

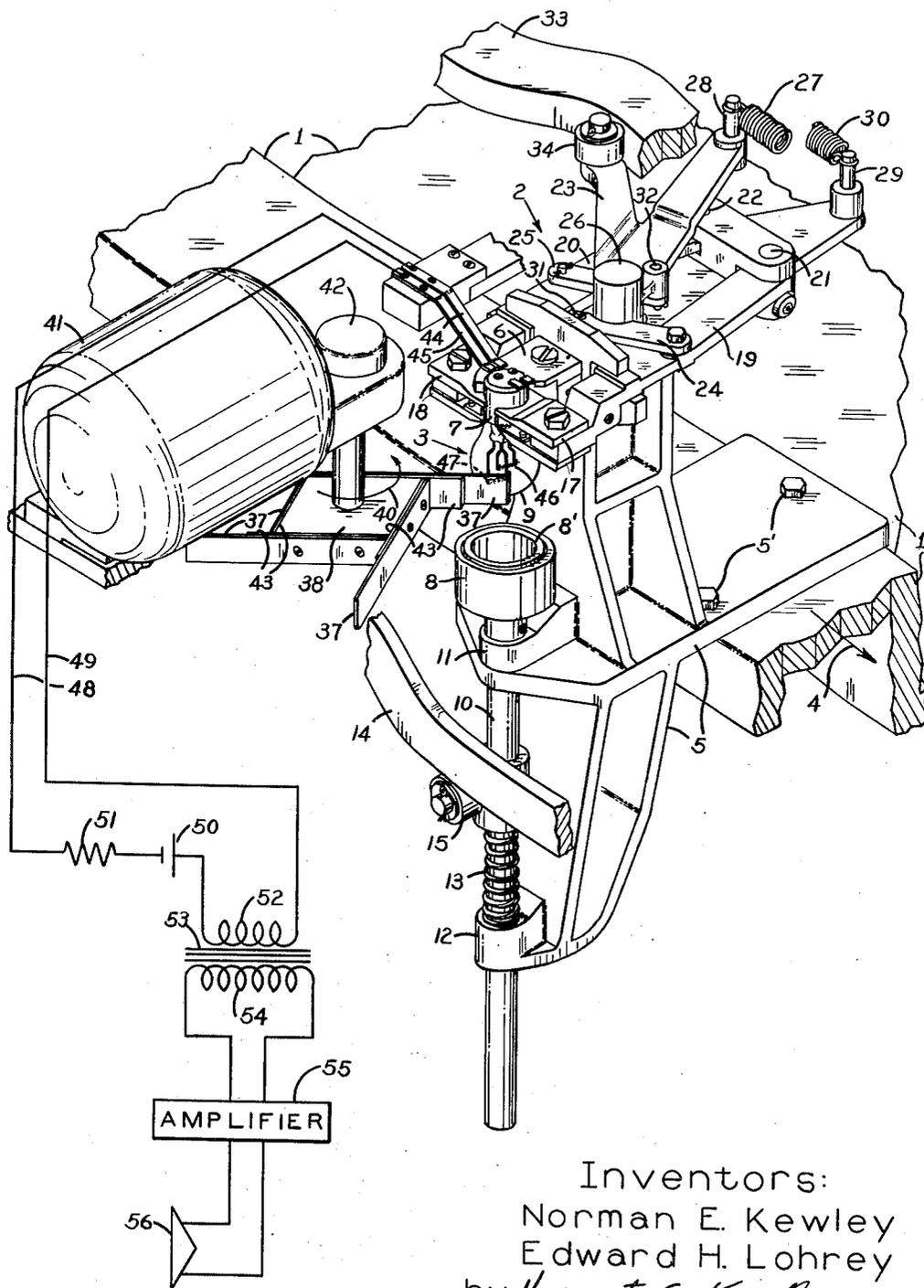
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N. E. KEWLEY ET AL

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ELECTRIC LAMP TESTING APPARATUS

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Inventors:  
Norman E. Kewley  
Edward H. Lohrey  
by *Vernut C. Kaufman*  
Their Attorney

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**ELECTRIC LAMP TESTING APPARATUS**

Norman E. Kewley, University Heights, and Edward H. Lohrey, South Euclid, Ohio, assignors to General Electric Company, a corporation of New York

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This invention relates generally to electric lamp making machinery, and more particularly to apparatus for automatically testing electric lamps in high speed manufacture.

