June 20, 1939. C. KORVER 2,162,847

FLASH LAMP

Original Filed April 26, 1935

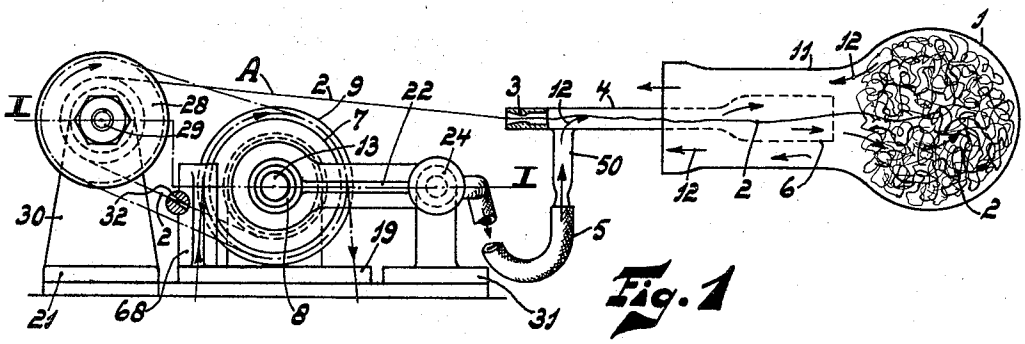


Fig. 1

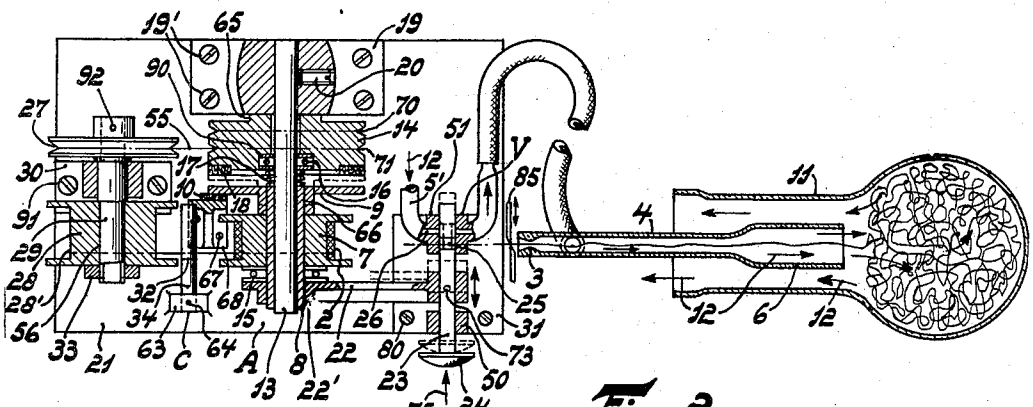
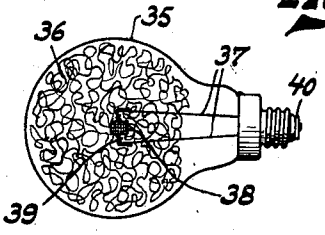


Fig. 2

Fig. 3



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FLASH LAMP

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Original application April 26, 1935, Serial No. 18,457. Divided and this application July 16, 1936, Serial No. 91,003. In Germany May 18, 1934

3 Claims. (Cl. 67—31)

My present invention relates to hollow bodies and more particularly to flashlight lamps having a filling of wire of little absolute strength, and this application forms a division of my pending application Serial No. 18,457 filed April 26th, 1935, now Patent No. 2,115,423.

According to the invention the filling of wire of little absolute strength is substantially evenly distributed throughout the volume of the body. It is very difficult, if not impossible, to transport or carry such a wire for obtaining the filling according to the invention and due to this circumstance articles according to my invention have not been manufactured before.

In accordance with the present invention the transportation of a wire of small absolute strength into a limited space is effected by means of a gas which medium carries the wire along with it.

As is described in my above-mentioned patent, the wire so carried can be distributed with great uniformity and in a curled state within the limited space.

By "wires" as used herein is meant not only metal wires, but also glass wires, artificial silk wires and the like.

In addition to transporting the wire, the gas used as carrying means also has a straightening action upon the wire, so that the curling power of the wire will cause no difficulties during the travel, such as the wire touching the inner surface of the tube through which it is being transported.

