Aug. 17, 1948. A. C. WALL 2,447,296

MECHANICAL FLASHLIGHT

Filed March 31, 1944

Fig. 1

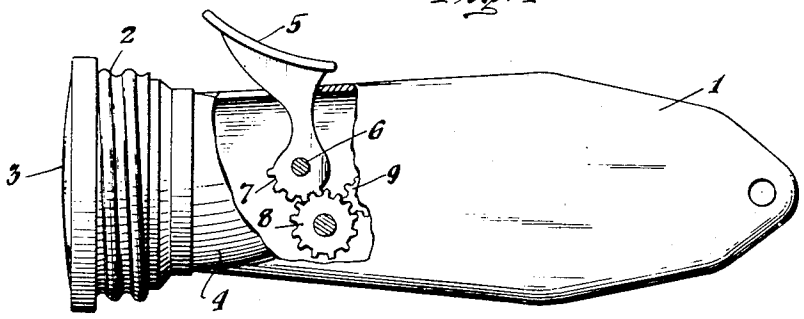


Fig. 2

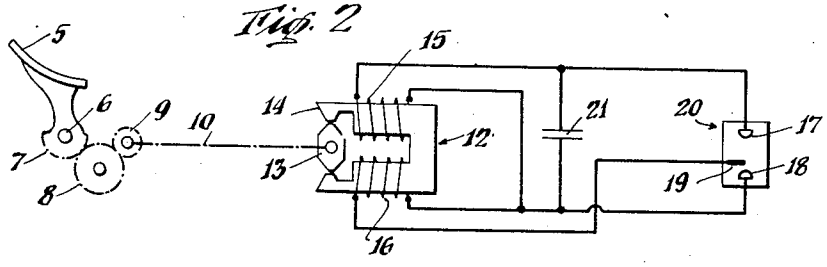


Fig. 3

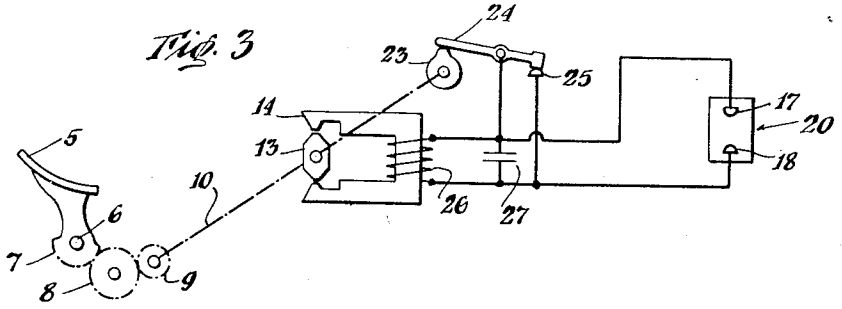


Fig. 4

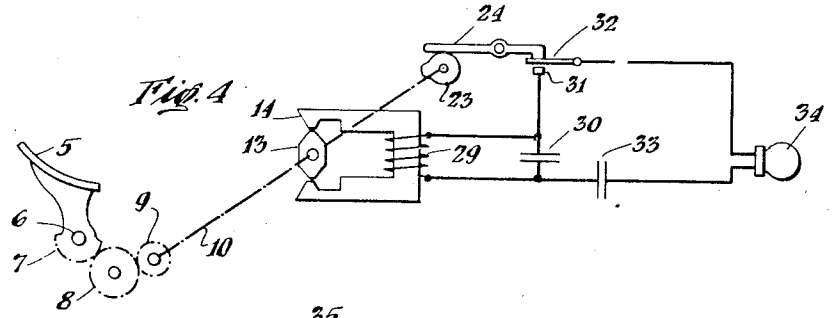
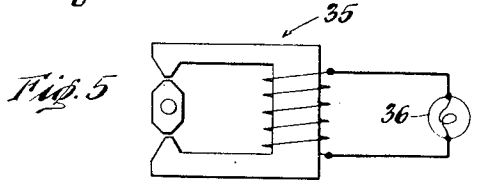


Fig. 5



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Patented Aug. 17, 1948

2,447,296

UNITED STATES PATENT OFFICE

2,447,296

MECHANICAL FLASHLIGHT

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Application March 31, 1944, Serial No. 528,819

4 Claims. (Cl. 240—10.5)

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This invention relates to hand operated flashlights and has for its object to increase the efficiency of such flashlights so that the relatively small mechanical power produced by the operator's hand will produce a light of greater energy and brilliance than heretofore.

