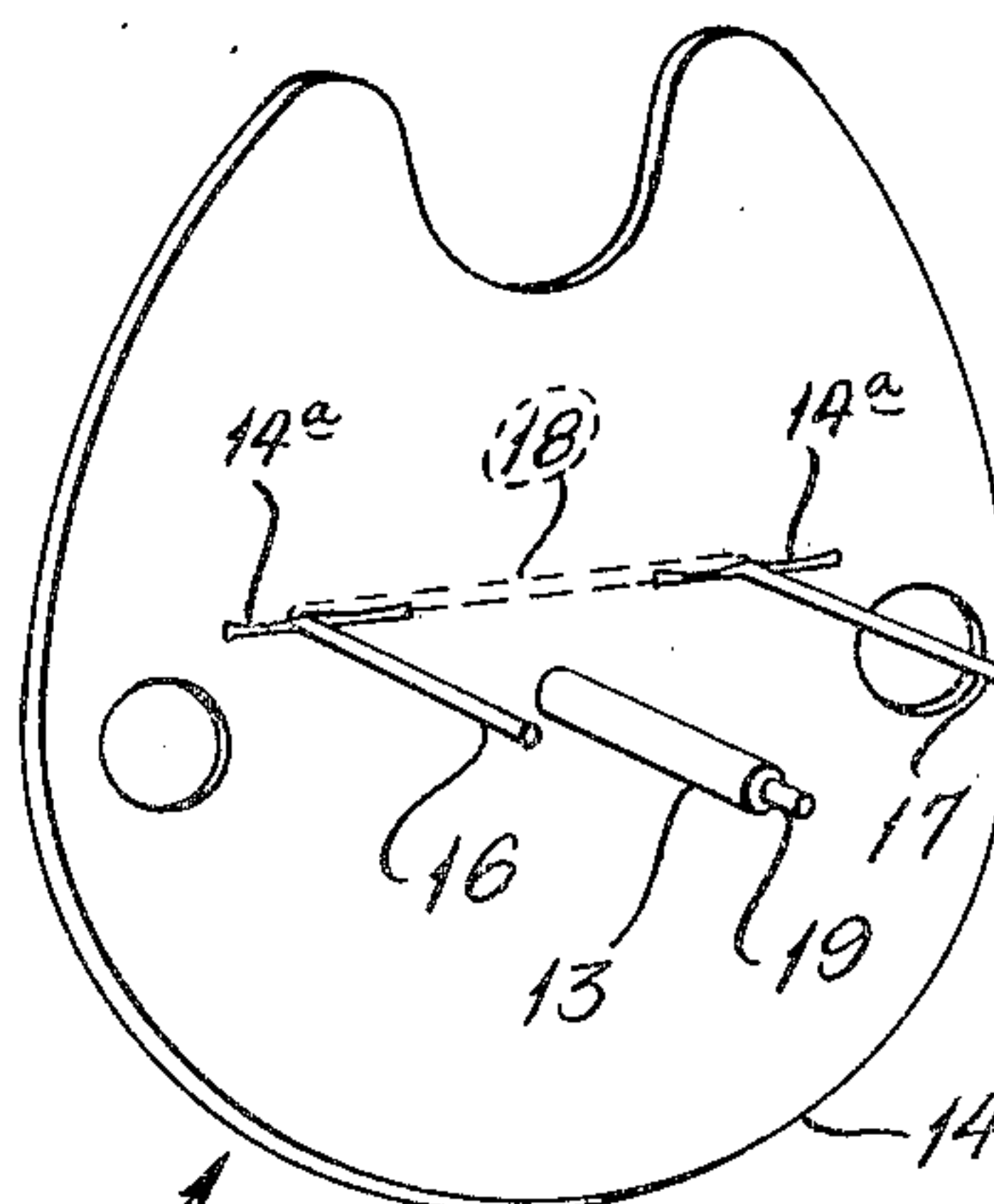


FIG. 6.

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## UNITED STATES PATENT OFFICE

2,540,828

## CLOCK BALANCE ESCAPEMENT DEVICE

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mesne assignments, to The Toastswell Com-  
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15 Claims. (Cl. 58—117)

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The invention relates to clock mechanism and more particularly to clock mechanism for use in timing electric toasters and other devices.