Particularly good results are obtained when the wire together with the incoherent medium is led through a tube which opens into the limited space and in which the tube openings for the inlet of the wire and of the gas are so located and dimensioned with respect to its outlet opening into the limited space, that the rate of flow of the medium is reduced upon entering this limited space.

As a rule, such thin wires inherently have sufficient internal strain to assume the desired curling upon entering the space, and to permanently retain such curling. In case the wire has insufficient internal strains to assume such curling the required internal strains may be imparted thereto before it is carried into the limited space, for instance by drawing the wire over an angular body.

As has been stated above, the invention is particularly well adapted for placing a fine filling within flash lamps. Flash lamps manufactured in accordance with the invention have the important advantage that the combustion is so complete that a maximum yield of actinic light is insured. Due to such complete combustion the objectionable phenomenon of molten unburned metal particles being thrown against the wall of the bulb and causing bursting of the bulb, which frequently occurs in the case of incomplete combustion, is also avoided.

To obtain complete combustion in prior art lamps, a large excess of oxygen was used; i. e. much more than theoretically required; in flash lamps manufactured according to the invention the provision of much excess oxygen is unnecessary, and therefore a comparatively low-pressure gasfilling can be used. This has the further advantage that the danger of the bulb bursting during the combustion is also eliminated.

The flash lamps manufactured in accordance with the invention have a very short "flash-time", for instance $\frac{1}{40}$ sec. or even less, and also a very short "contact time", for instance $\frac{1}{25}$ sec.; in addition the flash lamps made in accordance with the invention can be manufactured in mass production with highly uniform "flash-time" and "contact time".

The term "contact time" is to be understood to mean the lapse of time between the instant at which current is supplied to the bulb and the instant at which the emission of actinic light begins.

In order that the invention may be clearly understood and readily carried into effect, it will be described more fully with reference to the accompanying drawing, in which,

Figure 1 is a partly sectionized side view of a device suitable for carrying out the invention, and showing a flash lamp bulb filled with fine wire;

Fig. 2 is a sectionized view of Figure 1 taken on the line I—I of Fig. 1;

Fig. 3 is a view of a finished flash lamp having a wire filling placed therein.

Referring to Figs. 1 and 2, a flash lamp bulb 1 having a glass envelope comprising a neck portion 11, is arranged with its neck portion extending over a portion of a guide tube 4. The bulb is shown in the process of being filled with a thin wire 2, having an absolute tensile strength of about 25 grams; the wire passing through the guide tube 4. The guide tube 4 is formed on its end removed from the bulb, with a small funnel-shaped aperture 3 and on its other end with a portion 6 of enlarged diameter, and is also provided with an extension 50 through which enters the incoherent medium, for instance compressed air.

The compressed air flows in a direction indicated by the arrows 12 from a source of supply

(not shown) through an inlet 5' to a control valve V (see Fig. 2), later to be more fully described, through the valve V and tubes 5 and 50 into the guide tube 4.

In starting the operation of placing the wire into the bulb, a short end-portion of the wire 2 is first treated to remove any internal strains and consequently to eliminate any tendency of this portion to coil; this being done, for example, by heating the wire, for instance in the case of magnesium wire, by annealing the portion of the wire at a temperature of from 300 to 400° C. for about five seconds. The wire portion so treated is then led through the aperture 3 to extend a short distance into the guide tube 4 so that, upon admittance of the incoherent medium, the wire 2 will be transported along the tube and into the bulb 1.

The construction of aperture 3 causes substantially the entire compressed air stream to flow towards the bulb 1 and then to pass to the outside along the space formed between the tube 4 and the neck portion 11, as is indicated by the arrow. The compressed air flows through the tube 4 with considerable velocity and causes the wire 2 to be carried into the bulb, and at the same time tends to straighten the wire while in the tube 4, so that the feeding of the wire into the bulb will take place in a continuous, uninterrupted operation without the formation of wire pellets within the tube 4, caused by friction due to the wire coming into contact with the tube wall.

Due to the tube being enlarged at 6, the velocity of the compressed air in tube portion 6 is greatly reduced, which causes the wire 2 to resume its natural curling and to uniformly fill up the bulb 1.

