

July 11, 1933.

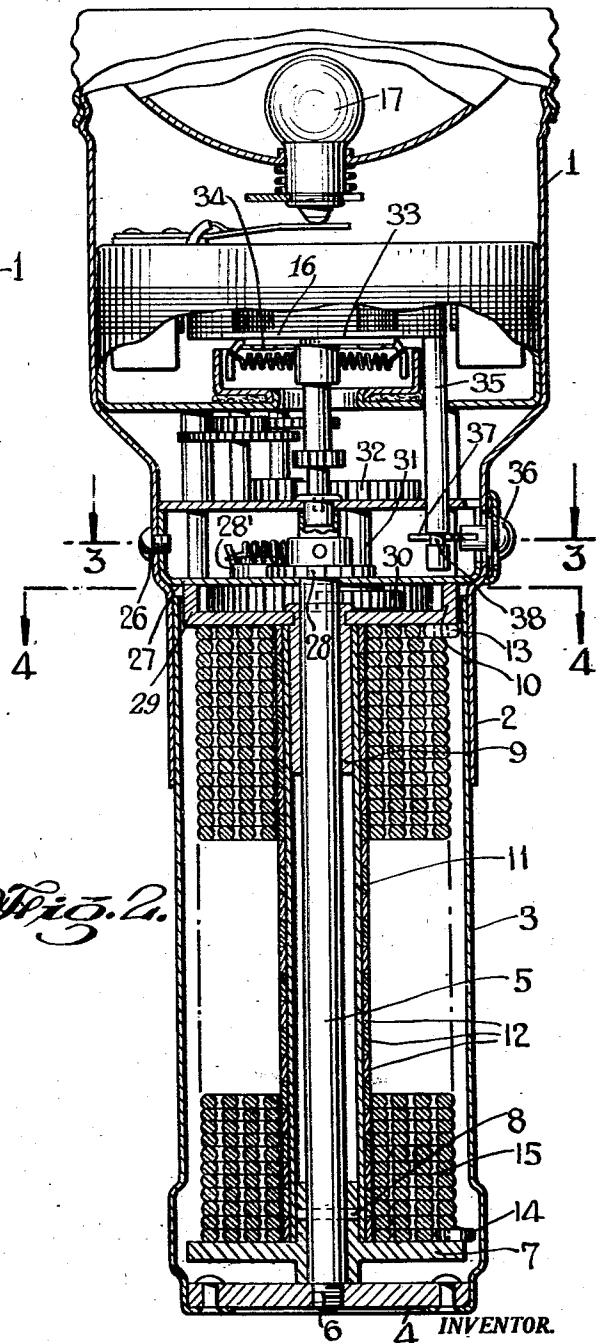
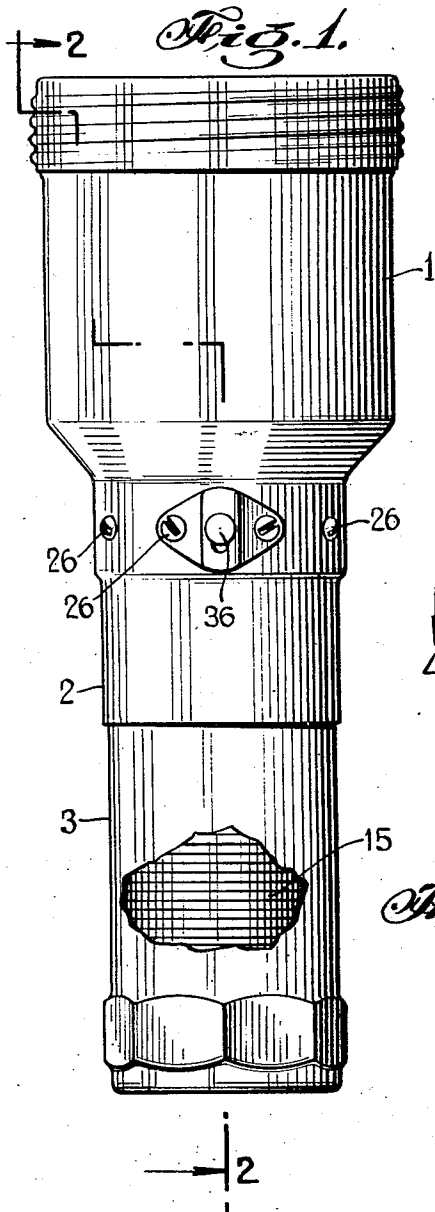
W. BECK

1,917,486

SPRING

Filed April 3, 1931

2 Sheets-Sheet 1



6 4 INVENTOR.
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Fig. 6.

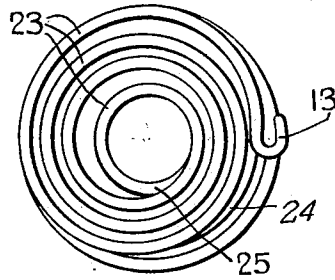


Fig. 5.