Reference is made to Patent No. 2,362,836, issued to the present applicant November 14, 1944, showing a clock mechanism. The present invention comprises improvements upon the clock mechanism illustrated and described in the above-mentioned patent. The present application is a continuation in part of application Serial No. 677,199, filed June 17, 1946, now abandoned by the present inventor.

In Patent No. 2,362,836, above referred to, the scape wheel engages the legs of a U-shaped wire pallet of the balance wheel and thrusts the balance wheel away from the scape wheel substantially in a direction perpendicular to the thrust of the spring member on the balance wheel. The balance wheel shaft shifts in its bearing to and from the scape wheel as the balance wheel is alternately engaged and released by the scape wheel. Although the clock mechanism is almost noiseless, if special attention is directed to it, a slight clicking sound can be heard.

The main object of the present invention is to effect even more quiet operation than heretofore of clock mechanisms constructed of parts made and assembled in quantities and of inexpensive materials, such as metal stampings, and to keep the parts in adjustment irrespective of wear.

This is accomplished by causing the spring member to thrust the balance wheel shaft substantially in the direction of thrust exerted by the scape wheel on the balance wheel and preferably towards the apex of an angular aperture. This arrangement restrains movement of the balance wheel in directions both parallel and perpendicular to the direction of thrust.

In Patent No. 2,362,836, the balance wheel comprises a pair of discs clamping between them the base of the U-shaped pallet and one of which is provided with circular openings to receive the pallet legs. The balance wheel disc preferably is made of sheet metal approximately .050" thick and the pallet preferably is made of spring wire approximately .014" in diameter. It is impractical to punch a circular hole in sheet metal smaller in diameter than the thickness of the metal, so that the diameter of the holes punched in the balance wheel disc for the pallet legs is relatively larger than the diameter of the pallet legs. The metal of the disc surrounding the pallet legs cannot readily be pressed firmly into surrounding engagement with the pallet legs. En-

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gagement and disengagement of the pallet with the scape wheel causes constant flexing of the pallet material where the legs join the connecting part which has been strained initially in making the sharp bend and this may result in the legs fracturing at the bend. Also, when pressing the metal about the disc aperture into engagement with the pallet legs, the latter are likely to shift in the aperture resulting in inaccuracies in the finished balance wheel.

Another object is to overcome these structural difficulties by providing elongated narrow slots in the balance wheel disc to receive the pallet legs. The slots can be made sufficiently narrow to closely approach the diameter of the pallet legs and to permit the metal at the side of the slots to be pressed firmly into engagement with the pallet legs and securely hold them in position and also to reinforce them at the bent portions. With this arrangement, only a single disc is needed and the pallet legs may be made separately and of straight pieces of thin wire and without the connecting part therebetween.

The above and other detail objects as will appear below are attained by the structure illustrated in the accompanying drawings, in which: Figure 1 is a side view of a clock mechanism embodying the invention, one side plate being removed.

Figure 2 is a detail vertical section taken approximately on the line 2—2 of Figure 1.

Figures 3 and 4 are detail vertical sections, drawn to enlarged scale, taken on line 3—3 of Figure 2 and showing the scape wheel and the balance wheel and associated parts in different positions.

Figure 5 is a detail of a portion of the spring member, the balance wheel shaft in vertical section and its bearing, drawn to enlarged scale.

Figure 6 is a perspective view of a balance wheel constructed according to the invention.

Figure 7 is a side view thereof.

Figure 8 is a detail side view of a balance wheel disc before the pallets and shaft are assembled thereto, and

Figure 9 is a view similar to Figure 3 showing another form of the invention.

The clock frame comprises side plates 1 and 2 held in spaced relation by posts 3. A train of gears, 4, 5 and 6, are mounted upon individual shafts journaled in plates 1 and 2 and associated with pinions 7, 8 and 9, respectively. A shaft 10 mounting pinion 9 and journaled in circular apertures 10a in plates 1 and 2 also carries a scape wheel 11.



In the embodiment shown in Figures 1 to 8, associated with scape wheel 11 is a balance wheel 12 mounted on a shaft 13 journaled in square apertures 13a in plates 1 and 2. The apex of one of the angles between adjacent sides of each aperture 13a preferably is positioned at the end of aperture 13a remote from apertures 13a.

