Sept. 14, 1937. W. I. HOLMES 2,092,845

FLASHLIGHT

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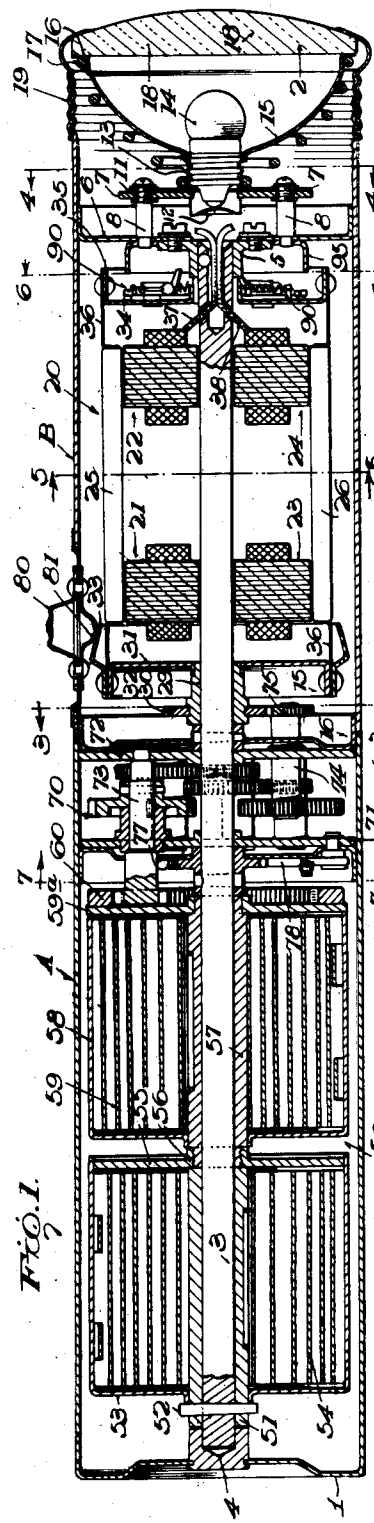

Fig. 1.

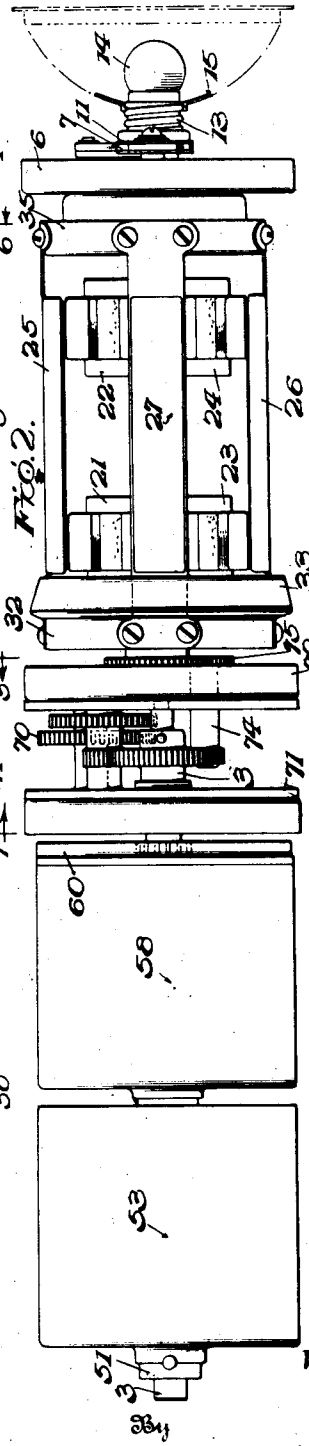

Fig. 2.

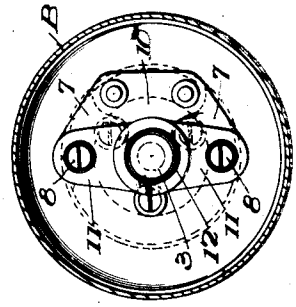

Fig. 4.