The mass production of incandescent lamps, as carried out in the industry at the present time, generally involves the use of three major machinery units for assembling the principal elements into the finished article. In the first unit, the internal parts are assembled into a mount; in the second unit, generally a sealing and exhausting machine, the stem or mount supporting the lead-in wires and the filament, is sealed into a glass bulb which is subsequently flushed and exhausted, and, if desired, filled with an inert gas; in the third unit, generally a finishing machine, a base is cemented on the neck of the bulb, the lead-in wires are soldered or otherwise connected to the appropriate parts of the base, and the lamp is flashed by passing a current through its filament.

Our invention is more particularly concerned with the testing of incandescent lamps, which heretofore has generally been performed as an incident of the inspection and packaging by an operator who received the lamps at the unloading station of the finishing machine. In the higher voltage sizes of incandescent lamps, such as the usual household types, testing for filament continuity is a relatively simple matter since the operator need only insert the lamp into a suitable socket and observe whether or not it lights up. However in the case of low voltage high current incandescent lamps, such as, for instance, miniature lamps for automobiles, a much more exacting test is required. The test must insure that no hidden defects are present which will eventually show up under the vibration to which the lamp will be subjected in use. Heretofore it has been customary for this purpose to subject the lamp to repeated light blows while the filament is included in a test circuit responsive to interruptions of continuity. One bench device which has been used for this purpose has comprised a socket in which the lamp is held manually and a vibrating reed device for striking the bulb of the lamp. It will be appreciated that the manual operations involved render such a testing procedure tedious and costly, and some means for testing the lamp while still mounted on the rotating turret of the finishing machine is much to be preferred.

Accordingly, the object of our invention is to provide apparatus operating in conjunction with a rotary turret type of lamp finishing machine for rigorously testing lamps for circuit continuity.

Another object of our invention is to provide such apparatus capable of detecting hidden defects in the connections between the filaments and the lead wires and which normally would only show up after the lamp has been subjected to vibration and similar abuse.

In accordance with the invention, we have found that it is possible to perform a filament continuity vibration test while the lamp is still supported in a head of a rotary turret of the usual finishing machine. For this purpose, we provide means for supporting the lamp solely by the base when it arrives at the testing station, rather than by the base and by the bulb together as is normally the case. The filament is subjected to vigorous vibration by means of a device which strikes or flails the bulb of the lamp. At the same time, a testing circuit is completed through fingers which make connection with the contact

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of the base at the testing station. By reason of the fact that the lamp is supported exclusively by the base, the flailing of the bulb subjects the filament to intense vibration so that any hidden defects such as a loose connection where the filament is clamped or otherwise connected to the lead-in wire will show up in the amplifier and be observed. Preferably the testing station immediately precedes the unloading station; thus the operator can set aside the defective lamps as soon as the amplifier gives warning.

For further objects and advantages and for a better understanding of the invention, attention is now directed to the following description and accompanying drawing. The features of the invention believed to be novel will be more particularly pointed out in the appended claims.

The single figure of the drawing is a pictorial view of testing apparatus forming a preferred embodiment of our invention and shown in conjunction with a single head or lamp supporting fixture of a rotary turret finishing machine.

Referring to the drawing, the testing apparatus is mounted at one station of a prior art lamp finishing machine which may be similar to that described in U. S. Patent 1,708,756 Fagan et al. It comprises a turret or reel of which a fragment is shown at 1, having mounted on its periphery a plurality of lamp holding fixtures or basing heads. A single head 2 has been illustrated in detail and supports a miniature incandescent lamp 3. It will be understood that suitable means are provided for rotating the turret in a counter-clockwise direction as indicated by the curved arrow 4. Such means may comprise a supporting shaft and an intermittent drive mechanism adapted to rotate the turret and advance the holders to successive stations for each indexing movement.

The basing head 2 comprises a bracket 5 bolted at 5' to the turret in a manner to overhang its edge. Fastened to the top face of the upper portion of the bracket, is a plate 6 provided with a recess having an inwardly turned flange for receiving the base 7 of the lamp. The base is normally urged upward against the plate 6 by means of a circular cup 8 fitted with a bushing 8' which is adapted to receive the bulb 9 of the lamp. The cup is mounted on a vertical spindle 10 sliding in bearings 11 and 12 and biased upwardly by a spring 13 to exert axial pressure against the bulb. Whenever it is desired to release the lamp at a particular station, a stationary cam such as is shown at 14 is positioned to engage a roller 15 fastened to the spindle. The spring 13 is thereby compressed and the cup 8 is lowered away out of engagement with the lamp 3.