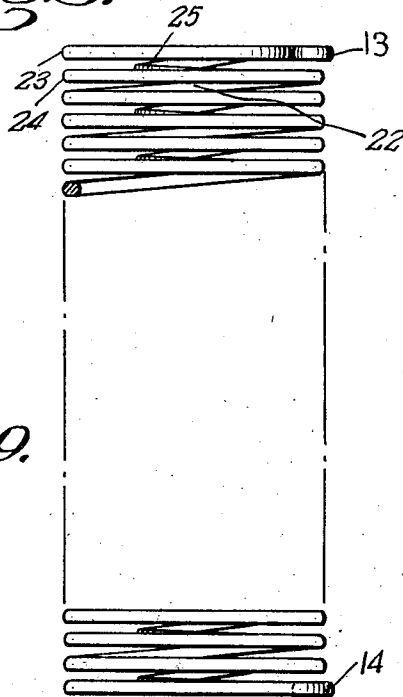


Fig. 9.



Fig. 7.

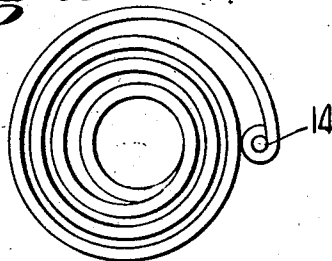


Fig. 3.

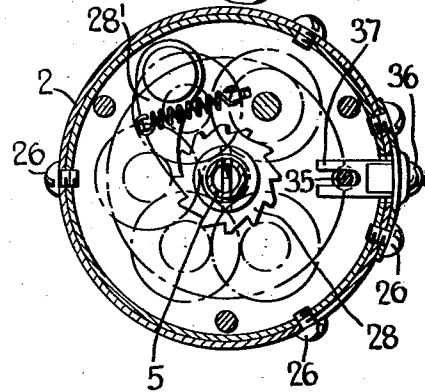


Fig. 4.

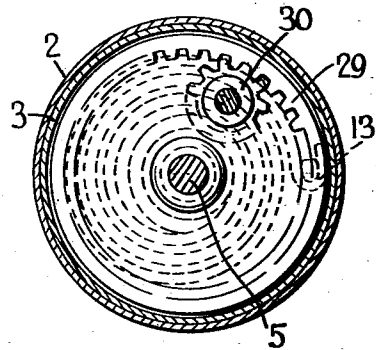
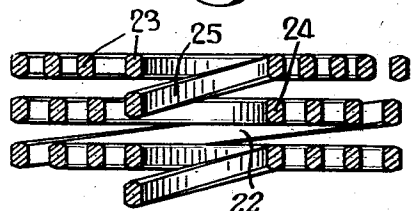


Fig. 8.



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UNITED STATES PATENT OFFICE

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SPRING

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This invention relates to power springs.

It is an object of the invention to provide a power spring for storing up energy to operate some driven element such that more energy per unit of weight and per unit of space is obtained than is the case with springs heretofore known.

It is a further object of the invention to provide a spring particularly suitable for driving the generator of a flashlight.

Still a further object of the invention is to provide means for materially reducing the loss of energy due to friction.

With these general objects, and others, in view, the invention consists of the features, combinations, details of construction and arrangement of parts which will first be described in connection with the accompanying drawings and then more particularly pointed out.

In the drawings:

Fig. 1 is a longitudinal view, with parts broken away, of a flashlight embodying a spring constructed in accordance with the invention;

Fig. 2 is a sectional view (enlarged) taken on the broken line 2—2 of Fig. 1;

Figs. 3 and 4 are sectional views taken on the lines 3—3 and 4—4, respectively, of Fig. 2.

Fig. 5 is a side view, partly schematic, of the spring removed;

Figs. 6 and 7 are, respectively, top and bottom end views of the same.

Fig. 8 is a fragmentary sectional view of the spring showing a modified wire shape; and

Fig. 9 is a sectional view of a modified wire shape.

While the spring is here illustrated as applied to the operation of the generator of a flashlight, it is to be understood that it may be used to store energy for operating other devices.

Referring to the drawings, the reference character 1 indicates a flashlight comprising two relatively rotatable casings 2, 3. Casing 2 contains a generator of any suitable construction for supplying current to the lamp 17. Secured to the bottom casing 3 is an end plate 4 having a threaded connection with the

threaded end 6 of a winding shaft 5. Keyed to shaft 5 by a pin 8 is a spring-supporting plate 7. Rotatably mounted on the shaft 5 is a sleeve 9 having a plate 10 connected therewith.

Connected between plate 7 and plate 10 is a coiled spring indicated generally by 15 and hereinafter described in more detail.

When casing 3 is rotated with respect to casing 2, the spring is wound up to store energy. When the spring unwinds, its released energy is utilized to run the generator.

Secured to casing 1 by screws 26 is a housing 27 into which shaft 5 extends. Mounted on the shaft within the housing is a ratchet 28 engaged by a spring pressed pawl 28' whereby the shaft is free to rotate in one direction.