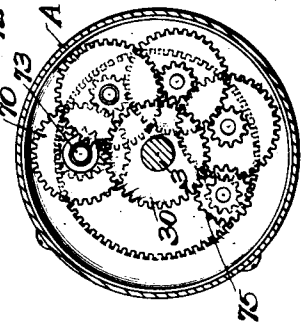

Fig. 3.

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Fig. 5.

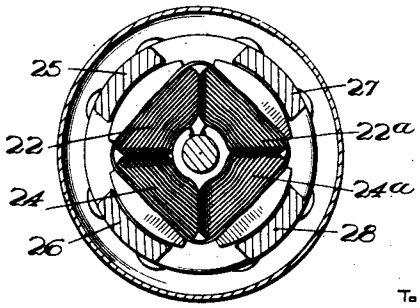


Fig. 8.

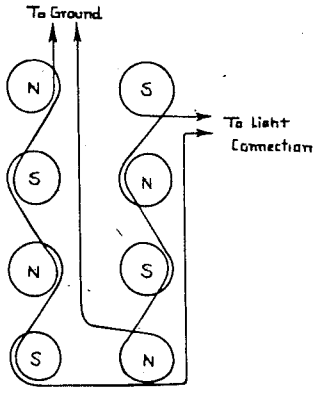


Fig. 6.

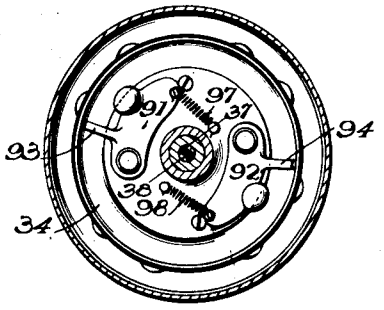
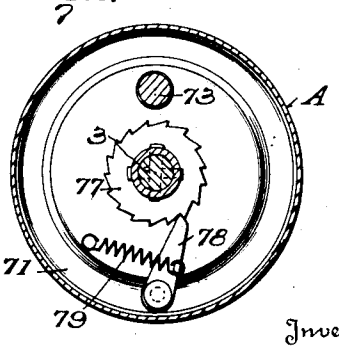


Fig. 7.



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UNITED STATES PATENT OFFICE

2,092,845

FLASHLIGHT

William I. Holmes, University Park, Md., assignor to Washington Institute of Technology, Inc., Washington, D. C., a corporation of Delaware

Application July 27, 1935, Serial No. 33,606

13 Claims. (Cl. 240—10.5)

The present invention relates to portable flashlights or lanterns and, more particularly, to devices of this general type in which a spring motor is employed to operate a generator of electric current, which current is utilized to energize an electric bulb.

It is an object of this invention to provide a flashlight of the generator type which will include novel features and arrangements of parts whereby new and improved results in devices of this type are achieved.

It is also an object of the invention to provide a portable generator type flashlight incorporating a spring motor of novel construction and which co-operates in a novel manner with other elements of the flashlight to provide improved operation of the winding and driving functions of the spring motor.

A further object of the invention is to provide a novel means for mounting the generator structure within the flashlight, whereby a saving in weight and space is attained.

A further object is to provide novel means for mounting within the flashlight case the gearing connecting the generator and spring motor, whereby such gearing may, if desired, be readily removed from the flashlight casing.

A still further object is to provide a new, simplified and improved flashlight of the generator type, which will be susceptible of simple and inexpensive manufacturing operations, but which will be strong in construction and reliable in operation.

Other objects and features of novelty will be apparent from the following description and the annexed drawings, it being expressly understood, however, that the invention is in no way restricted by or to such description and drawings, or otherwise than by the appended claims.

Referring to the drawings, in which similar reference numerals refer to like parts,

Fig. 1 is a longitudinal sectional view through the flashlight according to the invention,

Fig. 2 is an elevational view of parts shown in Fig. 1, the outer casing members being removed.

Fig. 3 is a view of the gear mechanism taken on line 3—3 of Fig. 1, certain supporting plates having been removed,

Fig. 4 is a view taken on the line 4—4 of Fig. 1.

Fig. 5 is a sectional view of the generator assembly taken on the line 5—5 of Fig. 1.

Fig. 6 is a view of the governor assembly taken on line 6—6 of Fig. 1.

