



(11) **EP 2 983 194 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention
of the grant of the patent:
31.01.2018 Bulletin 2018/05

(51) Int Cl.:
H01J 61/82 (2006.01) **H01J 61/56** (2006.01)
H01J 61/12 (2006.01) **H05B 41/14** (2006.01)

(21) Application number: **15179610.9**

(22) Date of filing: **04.08.2015**

(54) **A RETROFITTABLE ENERGY SAVING LAMP WITH INTEGRATED MAGNETIC COIL AND CERAMIC METAL HALIDE ARC TUBE TO REPLACE MERCURY VAPOR LAMPS, HIGH PRESSURE SODIUM LAMPS AND QUARTZ METAL HALIDE LAMPS**

NACHRÜSTBARE ENERGIESPARLAMPE MIT INTEGRIERTER MAGNETISCHER SPULE UND KERAMIKMETALLHALOGENIDBOGENRÖHRE ZUM ERSETZEN VON QUECKSILBERDAMPFLAMPEN, HOCHDRUCK-NATRIUM-LAMPEN UND QUARZ-METALLHALOGENIDLAMPEN

LAMPE À ÉCONOMIE D' ÉNERGIE DOTÉE D'UNE BOBINE MAGNÉTIQUE INTÉGRÉE ET D'UN TUBE CÉRAMIQUE À ARC À HALOGÉNURE MÉTALLIQUE POUR REMPLACER LES LAMPES À VAPEUR DE MERCURE, LAMPES À SODIUM HAUTE PRESSION, LAMPES QUARTZ À HALOGÉNURE MÉTALLIQUE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **04.08.2014 IN 82514**

(43) Date of publication of application:
10.02.2016 Bulletin 2016/06

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to ceramic metal halide lamps. Particularly, present invention relates to retrofit ceramic metal halide lamps with magnetic coil integrated in the base of the lamp. More particularly, the present invention relates to a retrofittable energy saving lamp with integrated magnetic coil and ceramic metal halide arc tube to replace mercury vapor lamps, high pressure sodium lamps and quartz metal halide lamps.

BACKGROUND OF THE INVENTION

[0002] Presently, the ceramic metal halide lamps have a very high efficiency (lumens/watt). Old technologies like mercury vapor lamps, high pressure sodium lamps and quartz metal halide lamps are being banned by gubernatorial regulation due to the high amount of mercury and/or low efficiency. To replace these lamps, retrofitting lamps can be developed for use on existing magnetic ballast systems with energy saving.

[0003] In the past, SHX super saver HPS lamp with magnetic choke was used for operating on mercury vapor ballast as shown in fig. 1. This lamp was designed to operate on 125W MBF ballasts and was used as an upgraded version from Mercury to HPS lighting with 50% increase in light output, without the need to change the light fittings, gears etc. The plastic part near the cap was fitted with ballast to convert the lamp voltage and current to match the arc tube. This SHX-S lamp having a yellow/orange color with bad color rendering, the same cannot be considered as an attractive solution to replace a white light lamp. Further, SHX-S solution with a HPS arc tube is also not efficient enough to comply with the new regulations.

[0004] US publication 20050073256 provides a high-pressure discharge lamp of ceramic metal halide type, having power ranges of about 150 W to about 1000 W. Such lamps are provided with a discharge vessel which encloses a discharge space. The discharge vessel has a ceramic wall and is closed by a ceramic plug. An electrode which is located inside the discharge space is connected to an electric conductor by way of a leadthrough element. ceramic metal halide lamps are suitable for high pressure sodium and/or quartz metal halide retrofit.

[0005] US8314554 teaches to an integrated gas discharge lamp including a lamp base, a gas discharge lamp burner and an ignition electronics, wherein the integrated gas discharge lamp includes an operation electronics for operating the gas discharge lamp burner, and the gas discharge lamp burner, the ignition electronics, and the operation electronics are unseparably coupled with each other.

[0006] US Patent No 7,135,822 describes a transformer for fitting in a lamp base, the transformer having a housing which surrounds at least one winding of the

transformer. This prior art also describes a lamp base having such a transformer. Further, a high-pressure discharge lamp having such a lamp base is also taught. The transformer acts, for example, as a starting transformer for generating high-voltage pulses for starting the gas discharge in the discharge medium of a high-pressure discharge lamp.