The supply of wire 2 and the control of the flow of the compressed air to tube 4 takes place by means of a device A; the parts of which are mounted on a common base plate 21. The device A comprises a bearing block 19, secured to the base plate 21 by means of four screws 19' and supporting a shaft 13, which shaft is fixedly secured to block 19 by a set screw 20. Rotatably mounted upon the shaft 13 is a pulley 14 having two V-shaped grooves 70—71; groove 70' serving to drive the pulley by means of a belt from a driving source (not shown), for example from an electric motor, and the groove 71 serving for a purpose later to be described.

The pulley 14 is provided on one side with a boss 65, acting as a bearing against the block 19, and on its other side with a counterbore 90 containing a thrust bearing 16. Secured to one side of the pulley is a friction ring 18, for a purpose later to be described. The pulley 14 is continuously rotated during the operation of the device.

Rotatably and slidably mounted on the shaft 13 is a bushing 8 having fixedly secured at one end, by means of a pin 66, a flanged disc 9. Arranged on the bushing 8 so as to move therewith—and with the flange 9—is a spool 7 upon which is wound a supply of the wire 2.

Secured to the base plate 21 by screws 67 is an angle bracket 68 having secured to its upstanding leg, a pad 10 of friction material. In the position shown the disc 9 is forced against the pad 10 by a compression spring 17 acting through the thrust bearing 16 upon the pulley 14, thus causing the disc 9, bushing 2, and reel 7 to remain at rest.

Arranged with a free fit over bushing 8 and bearing with one side through a thrust bearing 15 upon the side of spool 7, is one end 22' of an arm 22 whose other end is fixedly secured by means of a pin 73 to a rod 23 carrying at one end a push button 24.

The rod 23 is suitably guided so as to have axial movement—as indicated by the double-headed arrow—by two projections 50—51 of a supporting bracket 31, which bracket is secured to the base plate 21 by means of screws 80. The projection 51 also serves as the valve V, which controls the flow of compressed air to the tube 4, and for this purpose is provided with passageways 26 and 26' through which may flow the compressed air.

The rod 23 is provided with a portion 25 of reduced diameter, which, when the rod is in the position shown by the dotted lines, connects the passageways 26 and 26', and thus permits the flow of air. In the position shown the rod 23 intercepts the passageways 26—26', and thus prevents the flow of air.

Upon movement of the push button 24—and rod 23—in the direction indicated by the arrow 75, the end 22' of arm 22, acting through thrust bearing 15, moves the reel 7—together with the bushing 8 and disc 9—against the compression of spring 17. If the push button is moved into the position indicated by the dotted lines, flange 9 will assume the position shown in dotted lines with its surface in contact with the friction ring 18. Thus flange 9—together with the bushing 8 and reel 7—will be driven by and rotate with the pulley 14. This movement of the push button 24—and the rod 23—also brings the reduced portion 25 into alignment with the passageways 26 and 26' and interconnects same to permit the flow of compressed air to the tube 4. The reduced portion 25 is so located on the rod 23 that the interconnection of passageways 26 and 26', and thus the flow of air, takes place before the flange 9 contacts with the friction ring 18; i. e., before the reel 7 rotates and the supplying of the wire 2 begins.

Secured to the base plate 21 by screws 91 is a supporting block 30 having rotatably mounted thereon a shaft 29. Fixedly secured to the shaft 29 by a pin 92 is a grooved pulley 27, which pulley, together with the shaft 29, is driven by a belt 55—indicated in dot-dash line—from the groove 71 of pulley 14. Secured to a reduced portion 56 of shaft 29 by means of a nut 33 is a drum 28 having a surface 28', over which is drawn the wire 2.

The wire 28 is so driven from the pulley 14 that the peripheral speed of the surface 28' is greater—for instance 10% to 15% greater—than the greatest speed at which the wire leaves the reel 7. Due to this increased speed there is a certain amount of sliding friction between the wire 2 and the surface 28', which keeps the wire portion between the drum 28 and reel 7 under tension, and thus insures that the unwinding of the wire from the reel 7 proceeds at the desired speed.

If the wire 2 does not inherently possess sufficient internal strain to receive the desired curling upon entering the bulb, the desired internal strain may be imparted to the wire, and for this purpose a device C is provided.