Fig. 7 is a view taken on the line 7—7 of Fig. 1, and

Fig. 8 is a wiring diagram of the generator field coils.

The present invention is illustrated as being embodied in a generator type flashlight having the usual elongated cylindrical form of hand flashlights, although it may be embodied in any suitable or desired form. As illustrated, there is provided a cylindrical casing comprising the two registering casing sections A and B, the section A being denoted as the rear or motor casing and the section B being denoted the forward or generator casing. Casing section A is closed at its rear end by an integrally or separately formed plate 1, the other end thereof being open and communicating and registering with the rear open end of casing section B. The forward end of casing section B is provided with a lens 2 and means for holding such lens in place, as will be described fully hereinafter.

Disposed within and concentrically of the casing sections A and B is a fixed shaft 3, the rear end of which is received within a bushing 4 which is rigidly attached to the closure plate 1. The shaft extends through casing sections A and B and terminates adjacent the forward end of casing section B. The forward end of shaft 3 is journaled in a bushing 5 which is attached, centrally of the casing section B to a plate 6 which is attached at its edges to the inner surface of casing section B adjacent the forward end thereof and forms a closure therefor. It will be understood that shaft 3 is fixed in its bearing members against any rotary movement about its own axis.

Disposed between the closure plate 6 and the forward end of casing section B there is provided a plate 7, the same being preferably formed from bakelite or other insulating material and being supported on closure plate 6 by studs 8. Also mounted on studs 8 and in abutting relation to the forward face of insulating plate 7 there is provided a metal plate 11. Both plates 7 and 11 are provided with registering apertures at the axis of the flashlight assembly. The plate 7 is generally trapezoidal in shape and one portion thereof extends to one side of the axis of the casing to form a support for the head of a T-shaped metallic member 10, all as clearly disclosed in Fig. 4. The leg 12 of the T-shaped member extends toward the axis of the casing and terminates in a dished, resilient portion at the axis of the casing and adjacent and to the rear of the aperture through plates 7 and 11. Attached by any suitable means to the metallic plate 11 is a screw-threaded socket 13 adapted to receive the screw-threaded base of an electric

bulb 14. It will be seen that when the base of the bulb is threaded into the socket, the end thereof will pass through the apertures through plates 7 and 11 and will abut the spring member 12, whereby such spring member will constantly exert a resilient pressure on the bulb 14 in an axial direction thereby tending to retain the same against accidental loosening in the socket.

Mounted concentrically with the bulb 13 is a reflector 15 of any desired shape, the same being provided at its interior portion with an aperture which slidingly surrounds the socket 13, and being provided at its outer periphery with a flange 16. A helical spring 17 of conical form is disposed between plate 11 and flange 16, the smaller end thereof surrounding the socket 13 and the larger end thereof bearing against the flange 16. A lens 18 is provided for closing the forward end of casing section B and the outer periphery of the inner surface of such lens bears against the outer face of flange 16. The lens and reflector assembly is maintained in position on the end of casing section B by a cylindrical retaining member 19 which is screw-threaded to the forward end of casing section B and which is provided with an inwardly extending flange portion which abuts the outer periphery of the outer face of the lens 17. It will be apparent that as the retaining member 18 is screw-threaded on or off of the casing section B, the reflector will be moved inwardly against the tension of spring 17 or will be moved outwardly by the tension of such spring, thereby varying the reflecting character of the reflector 15 as desired.

Means are provided by the invention for energizing the bulb to illuminate the same, and such means comprise a generator denoted generally by the reference numeral 20. The generator 20 comprises a plurality of field coils eight being provided in the embodiment illustrated and each of which comprises a core piece and windings surrounding the same. These field coils which are denoted by numerals 21, 21*a*, 22, 22*a*, 23, 23*a*, 24, and 24*a*, are suitably mounted on and carried by the fixed shaft 3 and are permanently fixed in position. It will be seen that the outer faces of the field coils are spaced a considerable distance inwardly of the inner surface of the casing section B.

Disposed between the outer faces of the field coils and the inner surface of the casing section B are a plurality of permanent bar magnets 25, 26, 27 and 28, the same being mounted, by means to be described hereinafter, for rotary movement about and adjacent to the outer faces of the field coils.