[0007] US Publication No. 2006055340 discloses to a transformer for generating a starting voltage for a high-pressure discharge lamp having a ferrite core and at least one primary winding as well as at least one secondary winding. The invention further discloses a starting device and a high-pressure discharge lamp having such a transformer.

[0008] US Patent No. 7,696,699 describes a lamp base for a high-pressure discharge lamp where the lamp base comprises an ignition transformer, which is placed in the interior of the lamp base and which serves to ignite the gas discharge inside the high-pressure discharge lamp. To this end, the ignition transformer comprises a core on which its windings are placed.

[0009] US Patent No. 8,148,884 teaches a technology to fit a bulb to a coupler member in an electrodeless discharge lamp. The coupler member has: a cylindrical shaped core with an induction coil wound around a peripheral portion thereof.

[0010] US Publication No. 20040155594 discloses a high-voltage discharge lamp lighting apparatus which is formed by integrating a high-voltage pulse generating transformer of a lighting apparatus to a lamp base such as a high-voltage discharge lamp and a floodlight projector, and a high-voltage discharge lamp apparatus and a floodlight projector apparatus using the lighting apparatus.

[0011] US Patent No. 6,768,254 describes to an electrodeless discharge lamp, in particular, a self-ballasted electrodeless discharge lamp. A first self-ballasted electrodeless discharge lamp includes a discharge vessel having a cavity, an induction coil that is inserted into the cavity, ballast for supplying power to the induction coil, a case for covering the ballast; and a lamp base provided in the case. The discharge vessel is secured to the case via a holder. A part of the discharge vessel and a first portion of the holder are engaged with each other to constitute a combination structure. A second portion of the holder and a part of the case are engaged with each other to constitute a combination structure.

[0012] US Patent No 8,742,663 shows a transformer, a lamp base element having such a transformer, a lamp base having such a lamp base element, and a discharge lamp having such a lamp base.

[0013] The US patent N°20040155594 shows a high voltage discharge lamp comprising a coil on its cap portion.

[0014] The following patent documents, US6111359, EP1107285, EP1755148, WO02091431, US2010171426, and US 2006108942 are related to metal halide lamps.

The present inventors accordingly noted that prior art do not show teach or suggest white light energy saving retrofitting lamp with HID technology. Thus, the prior art solutions to the disadvantages are replacing both the ballast and lamp. The prior art also fails to teach integrated lamps with integrated magnetic coil and ceramic metal halide arc tube operable at 50/60Hz. The known SHX-S lamp is not a feasible solution to the prevailing disadvantages. Therefore in view of the brief discussion on prior art, the present inventors recognized that a technical solution to replace mercury vapor lamps, high pressure sodium lamps and quartz metal halide lamps which are likely to be statutorily banned in the near future.

Thus, in the present invention, a replacement lamp with an integrated magnetic coil and ceramic metal halide arc tube is provided so that energy saving can be realized with high efficiency (lumens/watt).

OBJECTS OF THE INVENTION

[0015] A retrofittable energy saving lamp according to the present invention is defined in claim 1. Preferred embodiments are set out in dependent claims 2 to 7.

[0016] It is therefore an object of the present invention to propose a retrofittable energy saving lamp with integrated magnetic coil and ceramic metal halide arc tube to replace mercury vapor lamps, high pressure sodium lamps and quartz metal halide lamps.

Another object of the present invention is to propose a retrofittable energy saving lamp with integrated magnetic coil and ceramic metal halide arc tube to replace mercury vapor lamps, high pressure sodium lamps and quartz metal halide lamps, which is operable with old fixture and easily attachable/detachable by simple fastening means.

[0017] A still another object of the present invention is to propose a retrofittable energy saving lamp with integrated magnetic coil and ceramic metal halide arc tube to replace mercury vapor lamps, high pressure sodium lamps and quartz metal halide lamps, which eliminates installation of other components on the fixture.

[0018] Yet another object of the present invention is to propose a retrofittable energy saving lamp with integrated magnetic coil and ceramic metal halide arc tube to replace mercury vapor lamps, high pressure sodium lamps and quartz metal halide lamps, which provides an easy and cost-saving solution for retrofit lamps.