The lamp may in addition be held by means of gripping plates or members 17 and 18 fastened to the forward ends of a pair of jaws 19 and 20, and shaped to the curvature of the base 7 of the bulb. The jaws are pivotally mounted at 21 and 22 on the rear upper portion of bracket 5, and are normally urged together by the linkage comprising bell crank 23 and links 24 and 25. The bell crank pivots on a stud 26 fastened to bracket 5 and is biased in a clockwise direction by a spring 27 which engages at one end a pin 28 on one of the arms of the bell crank, and at its other end a fixed pin on the bracket of an adjacent head, such pin corresponding to pin 29 in the present head. It will be appreciated that spring 30 is a portion of the spring for the head next in line on the turret to that being considered here. The clockwise pivoting of the bell crank draws the jaws 19 and 20 together through the links 24 and 25 which are pivotally fastened off the hub of the bell crank at 31 and 32 respectively, thereby to exert radial pressure on opposite sides of the base.

When it is desired to open the jaws and release the lamp, a suitable stationary cam such as is shown at 33 may be positioned at the station in question to engage a roller 34 mounted on the shorter arm of the bell crank. It will be appreciated that the cam track 33 is here shaped to allow the jaws to engage the lamp by its base at the testing station whereas the cam track 14 is shaped to lower the cup 8 out of engagement with the bulb.

The lamp is thus supported exclusively by the jaws through its base so that it is held in the same fashion as when located in a socket for actual use.

The forced vibration of the filaments within the bulb is effected by flailing members in the form of spring strips or blades 37, of which there are four fastened on a square block 38 carried on a short vertical shaft 39. Shaft 39 is rotated in a clockwise direction indicated by the arrow 40, by an electric motor 41 and reduction gearing of the usual type indicated at 42. As the block 38 rotates, the spring blades 37 act as paddles or flails which strike the bulb 9 of the lamp and subject it to forced vibration. The shorter spring members 43 serve as stiffeners for the spring blades 37. The motor may be allowed to run continuously and the paddles will flail the bulb whenever a lamp is indexed into the station.

The testing circuit proper is made through a pair of contact strips 44 and 45 whose ends (shown broken away in the drawing) are positioned to engage the contacts in the top of the base leading to the filaments. For the lamp illustrated, one side of each filament 46 and 47 is connected through its lead wires to one of the insulated contacts in the top of the base, whereas the other side of each filament is connected to the shell of the base. Thus by making connections to the insulated contacts in the base, a circuit is made through the two filaments and all the lead wires in series, and including the connections between the lead wires and the filaments where intermittent contacts are most likely to occur. The primary testing circuit is completed through the conductors 48, 49 in a series circuit comprising a battery 50, a current limiting resistor 51, and the primary winding 52 of the transformer 53. The secondary winding 54 of the transformer feeds into the input circuit of an audio amplifier 55 whose output may be supplied to a suitable indicator such as loud speaker 56.

In operation, as a bulb is indexed into the testing station, spindle 10 is forced down and bulb cup 8 is lowered out of engagement with the bulb 9. The lamp is then supported exclusively through its base by the gripping members 17 and 18. The flailing of the bulb by the spring blades 37 causes the filaments 46, 47 and their lead wires to vibrate very forcefully. Defects in the filament circuit may occur from a number of causes, but the most common are a defective clamp when the filament is supported by bending over the ends of the lead wires, a defective weld when a welded connection is used, or a defective press when the filament is pressed into the lead wires. In case of any such defect, the repeated interruptions of the circuit under the forced vibration causes a series of pulses to be transmitted through transformer 53, which pulses are amplified and result in a series of discordant noises in the loud speaker 56. The operator at the unloading station is thus warned that a defective lamp will be discharged from the machine. It will be appreciated of course that if desired the noise output of the amplifier 55 may be used to operate a solenoid in well known manner and the solenoid may be adapted to segregate the defective lamp automatically. For instance this may be achieved either by causing the solenoid to eject the defective lamp directly from the machine or again by causing it to operate a gate in a receiving chute at the unloading station whereby the defective lamps are deflected into a suitable receptacle. Equipment suitable for this purpose is well known in the art and is shown for instance in Patent 1,821,240 Seletzky.