Means are provided for supporting and rotating the bar magnets and such means comprise a sleeve 29 which is rotatably mounted on the fixed shaft 3 adjacent the rear open end of casing section B. A gear 30 is fixed to sleeve 29 and is adapted to mesh with a gear forming part of a driving means as will be fully described hereinafter. Mounted on the forward end of sleeve 29 and fixed thereto for rotation therewith is a plate 31 having a peripheral flange 32. A tapered brake drum 33 is carried by the flange 32 and will be described more fully. Rotatably mounted on fixed shaft 3 adjacent the forward end thereof there is provided a second plate 34 having a peripheral flange 35. As will be apparent from Fig. 1, the plates 31 and 34 are disposed at opposite ends of the coil assembly of the generator 20 and the peripheral flanges on these plates have equal radii. Extending between the two peripheral flanges and carried thereby are supporting means 36 which may take the form of flat non-magnetic strips and each of which supports one of the permanent bar magnets 25, 26, 27, 28. The radii of the peripheral flanges 32 and 35, the shape of the supporting members 36, and the thickness and shape of the permanent bar magnets are so chosen that the inner surfaces of the magnets will be just adjacent the outer faces of the field coils and, when the plates 31, 34 are revolved, the magnets will move across and closely adjacent to the outer faces of the field coils.

Means are provided by the invention for transmitting electric energy generated in the field coils during rotation of the magnet assembly to the bulb 13 to energize and illuminate the same. The windings of the field coils are connected in two groups as shown in Fig. 8 and each group is series connected. One terminal of each group is grounded to the shaft 3 or other portion of the casing, while the other terminals of the two groups are connected by leads 37, 38 to the T-shaped member 10, the same having the spring portion 12 which abuts and presses on the terminal on the end of the bulb 14. It will be apparent that, inasmuch as the base of bulb 14 is grounded through socket 13, metallic plate 11, studs 8 and plate 6, a circuit will be set up through the windings of the field coils and the filament of the bulb, which will energize and illuminate the same.

Means are provided by the invention for rotating the magnet assembly of the generator, and such means comprise a spring motor which is denoted generally by the reference numeral 50 and which is housed entirely within the rear casing section A. The spring motor 50 comprises a plurality of spring driving devices, and any desired number of these may be employed, although two are illustrated in the drawings. The rear spring driving element comprises a sleeve 51 which surrounds the rear portion of fixed shaft 3 and is rigidly attached thereto by means such as a pin 52. A barrel 53 is mounted on sleeve 51 for rotation about and with respect to the same, such barrel being of slightly less diameter than the inner surface of casing section A. A convolute spring 54 is disposed within the barrel 53 and the inner end of such spring is attached to the fixed sleeve 51, while the outer end of the spring is attached to the rotatable barrel 53. The barrel 53 is cup-shaped and the open end thereof is closed by a plate 55 which is attached at its periphery to the spring barrel and is formed centrally with a hub 56 defining an internally screw-threaded central aperture surrounding and spaced from the fixed shaft 3. A second sleeve 57 loosely surrounds the shaft 3 for rotation relative thereto, and such sleeve is provided at its rear end with a reduced axial extension which is screw-threaded to the hub 56 of plate 55, whereby the rear barrel 53, plate 55 and sleeve 57 constitute a single connected unit. A spring barrel 58 is journaled with a running fit on sleeve 57, whereby the barrel may rotate about and with respect to the sleeve. A convolute spring 59 is disposed within barrel 58 and the outer end thereof is attached to such barrel, while the inner end thereof is attached to sleeve 57. The barrel 58 is cup-shaped and the open end thereof is closed by a plate 59*a* which is provided with a central hub defining an aperture which loosely surrounds the forward end of sleeve 57. An internal ring gear 60 is fixed to

the forward end of the barrel 58 for rotation therewith and may, if desired, be attached to the outer face of the closure plate 59a.