Secured to or forming part of plate 10 is an internal gear 29 meshing with a pinion 30. This pinion is formed integral with a hub 31 to which is attached a gear 32. Between gear 32 and the rotor 16 of the generator is a gear train, as indicated in Figs. 2 and 3. The rotor also has a plate 33 and a governor 34.

The rotor is normally held against rotation by the contact of a shifting rod 35 slidably positioned to make contact with plate 33, thereby acting as a brake. To shift rod 35 there is provided a button 36 slidable on the exterior of the casing and having a forked spring 37 engaging a notch 38 in rod 35.

Referring now to spring 15, the upper end has an anchorage hook 13 which is attached to plate 10. From this anchorage point, the spring wire is spiralled inwardly in convolutions 23 (Fig. 6) which lie substantially in the same plane. So much of the spring may be termed, for convenience, a section. At a point near the center, indicated in the drawings by 25, the wire is given an offset bend and thence spirals outwardly in convolutions 24. These latter convolutions lie in substantially the same plane and form a second section. These two connected and reversely spiraled sections, the respective convolutions of which lie in adjacent planes, may be termed, for convenience, a unit.

The spring as an entirety comprises a plurality of these units, each succeeding unit

being connected to the preceding unit and all the units being formed of a single length of wire. To this end, the wire after completing the second or reverse section of the first unit, takes a slanting course, as indicated at 22 in Fig. 5, into an adjacent plane. Then it spirals inwardly to form the first section of the second unit, duplicating section 23 of the first unit. Then it is given another offset bend, duplicating bend 25, and spirals outwardly to form the second or reverse section of the second unit, duplicating section 24 of the first unit. This procedure is continued until as many units are provided as may be desired. At the lower end, the final spring section has an anchorage hook 14 attached to plate 7.

To wind the spring, rod 35 is moved into braking position, thus holding the rotor, and hence the gear train, to and including plate 10, against rotation. The two parts of the casing are then given a relative rotation or winding motion. By the consequent movement of shaft 5 the spring is wound up through connection 14, anchorage 13 at the other end of the spring being stationary. During this winding, reverse movement of the shaft is prevented by the pawl and ratchet.

There is provided roller bearing means for the inner convolutions of the several spring sections. To this end, as here shown as an example, surrounding shaft 5 and extending between plates 7 and 10 is a tubular central support 11. Embracing this support are a plurality of independent roller bearings in the form of collars 12. As these several collars fill the space between plates 7 and 10, which serve as abutments, they are self-spacing. That is, each collar, while free to rotate on support 11 independently of the other collars, is held in axial position by other collars.

When the spring is wound up the inner convolutions of the several spring sections are received by the roller bearings which, with support 11, serve as a central core or mandrel to enable the spring to be stretched to its elastic limit. With the spring shown, four convolutions in neutral condition become five convolutions in wound-up condition.

To utilize the device described, catch 36 is pushed downwardly, moving rod 35 away from plate 33 and thus freeing rotor 16. Thereupon the spring unwinds and rotates rotor 16, through the connections described, to generate the necessary current for the light.

As the spring unwinds, friction losses are

materially reduced by the roller bearings provided for the inner convolutions. The several spring units may not start to unwind simultaneously. But with the construction described each unit has its own independent roller bearing as each collar 12, as shown in Fig. 2, is long enough and only long enough to receive the two convolutions of one unit.

In the modification shown in Fig. 8, the wire is shown as flat on the inner sides and rounded on the top, so that when the spring is wound up the respective turns of each section do not have a rolling tendency on each other.

With the construction described, the energy is supplied smoothly and without jerks. A relatively large amount of useful energy is stored in a relatively small space and the spring is capable of operating the driven element a relatively long time, thus making it particularly adaptable for a flashlight.

I claim:

1. A power spring formed of a single length of wire and comprising a plurality of duplicating units, each unit comprising two reversely wound spiral sections.

2. A power spring formed of a single length of wire and having an anchorage point, said wire being wound from said anchorage point in a decreasing spiral, thence offset into another plane, thence wound from the center outwardly in an increasing spiral, thence offset into a third plane, and thence wound inwardly in a decreasing spiral.

3. A power spring formed of a single length of wire and comprising a plurality of spiral coils lying in substantially parallel planes, the convolutions of the first and thence alternating coils spiraling in one direction, the convolutions of the second and thence alternating coils spiraling in the opposite direction, the first and thence alternating coils being connected at their respective centers to the second and thence alternating coils, and the second and thence alternating coils being connected respectively to the third and thence alternating coils at the outside.

4. In combination, a power spring formed of a single length of wire and comprising a plurality of units, each unit comprising two reversely wound spiral sections, a central support, means for winding the spring, two spaced abutments associated with said support, and a plurality of roller-bearing collars embracing said support; each of said collars being of a length to receive the inner convolutions of one of said spring units.

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