Another object of the invention is to provide a small compact flashlight of the above type, employing a hand operated source of electrical energy capable of producing intermittent flashes of high instantaneous power which, due to persistence of vision, will appear as a substantially continuous high power light.

Another object of the invention is to provide a flashlight of the type specified, operated without the use of batteries, having novel and improved details of construction and features of operation.

Various other objects and advantages will be apparent as the nature of the invention is more fully disclosed.

The principal limitation of mechanical flashlights, as previously constructed, has been that with the very small mechanical power produced by the operator's hand, and the inefficiency with which such mechanical power is translated into visible light energy, only a very weak light could be produced.

The present invention increases the efficiency with which the mechanical power of the operator is translated into visible light energy in a flashlight of the above type by increasing the apparent visible light energy. This is accomplished by producing a series of short flashes of high instantaneous power at a rate above the persistence of vision, so that the light appears to the eye as a steady light of high intensity.

Although the novel features which are characteristic of this invention are set forth more in detail in the claims appended hereto, the nature and scope of the invention may be better understood by referring to the following description, taken in connection with the accompanying drawing forming a part thereof, in which certain specific embodiments have been set forth for purposes of illustration.

In the drawing:

Fig. 1 is a side view of the flashlight with a portion of the casing broken away to show the actuating mechanism;

Fig. 2 is a circuit diagram illustrating one embodiment of the invention employing a special gas discharge tube;

Fig. 3 is a diagram illustrating a modified circuit;

Fig. 4 is a circuit diagram illustrating another modification of the invention employing an incandescent lamp; and

Fig. 5 is a circuit diagram illustrating still another embodiment of the invention.

In the following description certain specific terms are used for convenience in referring to the various details of the invention. These terms, however, are to be interpreted as broadly as the state of the art will permit.

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The flashlight shown in the drawing may comprise a casing 1 having a front cover 2 with the usual lens 3 and associated reflector 4 in which the lamp is seated in the usual manner.

The manual operating mechanism includes a handle or thumb piece 5 pivoted to the casing at 6 and containing a toothed segment 7 meshing with an overrunning clutch 8 which, in turn, meshes with a step-up gear 9 fixed to the shaft 10 of the power generator.

The system of Fig. 2 includes a magneto type generator 12 comprising a rotary armature 13 mounted on shaft 10 between the poles of a stationary magnet 14. The poles of armature 13 and magnet 14 are wedge shaped, as illustrated, to form a peaked voltage wave on rotation of the armature.

The magnet 14 has a low-turn running winding 15 and a high-turn starting winding 16, the former being connected to the running electrodes 17 and 18 of a fluorescent gas discharge tube 20, and the latter being connected to the electrode 18 and to a starting or tripping electrode 19 which is mounted adjacent said electrode 18. A condenser 21 is connected across the electrodes 17 and 18, as illustrated.

The operation of the system of Fig. 2 is as follows: rotation of the armature 13 by the actuation of handle 5 charges the condenser 21 from winding 15. This voltage is not sufficiently high, however, to cause the gas tube 20 to discharge by itself. The separate winding 16 supplies a voltage to the tripping electrode 19 which is timed to peak when condenser 21 reaches its maximum charge tripping the tube 20 and allowing the condenser to discharge through the main electrodes 17 and 18 of the tube to produce a light flash of a high degree of brilliance.

In the system of Fig. 3 the shaft 10 carrying rotor 13 of the generator also carries a cam 23 actuating a contact arm 24 adapted to alternately close and open a contact 25. In this embodiment of the invention the tube 20 has no starting electrode. In Fig. 3, furthermore, the magnet 14 has a single winding 26, one terminal of which is connected to contact arm 24 and to electrode 17 of tube 20, while the other terminal is connected to contact 25 and electrode 18 of tube 20. A condenser 27 is connected across the terminals of winding 26, as illustrated.