The device C consists of a rod 34 having a diametrical and axially-extending slot 32 (see Fig. 1) through which passes the wire 2; the rod 34 being supported by a bracket 63 secured to the base plate 21. The rod 34 is supported so as to be adjustable about its axis and adapted to be

secured in the desired position by means of a set screw 64. Thus the rod 34 can be secured in the desired position with the slot 32 at the correct angles to give the wire the desired amount of curling power.

With the push button 24 pushed in, both the wire and the compressed air is being supplied to the tube 4 and the bulb becomes filled with the wire.

After the bulb 1 has been filled with the desired length of wire, the push button 24 is released and the disc 9 is disconnected from the friction disc 18 by the spring 17 and is immediately placed into contact with the friction pad 10, which stops the movement of the reel 7 and the supplying of wire to the tube 4. Such releasing of the push button also causes the rod 23 to interrupt communication between the passageways 26 and 26', and thus interrupts the supply of compressed air. Due to the disposition of the portion 25 on the rod 23, the supply of air continues until after the reel 7 has come to rest. Subsequently the bulb 1 is moved to the right and the wire is severed by means of a suitable cutter, indicated by 85.

Various factors influence the operation, for instance, the peripheral speed of the reel 7; the internal diameter and length of tube 4; the speed of the compressed air through the tube; the diameter and length of the end portion 6; as well as the sizes of the bulb and of the neck portion 11. These factors have to be selected with regard to the specific properties of the particular wire used in order that there be no bunching or bundling of the wire while filling; i. e. that the density of the filling be substantially equal throughout the bulb, and in addition, that the wire filling elastically bears against the bulb wall and be immovable within the bulb.

For example, in the case of a specific flash lamp having a content of about 100 c. c. and an external diameter of about 55 mm., 10 meters of wire having a diameter of 35 microns and consisting of an aluminium-magnesium alloy containing 8% magnesium, are used. In such lamp dimensions and factors the following were found satisfactory: The neck portion 11 having a length of about 50 mm. and an external diameter of about 30 mm.; the guide tube 4 having a total length of 170 mm. and the portion 6 a length of 40 mm.; the opening of the aperture 3 having a diameter of about 0.12 mm.; the diameter of the tube about 1.9 mm.; and the widened portion 6 a diameter of about 13 mm. Under these conditions, when using compressed air at an overpressure of two atmospheres, the wire moved at the rate of about 1 meter per second.

A flash lamp filled in this manner is illustrated in Fig. 3 and comprises a bulb 35 containing a wire filling 36 of the above-mentioned material. The flash lamp is provided with the two terminal wires 37—37 connected with one end to the terminals of base 40 and carrying at their other ends a filament 38 provided with an ignition mixture 39 consisting, for example, of a pulverized metal, for instance aluminium, an oxidizing agent, for instance lead dioxide, and a binder, for instance nitro-cellulose or siliceous varnish. The bulb 35 contains a gas filling of oxygen at a pressure of ⅓ atmosphere.

The term "undulated wire" as used in the claims is to be understood to mean a wire which per se is provided with undulations e. g. kinks or waves. The term "serpentine course" is to be understood to mean a course which is winding or turning one way and the other like that of a moving serpent.

While I have described my invention in connection with specific examples, and in specific applications, I do not wish to be limited thereto, but desire the appended claims to be construed as broadly as permissible in view of the prior art.

What I claim is:

1. A flash-lamp comprising a container of actinic light-transmitting material having an active portion, a mass of thin undulated wire disposed within said active portion so as to be elastically supported from the wall thereof, and a substance which upon ignition enters into an actinic reaction with said wire, said wire being in substantially uniform spacial distribution throughout said active portion with each unit length of the wire surrounded by substantially the same amount of said substance.

2. A flash-lamp comprising a container of actinic light-transmitting material having an active portion, a mass of thin undulated wire disposed within said active portion so as to be elastically supported from the wall thereof, and a gas which upon ignition enters into an actinic reaction with said wire, said wire being arranged in a serpentine course so as to be in substantially uniform spacial distribution.

3. A flash-lamp comprising a container of actinic light-transmitting material having an active portion, a skeleton-like mass of thin wire provided with a large number of undulations, said mass being disposed within said active portion with the tips of a large number of the outer undulations in contact with the wall of the container so as to elastically support the mass, and a gas which upon ignition enters into an actinic reaction with said wire.

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