Balance wheel 12 comprises a single plate disc 14 having elongated slots 14a and provided with a pallet structure preferably formed by a U-shaped unit of small diameter spring wire with its cross piece 18 applied to one face of the disc and with its legs 16 and 17 extending outwardly from the opposite face of the disc. After the pallet structure is applied to the disc, the metal of the latter is deformed or offset to tightly press the metal against opposite sides of the legs at points spaced from the apex of the sharp angle formed by the bends which connect elements 18 with elements 16 and 17. With this arrangement flexure of the pallet structure is restricted to the portions of elements 16 and 17 projecting from the disc and is not applied to the right angle bend in the wire where repeated flexing might readily result in failure of the wire.

Balance wheel 12 oscillates on its shaft to alternately engage and disengage pallet legs 16 and 17 with the scape wheel teeth and the spring quality of the pallet structure gives the balance wheel its oscillatory movement and functions as does the hair spring in the usual clock mechanism. Furthermore, the yielding action of the pallet structure avoids the pronounced click usually present in inexpensive simple clock mechanisms and produces a quiet clock operation which is highly advantageous in timing devices for appliances such as toasters, etc.

To further contribute to the quiet efficient operation of this device and to avoid the necessity of fine fitting of the balance wheel shaft pintles 19 in their bearings, a spring member 20 having a bow-like contour with hooked ends extends around a post 3 and has one of its ends engaging a pindle 19 of shaft 10 and the other end engaging an inward projection 21 on plate 1. Spring member 20 engages the adjacent surface of the associated pindle 19 and thrusts the opposite surfaces of both pintles 19 toward the apices of the bearing surface angles of apertures 13a in a direction substantially in alignment with the general direction of thrust exerted by scape wheel 11 on balance wheel 12 as the teeth of scape wheel 11 alternately engage pallet legs 16 and 17. This arrangement provides for rolling contact of pindle 19 of shaft 13 and the associated looped end of spring member 20 as described in Patent No. 2,362,836 mentioned above.

The force exerted on balance wheel 12 during its engagement by the scape wheel is in a direction substantially perpendicular to the pallet engaging face of the tooth engaging the pallet leg. When a tooth of scape wheel 11 engages pallet leg 16, as shown in Figure 3, the direction of thrust of scape wheel 11 on balance wheel 12 is indicated by arrow x. When a tooth of scape wheel 11 engages pallet leg 17, as shown in Figure 4, the direction of thrust of scape wheel 11 on balance wheel 12 is indicated by arrow y. Between each such engagement, no force is exerted by scape wheel 11 on balance wheel 12 and shaft pintles 19 may tend to move away from the opposing bearing surfaces of apertures 13a, particularly when the pindle supporting bearing surfaces incline downwardly away from the apices. Spring member 20 maintains

shaft pintles 19 of balance wheel 12 in apertures 13a substantially in the positions which they normally assume when balance wheel 12 engages scape wheel 11, thus quieting the mechanism. If the sides of apertures 13a should become worn, the thrust of spring member 20 on balance wheel pindle 12 holds the balance wheel pindle against the bearing surface substantially opposite to the scape wheel and thrusts the balance wheel in the direction of thrust of the scape wheel on the balance wheel.

The structure shown in Figure 9 is similar to that previously described in Figures 1 to 8 except that spring member 30 has its looped ends engaging pindle 31 of scape wheel shaft 32 and pindle 33 of balance wheel shaft 34. Apertures 32a and 34a both may be circular and receive pintles 31 and 33, respectively, but need not fit them closely. Spring member 30 engages adjacent surfaces of pintles 31 and 33 and thrusts the shafts apart with the opposite surfaces of the pintles against the bearing surfaces of apertures 32a and 34a in a direction substantially in alignment with the general direction of thrust exerted by scape wheel 35 on balance wheel 36 as the teeth of the scape wheel engage balance wheel pallet legs 37 and 38.

The above described structures attain the objects set forth in the introductory portion of this specification and provide rugged, inexpensive mechanisms which are so quiet as to be almost inaudible and which have long useful lives, notwithstanding rough handling and other disadvantageous conditions under which clocks must work when used in the type of equipment mentioned.

The details of the structure may be varied substantially from the specific disclosure herein without departing from the spirit of the invention and the exclusive use of those modifications coming within the spirit of the claims is contemplated.

What is claimed is:

1. In a clock escapement device, a balance wheel, a scape wheel associated therewith, a shaft mounting said balance wheel, and an element yieldingly thrusting said shaft in a direction substantially in alignment with the general direction of thrust exerted by said scape wheel on said balance wheel.