With the contact 25 closed in Fig. 3, and the winding 26 thus short-circuited, rotation of the generator by handle 5 causes a current to be circulated in the winding, representing stored electro-magnetic energy. When this energy is a maximum, contact 25 opens, causing trans-

ference of the energy from electro-magnetic in the coil to electro-static in condenser 27, thus generating a voltage sufficiently high to break down the tube 20. The condenser 27 then discharges suddenly into the tube, causing a brilliant flash. The contact 25 is then re-closed and the cycle repeated.

In the system of Fig. 4 the magnet 14 of a peaked generator has a high voltage winding 29 connected to charge the condenser 30, and the cam or breaker 23 on shaft 10 actuates the arm or lever 24 which in this case is adapted to alternately close and open contacts 31 and 32. One terminal of condenser 30 is connected through a condenser 33 to an incandescent lamp 34, while the other terminal of said condenser is connected to the contact 31. The contact 32 is connected to the other side of lamp 34.

In the operation of the system of Fig. 4, the peaked generator charges the condenser 30, and, as the cam 23 revolves, contacts 31 and 32 are closed, allowing the condenser 30 to discharge into lamp 34, and thus charge condenser 33. The contacts 31 and 32 are then opened, leaving the charge on condenser 33. On the next half cycle the generator charges condenser 30 to the opposite polarity and at the appropriate moment contacts 31 and 32 are closed, allowing condenser 30 to discharge through lamp 34; but since condenser 33 has retained a charge of opposite polarity, the effect is additive and the energy remaining on condenser 33 also discharges through the lamp. Thus the purpose of condenser 33 is to utilize more fully the energy produced by the generator.

Fig. 5 shows another modification of the invention which functions without the electrical accumulation of energy referred to above. This system includes a generator 35, having a peaked armature and stationary magnet, adapted to give a very sharp voltage peak which is discharged through either a gas tube or filament bulb 36 the light-emitting efficiency of which is greater at higher instantaneous power.

I have found that with systems of the above type it is possible to generate between 2 and 3 electrical watts continuously, with little exertion on the part of the operator. From a strictly energy standpoint alone it is possible to generate flashes at a rate of 20 to 60 per second, the instantaneous power of the flash being at least ten times the constant input power level. Hence the flashes each have a brilliance some ten times greater than that of a light energized continuously at the same average power.

Furthermore, the radiating efficiency in the visible range of a tungsten filament is higher at the higher temperatures reached during instantaneous flashes, than it would be at a continuous lower temperature.

Although certain specific embodiments of the invention have been shown for purposes of illustration it will be evident that the invention is capable of various other modifications and adaptations without departing from the scope and spirit of the appended claims.

What is claimed is:

1. A flashlight comprising a hand driven generator of relatively low power having a rotating shaft, a condenser connected to be charged by said generator, a light source, make and break contact means, a cam driven by said shaft to actuate said contact means periodically in synchronism with said generator, a second condenser connected in series circuit with said first condenser, said contact means and said light source to be charged from said first condenser and to discharge with said first condenser through said light source on alternate closings of said contact means, whereby the energy in two half cycles is stored and made available for a flash discharge through said light source.

2. A flashlight comprising in combination a generator having a rotating shaft, a first condenser connected to be charged by said generator, a second condenser and a light source in series connection with each other, and contact means under the control of said shaft adapted when actuated to periodically connect said second condenser and said light source across said first condenser and to discharge energy stored in said first condenser through said second condenser and light source thereby to produce a series of flashes.

3. A flashlight comprising in combination a generator for converting mechanical energy into alternating electrical energy and including a rotatable element, a first condenser connected across the output of said generator and periodically charged thereby in opposite directions, a second condenser and an electrically operable light source in series connection therewith, and make and break contact means under the synchronous control of said rotatable element, said contact means being normally open and being adapted to be closed for a short period of time during each revolution of said rotatable element to connect said second condenser and said light source across said first condenser and to discharge both said first and second condensers through said light source thereby to produce a series of flashes.

4. A flashlight comprising in combination a continuously driven alternating current generator including a rotatable element, a first condenser connected across the output of said generator and charged in opposite directions during successive half cycles, a second condenser and an electrically operable light source in series connection therewith, and normally open contact means under the synchronous control of said rotatable element, said contact means being adapted to be closed for a short period of time during each revolution of said rotatable element to connect said second condenser and said light source across said first condenser whereby energy stored in both condensers during two successive half cycles is additively applied to said light source to produce therein a series of flashes.

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