[0019] A further object of the present invention is to propose a retrofittable energy saving lamp with integrated magnetic coil and ceramic metal halide arc tube to replace mercury vapor lamps, high pressure sodium lamps and quartz metal halide lamps, which provide white light and fulfills the conditions of new regulations of minimum lumens/watt, lumen-maintenance and maximum allowed mercury content.

[0020] Other objects and advantages of the invention will appear to those skilled in the art to which it appertains as the description proceeds, both by direct recitation thereof and by implication from the context.

[0021] According to this invention a retrofit ceramic metal halide lamps with magnetic choke integrated in the base of the lamp is provided for replacing mercury vapor lamps, low pressure sodium lamps and quartz metal halide lamps.

SUMMARY OF THE INVENTION

[0022] Accordingly the present invention provides a retrofit ceramic metal halide lamp for replacing mercury vapor lamps, low pressure sodium lamps and quartz metal halide lamps. The inventive lamp gives white light and fulfills the conditions laid down in the new regulations such as minimum lumens/watt, lumen-maintenance and maximum allowed mercury content.

[0023] In a preferred embodiment of the present invention, a retrofit ceramic metal halide lamp for replacing mercury vapor lamps, low pressure sodium lamps and quartz metal halide lamps is provided with a magnetic coil integrated in the housing of the ceramic metal halide lamp-base. It is connected to the arc tube and is in serial connection with the ballast.

[0024] In another embodiment of the present invention, for replacement of HPS or quartz metal halide lamps, the retrofittable lamps are provided with a fuse integrated in the housing-base. The coil and other components are integrated in a housing-base and fixed to an outer bulb, wherein the metal halide arc tube is mounted.

[0025] In a still another preferred embodiment of the present invention, for replacing the mercury vapor lamps, ceramic metal halide lamps, the retrofittable lamps are provided with magnetic coil integrated with an ignition device. This ignition device can be a glow-bottle or an electronic circuit. The ignition device is a switching element and generates current steps.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

[0026] Further objects and advantages of this invention will be more apparent from the ensuing description when read in conjunction with the accompanying drawings and wherein:

FIG. 1 shows prior art HPS lamp with magnetic choke in the plastic part near the cap for operating on mercury vapor ballast;

FIG. 2 shows a coil added in serial and integrated in the housing-base of the ceramic metal halide lamp-base according to the present invention;

FIG. 3 shows an internal structure of the lamp according to the present invention;

FIG. 4 shows an embodiment of the invention for replacement of mercury vapor lamps with an ignition device;

FIG. 5 shows another replacement of embodiment of the invention suitable for HPS or quartz metal halide lamps.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0027] Due to the high efficiencies of ceramic metal halide arc tubes, efficiencies above 100lum/W, the retrofittable lamps of the invention is constructed to provide lower power for the same light level. For example mercury vapor lamps have an efficiency of 50lum/W. So the power for making a replacement lamp according to the invention can be 50%, resulting in an energy saving of 50%. To operate these lower power lamps, another ballast is provided in addition to the existing ballast in the fixture with higher inductance. Referring to fig. 2, instead of changing the ballast in the fixture, a coil is added in serial and integrated in the housing in a ceramic metal halide lamp-base according to the present invention. The coil in the base together with the coil in the fixture limits the current through the arc tube. The coil in the housing-base is in serial with the ballast in the fixture, so the total impedance in serial with the arc tube goes up as shown in fig. 3. Fig. 3 shows the internal structure of the lamp according to the present invention. This means that the current through the lamp goes down and the power in the lamp will go down. For operating these ceramic metal halide arc tubes, a starting pulse is needed.

[0028] Referring to fig. 4, in mercury vapor lamps no igniter is available in the fixture. Accordingly, an ignition device is integrated. This ignition device can be a glow-bottle or an electronic circuit. The ignition device is a switching element and generates current steps. By switching the current the coils in serial with the arc tube gives voltage peaks $U=Ldi/dt$, above 500V, which is high enough to ignite the lamp. When the arc tube is burning, the ignition device stops switching.

Referring to fig. 5, for retrofittable lamps applicable for replacement of HPS or quartz metal halide lamps, there is no need to integrate an ignition device in the housing-base as it is already available in the fixture. For protection, a fuse is integrated in the housing-base. The coil and other components are integrated in a housing-base and fixed to an outer bulb, wherein the metal halide arc tube is mounted.