2. In a clock escapement device, a balance wheel, a scape wheel, shafts mounting said balance wheel and said scape wheel and each having a journal, a plate having apertures receiving said journals and forming bearings therefor, said balance wheel and said scape wheel exerting thrusts one on the other in substantially opposite directions, and a spring element thrusting said balance wheel shaft in a direction substantially in alignment with the general direction of thrust exerted by said scape wheel on said balance wheel.

3. In a clock escapement device, a balance wheel, a scape wheel associated therewith, shafts mounting said balance wheel and said scape wheel and each having a journal, said balance wheel having a pair of widely spaced pallets, said scape wheel alternately engaging said pallets and thrusting said pallets in different directions, and a spring thrusting said balance wheel shaft in a direction between the directions of said thrusts.

4. In a clock escapement device, a balance wheel, a scape wheel, shafts mounting said balance wheel and said scape wheel and each hav-



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ing a journal, a plate having apertures receiving said journals and forming bearings therefor, and a spring element having one end anchored to said plate and having the other end yieldingly thrusting said balance wheel journal against the side of the associated aperture most remote from said scape wheel.

5. In a clock escapement device, a balance wheel, a shaft mounting said balance wheel and having a journal, a plate having an aperture receiving said journal and forming a bearing therefor, said aperture having at least two sides forming the apex of an angle, and a spring element yieldingly thrusting said journal towards the apex of said angle.

6. In a clock escapement device, a balance wheel, a scape wheel associated therewith, shafts mounting said balance wheel and said scape wheel, and a spring element thrusting said shafts in opposite directions.

7. In a clock escapement device, a balance wheel, a scape wheel, shafts mounting said balance wheel and said scape wheel and each having a journal, a plate having apertures loosely receiving said journals and forming bearings therefor, and a spring element yieldingly thrusting said journals apart and against a side of the associated aperture.

8. In a clock escapement device, a balance wheel, a scape wheel, shafts mounting said balance wheel and said scape wheel and each having a journal, a plate having apertures loosely receiving said journals and forming bearings therefor, said balance wheel and said scape wheel exerting thrusts one on the other in substantially opposite directions, and a spring element thrusting said shafts in directions substantially in alignment with the general directions of thrust exerted by said scape wheel and said balance wheel on one another.

9. In a clock escapement device, a balance wheel, a scape wheel, shafts mounting said balance wheel and said scape wheel and each having a journal, a plate having apertures receiving said journals and forming bearings therefor, and an element engaging adjacent surfaces of said journals and yieldingly thrusting said journals apart and thrusting the opposite surfaces of said journals against boundaries of the apertures.

10. Structure as described in claim 9 in which the journal engaging element comprises a spring having a hook at each end.

11. In a clock escapement device, a balance wheel, a scape wheel associated therewith, shafts mounting said balance wheel and said scape wheel and each having a pintle, a plate having apertures receiving said pintles, a spring ele-

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ment in engagement with said pintles and yieldingly thrusting said pintles apart against boundaries of the associated apertures.

12. In a clock escapement device, a balance wheel, a scape wheel associated therewith, shafts mounting said balance wheel and said scape wheel and each having a journal, a plate having apertures loosely receiving said journals and forming bearings therefor, said balance wheel having a pair of widely spaced pallets, said scape wheel alternately engaging said pallets and thrusting said pallets in different directions, the reactions from said thrusts urging said scape wheel in directions substantially opposite to the directions of said thrusts, and a spring thrusting said balance wheel shaft in a direction between the directions of said thrusts on said pallets and thrusting said scape wheel shaft in a direction between the directions of said thrusts on said scape wheel.

13. In a clock escapement device, a balance wheel comprising a disc-like member having a pair of slots, pallet structure consisting of a U of spring wire with its cross bar adjacent one surface of said disc and with its legs extending through said slots in said member and projecting from the other surface, portions of said member adjacent said legs tightly pressing against opposite sides of said legs outwardly of their connection to said cross bar.

14. In a clock escapement device, a balance wheel comprising a disc-like member having an elongated slot, a flexible pallet extending through said slot and held firmly therein by opposing portions of the disc engaging opposite faces of said pallet substantially at the point where the pallet emerges from said disc.

15. In a clock escapement device, a mounting plate having a substantially polygonal aperture, a balance wheel having a shaft provided with a journal loosely received in said aperture, and a spring element exerting a constant thrust on said journal parallel to said plate to hold the journal against play in a bearing formed by the converging sides of an angle of said aperture.

PAUL J. McCULLOUGH.

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