It is to be understood that the specific embodiment of the invention which has been described herein is to be considered illustrative of the invention and that various modifications may be made in connection with it as will be evident to those skilled in the art. For instance it will be obvious that the basing head or lamp holding fixture which has been illustrated is subject to modification in order to accommodate lamps of different sizes or configuration. The scope of the invention is accordingly to be determined solely by the appended claims.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. Apparatus for electrically testing based incandescent lamps, including a bulb, a filament therein, and a base, for filament circuit continuity, comprising a turret indexable to a series of successive stations, a plurality of lamp holding heads carried on said turret, gripping means in each head operable to support a lamp exclusively by its base, means actuating said gripping means at a station,

a testing circuit including contact members positioned at said station for completing a circuit through the filament of said device and responsive to interruptions of circuit continuity therethrough, and means for agitating the bulb of said device at said station while supported exclusively by its base, said last-named means comprising flailing members positioned to strike the bulb at said station.

2. Apparatus for electrically testing based incandescent lamps, including a bulb, a filament therein, and a base, for filament circuit continuity, comprising a turret indexable to a series of successive stations, a plurality of lamp holding heads on said turret, first gripping means in each head operable to support a lamp by its bulb and base and second gripping means operable to support a lamp entirely by its base, means at a testing station for disabling the first and actuating the second gripping means, a testing circuit including contact members positioned at said station for completing a circuit through the filament of said device and responsive to interruptions of circuit continuity therethrough, and means for agitating the bulb of said device at said station while supported exclusively by its base, said last-named means comprising flailing members positioned to strike the bulb at said station.

3. Apparatus for electrically testing based incandescent lamps, including a bulb, a filament therein, and a base, for filament circuit continuity, comprising a turret indexable to a series of successive stations, a plurality of lamp holding heads carried on said turret, gripping means in each head operable to support a lamp exclusively by its base, means actuating said gripping means at a station, a testing circuit including contact members positioned at said station for completing a circuit through the filament of said device and responsive to interruptions of circuit continuity therethrough, and means for agitating the bulb of said device at said station while supported exclusively by its base, said last-named means comprising a rotating member and spring-like blades projecting from said rotating member and disposed to strike the bulb at said station.

4. Apparatus for testing for circuit continuity electric devices including an envelope having a base fastened thereto, comprising a conveyor carrying a plurality of holding heads for said devices and adapted to index said heads to a series of successive stations, first gripping means in each head adapted to hold a device by its envelope and base and second gripping means adapted to hold a device by its base only, means at a testing station for disabling the first gripping means and making only the second gripping means operative to hold said device exclusively by its base, a testing circuit including contact members completing a circuit through said device at said testing station and responsive to interruptions of circuit continuity therethrough, and means operating exclusively on the envelope of said device and subjecting it to forced vibration while so supported.

5. Apparatus for testing for filament continuity incandescent lamps including a bulb enclosing a filament and having a base fastened thereto, comprising a conveyor carrying a plurality of lamp holding heads and indexable to a series of successive stations, first gripping means in each head operable to support a lamp by its bulb and base and second gripping means operable to support a lamp entirely by its base, means at a testing station for disabling the first and making only the second gripping means operative to hold said lamp exclusively by its base, a testing circuit including contact members completing a circuit through the filament of said device at said testing station and responsive to interruptions of circuit continuity therethrough, and means operating exclusively on the bulb of said device to agitate it while supported by its base in order to subject its filament to forced vibration.

6. Apparatus for testing for circuit continuity electric devices including an envelope having a base fastened thereto, comprising a turret indexable to a series of successive stations, a plurality of lamp holding heads carried on said turret, each of said heads comprising a first gripping means exerting axial pressure on the envelope and restraining the base whereby to support the device by its envelope and base, and second gripping means applying radial pressure on opposite sides of the base to support the device by its base, means at a testing station for disabling said first gripping means and making only the

second gripping means operative to support said device exclusively by its base, contact members positioned at said station for completing a circuit through said device and responsive to interruptions of circuit continuity therethrough, and means operating exclusively on the envelope of said device and subjecting it to forced vibration while supported by its base at said station.

## References Cited in the file of this patent

## UNITED STATES PATENTS

Number	Name	Date
5 1,760,507	Loebe et al. -----	May 27, 1930
1,821,240	Selectzky -----	Sept. 1, 1931
2,278,697	Gould -----	Apr. 7, 1942
2,418,437	Vogt -----	Apr. 1, 1947
2,487,599	Schell -----	Nov. 8, 1949