Thus in the retrofit lamps according to the present invention, an energy saving of around 30 percent is reached. A 170W lamp is for replacing a 250W mercury vapor lamp. An 85W is for replacing a 125W mercury vapor lamp. A 55W is for replacing an 80W mercury vapor lamp. The lamps have efficiency of about 88lum/W and have a color temperature of about 3000K with a color rendering of about 84.

Claims

1. A retrofittable energy saving lamp to replace mercury vapor lamps, high pressure sodium lamps and quartz metal halide lamps, the retrofittable energy saving lamp comprising a housing-base, and a ceramic met-

al halide arc tube, **characterized in that** a magnetic coil is integrated in the housing base of the retrofittable energy saving lamp and **in that** said coil is adapted to be in serial connection with the existing ballast of the fixture, in such a way the total impedance with the arc tube increases.:

2. The lamp as claimed in claim 1, wherein a fuse is integrated in the housing-base.
3. The lamp as claimed in claim 1, wherein an ignition device is integrated in the housing-base.
4. The lamp as claimed in claim 3 wherein the ignition device is selected from a glow-bottle or an electronic circuit.
5. The lamp as claimed in claim 3 wherein the ignition device is a switching element and is capable to generate current steps.
6. The lamp as claimed in claim 1 wherein the lamp is having efficiency of about 88lum/W, color temperature of about 3000K with a color rendering of about 84.
7. The lamp as claimed in claim 1 wherein the wattage of the lamp ranges from 55watt to 170watt.

Patentansprüche

1. Nachrüstbare Energiesparlampe zum Ersetzen von Quecksilberdampflampen, Hochdruck-Natriumdampflampen und Quarz Halogenmetallampflampen, wobei die nachrüstbare Energiesparlampe einen Gehäusesockel und eine Keramikmetallhalogen-Lichtbogenröhre umfasst, **dadurch gekennzeichnet, dass** in den Gehäusesockel der nachrüstbaren Energiesparlampe eine Magnetspule integriert ist, und dadurch, dass die Spule für die Reihenschaltung mit dem vorhandenen Vorschaltgerät der Vorrichtung eingerichtet ist, so dass die Gesamtimpedanz mit der Lichtbogenröhre steigt.
2. Lampe nach Anspruch 1, wobei eine Sicherung in den Gehäusesockel integriert ist.
3. Lampe nach Anspruch 1, wobei eine Zündvorrichtung in den Gehäusesockel integriert ist.
4. Lampe nach Anspruch 3, wobei die Zündvorrichtung aus einer Glimmlampe oder einer elektronischen Schaltung ausgewählt ist.
5. Lampe nach Anspruch 3, wobei die Zündvorrichtung ein Schaltelement und in der Lage ist, Stromschritte zu erzeugen.

6. Lampe nach Anspruch 1, wobei die Lampe eine Effizienz von etwa 88 lum/W, eine Farbtemperatur von etwa 3000 K mit einem Farbwiedergabeindex von etwa 84 aufweist.

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7. Lampe nach Anspruch 1, wobei die Wattzahl der Lampe im Bereich von 55 bis 170 Watt liegt.

Revendications

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1. Lampe de remplacement à économie d'énergie destinée à remplacer des lampes à vapeur de mercure, des lampes à sodium haute pression et des lampes quartz à halogénure métallique, la lampe de remplacement à économie d'énergie comprenant une base de boîtier et un tube céramique à arc à halogénure métallique, **caractérisée** en qu'une bobine magnétique est intégrée dans la base du boîtier de la lampe de remplacement à économie d'énergie et en ce que ladite bobine est adaptée pour être en liaison série avec le ballast existant de l'appareil d'éclairage, de telle sorte que l'impédance totale avec le tube à arc augmente.
2. Lampe selon la revendication 1, dans laquelle un fusible est intégré dans la base du boîtier.
3. Lampe selon la revendication 1, dans laquelle un dispositif d'allumage est intégré dans la base du boîtier.
4. Lampe selon la revendication 3 dans laquelle le dispositif d'allumage est choisi entre une lampe à incandescence et un circuit électronique.
5. Lampe selon la revendication 3 dans laquelle le dispositif d'allumage est un élément de commutation et est capable de générer des paliers de courant.
6. Lampe selon la revendication 1 dans laquelle la lampe a un rendement d'environ 88 lum/W, une température de couleur d'environ 3000 K avec un rendu des couleurs d'environ 84.
7. Lampe selon la revendication 1 dans laquelle la puissance de la lampe va de 55 Watts à 170 Watts.