The forward end of spring barrel 58 is spaced rearwardly from the forward or open end of the casing section A, and the intervening space is provided for accomodating a reduction gear assembly, denoted generally by reference numeral 70, which is adapted to transmit rotary movement of the spring barrel 58 to the rotary magnet assembly, in so doing causing an increase in speed. Disposed just forward of the forward end of the spring barrel 58 is a partition or wall 71, the same being attached to the casing section A. A second partition or wall 72 is provided at the open end of casing section A and such walls form spaced means for supporting the elements of the reduction gearing assembly 70. Journaled in the two walls 71, 72 is a shaft 73 having at one end thereof a pinion gear meshing with the internal ring gear 60, such pinion gear being disposed outside and to the rear of the wall 71. Between the walls 71, 72, a gear wheel is mounted on shaft 73, such gear meshing with a smaller gear, the series being extended to any desired degree to include between the walls 71, 72 sufficient reduction gearing to provide a desired output speed of rotation. The final rotating shaft 74 of the gear assembly is provided with a pinion 75 which is disposed outside and in front of the forward wall 72 and which meshes with and drives the gear 30 which is carried by the sleeve 29, as described hereinbefore. Flanged closure plates may be provided at the outer faces of supporting plates 71, 72 to provide an oil and dust seal at each end of the gear assembly.

It will be seen that the entire reduction gearing assembly is mounted in the rear casing section A and, further, that when the casing sections are separated the entire reduction gearing assembly may be removed as a unit from the rear casing section.

Means are provided for preventing slipping and reverse rotation of the gear assembly when the spring motor is being wound, and such means comprise a ratchet wheel 77 which is preferably disposed rearwardly of the rear closure plate 71 and which is rigidly attached to the fixed shaft 3. Pivotally mounted on the fixed closure plate 71 is a pawl 78, the same having its free end portion constantly urged into engagement with the teeth of the ratchet wheel by means of a spring 79, and the pawl and ratchet teeth being so disposed that when the spring motor is being wound, as will be described fully hereinafter, the pawl and ratchet will co-operate to prevent unwinding rotation of the gear assembly about the shaft 3, whereby the wound tension of the convolute springs 54, 59 is retained. Such structure is clearly illustrated in Figs. 1 and 7.

The invention also provides means for braking the rotation of the rotating magnet assembly, whereby the illumination of the bulb 14 may be cut off and whereby the gear assembly may be locked to permit winding of the spring motor. Such means comprise the member 80 which is slidably mounted on the outside of casing section B and which is adapted to be engaged by the finger to be moved to either braking or released position. Carried by the member 80 and disposed interiorly of the casing section B is a brake shoe 81 which, when moved to braking position by the finger portion 80 is adapted to engage the brake drum 33 which is carried by the rotary magnet assembly, to stop the rotation thereof.

Means are also provided for preventing rotation of the rotary magnet assembly at speeds in excess of a pre-determined speed, and such means comprise the governor assembly, denoted generally by reference numeral 90, and disclosed clearly in Figs. 1 and 6. The governor assembly comprises two arms 91, 92 pivotally mounted at diametrically opposite points of the plate 34 which forms the forward support for the rotary magnet assembly. These arms are provided, adjacent their pivotal connections with the plate 34 with upstanding lugs 93, 94 which, when the speed of rotation of the rotary magnet assembly is lower than a predetermined speed, are spaced from the inner face of the flanged periphery 95 of a plate which is rigidly connected to the rear face of the plate 6 which, in turn, is rigidly connected to the casing section B. It will be apparent that when the speed of rotation of the rotary magnet assembly exceeds a predetermined speed, the pivoted arms 91, 92 will move outwardly about their pivots, thereby forcing the lugs 93, 94 against the fixed flange 95 and exerting an effective braking force on the rotating assembly. Springs 97, 98, connected at their one ends to arms 91, 92 and at their other ends to plate 34 are provided for preventing operation of the governor until a pre-determined speed is reached.

It will be apparent that the positioning of the braking lugs 93, 94 adjacent the pivots of the arms will have the effect of increasing the force exerted by the lugs on the braking flange, thereby increasing the sensitivity and efficiency of the governor.

In order to operate the flashlight, it is first necessary to wind the spring motor in order to store energy therein which may be employed to rotate the permanent magnet assembly, and this winding operation is effected by rotation of the rear casing section A with respect to the front casing section B. In order to effect winding of the spring motor, it is first necessary to place the finger element 80 and attached braking element 81 in braking position, in which the braking element abuts the drum 33 and rigidly attaches the same to the front casing section. Inasmuch as the drum 33 and the gear 30 are both rigidly attached to the sleeve 29, it will be apparent that when the drum 33 is braked in the manner described all of the gears of the reduction gearing assembly will be held from rotation about their own axes. The housing of the gear assembly is fixed, however, to the rear casing section A and as the rear casing is rotated the entire gear assembly will be rotated, as a body, therewith. The spring barrel 58 will therefore be rotated with the rear casing section, due to the fact that the ring gear 60 thereon is engaged with the pinion on shaft 73, which pinion is now held from any rotation about its own axis and is carried in an orbit by the rotation of the gear assembly with the rear casing section. The pawl 78 which is carried by the gear housing plate 71 engages with the stationary ratchet wheel 77 and prevents reverse rotation of the rear casing section and gear housing as the springs become wound.

As the spring barrel 58 rotates with the rear casing section, a tension is exerted on spring 59 which causes rotation of the sleeve 57 to which the inner end of the spring is attached, it being remembered that spring barrel 58 is rotatably mounted on sleeve 57. Due to the interconnecting means 56, rotation of sleeve 57 will cause ro-

tation of the rear spring barrel 53, thereby exerting a tension on spring 54. The inner end of spring 54 being attached to the fixed sleeve 51, such spring will be wound. When the spring is completely wound, no further rotation of barrel 53 and sleeve 57 will take place and further rotation of barrel 58 will then cause spring 59 to be wound.

It will be seen from the above description that the spring motor is wound by first locking the gear members from rotation about their own axes and then rotating the entire gear assembly which, being geared to the spring motor, causes winding movement thereof. It will also be seen that the rear spring 54 will be entirely wound before winding of the forward spring begins. The rotatable magnet assembly being carried by the plate 31 which also carries the brake drum 33, the operation of the brake to hold the gear members from rotation will also prevent rotation of the permanent magnet assembly.

When it is desired to operate the flashlight, the finger piece 80 is moved to disengage the brake shoe 81 from the drum 33, thereby releasing any holding force acting on the gear members and on the magnet assembly. The gear members being released for rotation about their own axes, the spring barrel is released and is rotated by the unwinding of spring 59, thereby rotating the attached ring gear 60, whereby the entire reduction gear train is placed in rotation. The rotary magnet assembly, being connected to the gear train through sleeve 29 and gear 30, will be rotated on operation of the spring motor. Current generated in the windings of the field coils by the movement of the magnets past the faces thereof will be supplied to the bulb 14 in the manner described hereinbefore and will cause illumination of the same.

It will be noted that the unwinding of spring 59 will rotate spring barrel 58, but that no unwinding movement of spring 54 will take place initially, due to the fact that there is no interconnection between spring barrel 58 and the rear spring assembly. The front spring assembly will therefore drive the gearing and generator as long as the stored-up energy therein is sufficient to do so. However, due to the connection of rear spring barrel 53 to the sleeve 57 to which the front spring is attached, the rear spring 54 is constantly supplying the energy to the front spring through barrel 53 and sleeve 57, thereby maintaining constantly sufficient tension in the front spring to drive the rotary parts. It will be seen, therefore, that the rear spring acts as a reservoir of power for the front spring and never acts to directly drive the rotating assemblies.

The governor means 90 prevents rotation of the magnet assembly at higher than a pre-determined rate of speed, in a manner as fully described hereinbefore.

Rotation of the generator, gearing and spring assemblies, and illumination of the bulb may be stopped or cut off at any time by moving the finger piece 80 to bring the brake shoe 81 into braking engagement with the drum 33.

While I have described and disclosed a single embodiment of my invention, it will be apparent to those skilled in the art that further embodiments and improvements may be made without departing in any way from the scope of the invention, for the limits of which reference must be had to the appended claims.