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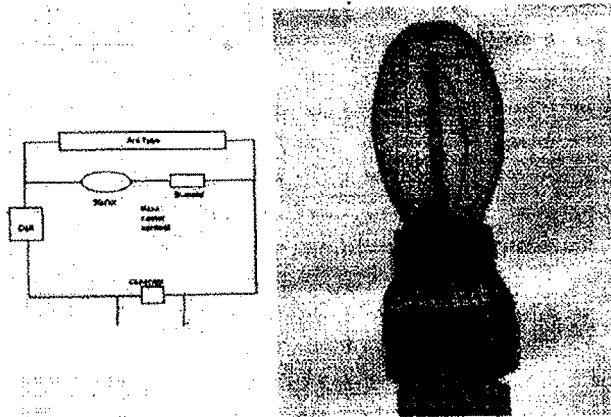


Figure : 1

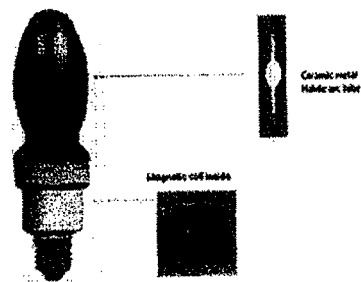


Figure : 2

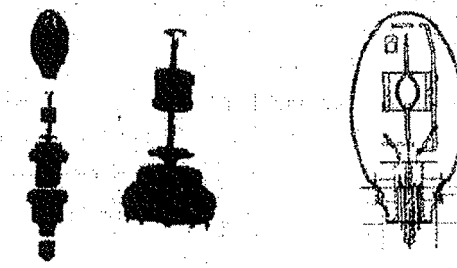


Figure : 3

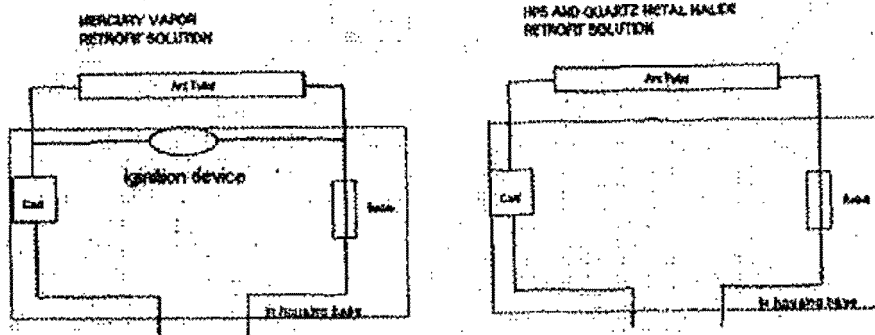


Figure : 4

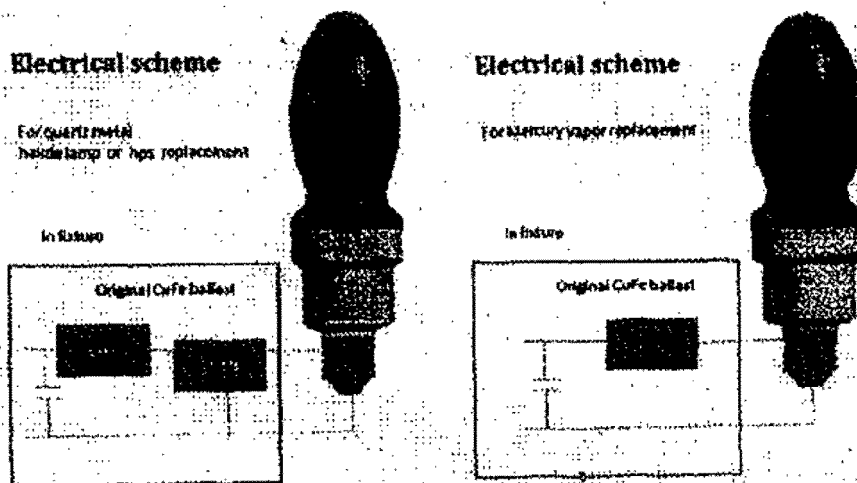


Figure : 5

REFERENCES CITED IN THE DESCRIPTION

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