I claim:

1. A flashlight comprising a plurality of aligned cylindrical, relatively rotatable casing members having registering and abutting open ends, a generator mounted in one of said casing members, a light source in said casing member adapted to be energized by current from said generator, a spring motor in the second of said casing members, a gear assembly connecting said spring motor and generator and being disposed entirely within said second casing member, and means for locking the rotatable elements of said gear assembly from rotation about their own axes, and means connecting said spring motor and gear assembly whereby rotation of said second casing member with respect to said first-named casing member will cause said spring motor to be wound.

2. A flashlight comprising a plurality of aligned, cylindrical, relatively rotatable casing members having registering and abutting open ends, a generator mounted in one of said casing members, a light source in said casing member and being connected to said generator for energization thereby, a spring motor mounted in the second casing member, a housing mounted in and attached to said second casing member, a gear assembly mounted in said housing and having members operably connected to said spring motor and said generator, whereby said spring motor may drive said generator through said gear assembly, and means for preventing rotation of the members of said gear assembly about their axes, whereby said spring motor will be wound when said second casing member and said housing are rotated with respect to said first casing member.

3. A flashlight comprising a plurality of aligned cylindrical relatively rotatable casing members having registering open ends, a generator in one of said casing members, a light source in said casing member being connected to said generator for energization thereby, a spring motor in the second casing member comprising a spring and a member surrounding said spring and operable to wind said spring, a gear assembly mounted in said second casing member and having a member connected to said winding member and a member connected to said generator, and means for locking the members of said gear assembly from rotation about their axes, whereby when said second casing member is rotated relatively to the said first casing member, said gear assembly will be rotated therewith as a body to thereby cause winding of said spring.

4. A flashlight comprising a plurality of aligned cylindrical relatively rotatable casing members having registering open ends, a generator in one of said casing members having a rotatable part and a fixed part, a spring motor in the second casing member comprising a coiled spring and a barrel surrounding said spring and being attached to one end of said spring, means for fixing the other end of said spring against movement, a housing within and fixed to said second casing member, a gear assembly mounted within said housing and comprising a gear connected to said barrel and a second gear connected to the rotatable part of said generator, and means for locking said gear members against rotation about their axes, whereby when said second casing member, said housing and said gear assembly are rotated as a body with respect to said first casing section said barrel will be rotated to cause winding of said spring.

5. A flashlight comprising a plurality of aligned cylindrical relatively rotatable casing members having registering open ends, a generator in one

of said casing members and having a rotatable part and a fixed part, a brake drum fixed to the rotating part of said generator, means mounted on said one casing member and movable into and out of engagement with said drum for selectively preventing rotation thereof, a spring motor mounted in the second casing member and comprising a spring having one end thereof fixed and a rotatable barrel surrounding said spring and being attached to the other end of said spring, a gear assembly mounted in said second casing member and attached as a unit thereto, said gear assembly comprising a gear at one end thereof attached to said barrel and a gear at the other end thereof attached to the rotating part of said generator, whereby operation of said braking means into braking engagement with said drum will prevent rotation of said gears about their axes so that rotation of said second casing member and said gear assembly with respect to said first casing member will cause movement of said barrel to wind said spring.

6. A flashlight comprising casing members, a generator mounted in one of said casing members, a light source in said casing member and connected to said generator to be energized thereby, a shaft extending through both said casing sections and being fixed against rotary movement, said shaft terminating at one end adjacent said light source, the end of said shaft adjacent said light source forming a conduit for wires leading from said generator to said light source.

7. A flashlight comprising a plurality of aligned, cylindrical, relatively rotatable casing members having registering open ends, a fixed shaft extending through said casing members, a generator in one of said casing members having a portion attached to said fixed shaft, a spring motor in the other casing member comprising a sleeve rotatably mounted on said shaft, a barrel surrounding and rotatably journaled on said sleeve, a coiled spring within said barrel and having one end attached to said barrel and one end attached to said sleeve, a second sleeve surrounding said shaft and fixed thereto, a second barrel surrounding and rotatably mounted on said fixed shaft and being attached to said first-named sleeve, and a coiled spring disposed within said second barrel and having one end attached to said barrel and one end attached to said second sleeve.

8. A flashlight comprising a plurality of aligned, cylindrical, relatively rotatable casing members having registering open ends, a fixed shaft extending through said casing members, a generator in one of said casing members comprising a fixed portion and a portion rotatably mounted on said shaft, a spring motor in the other casing member, said spring motor comprising a sleeve rotatably mounted on said shaft, a barrel surrounding and being rotatably mounted on said sleeve, a spring within said barrel and having one end attached to said barrel and the other end attached to said sleeve, a second sleeve mounted on said shaft and being fixed thereto, a second barrel surrounding and rotatably mounted on said second sleeve and being attached to said first sleeve, a spring within said second barrel and having one end attached to said second barrel and the other end attached to said second sleeve, a gear assembly in said second casing member comprising a gear connected to said first barrel and a second gear connected to the rotatable portion of said generator, and means for simultaneously braking the rotating portion of said generator and holding said gears from rotation about their axes, whereby rotation of said second casing member and said gear assembly as a unit will cause winding of said springs.

9. A flashlight comprising a plurality of aligned cylindrical relatively rotatable casing members having registering open ends, a bulb in one of said casing members, a generator in said casing member comprising a rotatable part and a fixed part, means for braking the rotation of said rotatable part, driving means in the second casing member, means disposed within and carried by said second casing member for connecting said driving means to the rotatable part of said generator, said connecting means being fixed as a unit to said second casing member, said braking means being operable to establish a rigid connection of the members of said connecting means to said first-named casing member whereby rotation of said second casing section will be operable to store energy in said driving means.

10. A flashlight comprising a plurality of casing members, a bulb in one of said casing members, a generator in said casing member being electrically connected to said bulb to energize the same, a spring motor in the second casing member, a plurality of spaced plates within and connected to said second casing member, a gear assembly disposed between and carried by said plates, and including a gear at one end thereof connected to said spring motor and a gear at the other end thereof connected to said generator, said gear assembly being rotatable as a unit with said second casing member, a shaft extending through said casings and being fixed against rotary movement, a ratchet wheel carried by and fixed to said shaft, and a pawl carried by one of said plates and co-operating with said ratchet wheel to prevent reverse relative rotation between said spring motor and said gear assembly.

11. A flashlight comprising a casing member, a partition carried by said casing member, an insulating plate carried by and spaced from said partition and having an opening therethrough, a metallic member mounted on one face of said insulating plate and having a resilient portion terminating adjacent said opening, a second metallic plate mounted on the other face of said insulating plate, a bulb socket mounted on said insulating plate in registry with said opening and being electrically connected to said second plate, a bulb received in said socket and abutting at its end against the resilient portion of said member, and means connected to said metallic member and said metallic plate for energizing said bulb.

12. A flashlight comprising a plurality of aligned, cylindrical, relatively rotatable casing members having registering open ends, a fixed shaft extending through all of said casing members, a generator in one of said casing members having a portion attached to said fixed shaft, a spring motor in the other casing member comprising a sleeve rotatably mounted on said shaft, a barrel surrounding and rotatably journaled on said sleeve, a coiled spring within said barrel and having one end attached to said barrel and one end attached to said sleeve, a second sleeve surrounding said shaft and being fixed thereto, a second barrel surrounding said shaft and said second sleeve and being rotatably mounted on said second sleeve and being attached to said first sleeve, and a coiled spring disposed within said second barrel and having one end thereof at-

tached to said second barrel and one end thereof attached to said second sleeve.

13. A flashlight comprising casing members, a shaft extending through said casing members and being fixed against rotation, an electric bulb in one of said casing members, a generator in one of said casing members, said generator comprising a plurality of field coils mounted on said fixed shaft and having pole faces disposed adjacent the inner wall of said casing member and a plurality of permanent bar magnets disposed between said pole faces and said casing member, a plurality of plates rotatably mounted on said shaft and disposed at opposite ends of said field coils and supporting said bar magnets, electric connections between said field coils and said bulb to cause said bulb to be energized by current generated in said field coils during rotation of said bar magnets, and a spring motor disposed within said casing members and operatively connected to said plates to rotate said plates and said bar magnets with respect to said field coils.

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