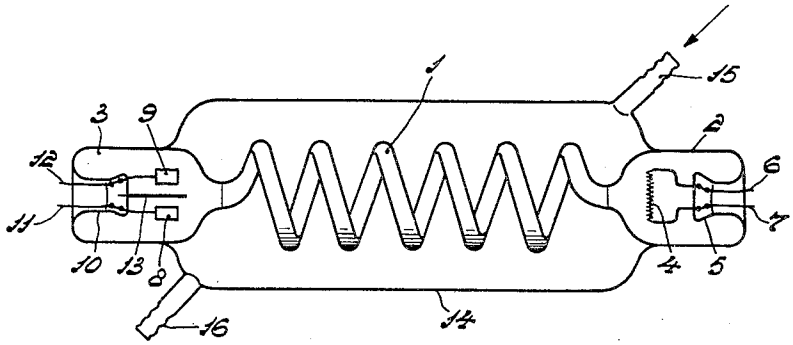
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DEVICE SUITABLE FOR THE IRRADIATION OF SUBSTANCES WITH ULTRA-VIOLET RAYS

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DEVICE SUITABLE FOR THE IRRADIATION OF SUBSTANCES WITH ULTRA-VIOLET RAYS

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4 Claims. (Cl. 99—2)

The invention relates to devices suitable for the irradiation of substances with ultra-violet rays. Such devices may be used, for example, for the sterilization of liquids and they usually comprise an electric discharge tube in which ultra-violet rays are generated which emerge from the discharge tube through its wall which consists of a material adapted to transmit these rays, for example, of quartz. These rays act on the substance to be treated. The quantity of the substance which can be treated in a given lapse of time depends inter alia on the dimensions of the discharge tube in which the ultra-violet rays are generated. It is easy to understand that when use is made of a long discharge tube, it is possible to sufficiently irradiate in a given lapse of time a larger quantity of the substance than with the use of a short discharge tube. In the former case the energy absorbed by the tube will usually be greater than in the latter case. The capacity of the irradiation device can therefore be raised by increasing the dimensions of the installation. However, when the device has large dimensions it is not easily conveyable and takes much room. If the wall of the discharge tube of such an installation is connected at several points to the wall of the irradiation chamber, the joints may be strongly heated during the operation of the device due to a disparity in the alteration of length of the discharge tube and of the irradiation chamber for the wall of the discharge chamber will be more strongly heated than that of the irradiation chamber.

The invention has for its object to obviate the said disadvantages and to suggest a device for irradiating substances with ultra-violet rays in which a great capacity is combined with small dimensions and in which the joints between the discharge space and the irradiation chamber are less charged.

In a device according to the invention, the ultra-violet rays are generated by an electric discharge which is produced in a discharge space provided in the irradiation space (i. e. the space which may contain the substance to be irradiated) and having an elongated bent shape, for example that of a helix, the wall of the discharge chamber being connected at several points, for example at the ends, to the wall of the irradiation chamber. Due to this construction a slight disparity in expansion of the wall of the discharge chamber and that of the irradiation chamber may occur without the seals being too much charged. The outer wall of the device preferably consists of a material which is not transparent to ultraviolet rays, for example, of glass. This construction, more particularly, affords the advantage that some disparity in the expansion of the walls of the two chambers is allowable,

The invention will be more clearly understood by referring to the accompanying drawing which represents one embodiment thereof given by way of example.

In the drawing, 1 denotes a helically wound tube made of a material which is transparent to ultra-violet rays, for example of quartz. This tube 1 forms part of an electric discharge tube and is connected to electrode spaces 2 and 3 which need not consist of the same material as the tube 1 but may be made for example, of glass. These glass parts have a larger coefficient of expansion than the quartz part 1 to which they may be connected by means of a plurality of rings which are sealed to one another and between the parts 1, 2 and 1, 3 respectively, said rings having different coefficients of expansion. The coefficients of expansion of the rings sealed to the quartz part 1 have the smallest and those of the rings sealed to the parts 2 and 3 have the highest value, the coefficients of expansion of the intermediate rings having values which are the higher the more they are located near the glass parts.

In the electrode-chamber 2 is arranged an incandescent cathode 4, for example an oxide cathode, which is secured to a stem 5 through which pass leading-in wires 6 and 7. Two anodes 8 and 9 mounted in the electrode chamber 3 on a stem 10, are connected to supply wires 11 and 12 and are separated from one another by a screen 13 which is also secured to the stem 10.

The helically wound tube 1 is arranged in a tube 14 which is sealed to the parts 2 and 3 and which preferably consists of a material which is not transparent to utlra-violet rays, for example of ordinary glass. This tube 14, which may contain the substance to be irradiated, is provided with inlet and outlet tubes 15 and 16.

The electric discharge tube constituted by the helically wound tube 1 and by the electrode chambers 2 and 3 contains a certain quantity of metal vapour, for example mercury vapour, to which is added a suitable gas, for example some argon. Due to the presence of an incandescent cathode and two anodes this discharge tube is adapted to be operated by alternating current, a so-called two-phase operation being thus ren-

dered possible. Due to the discharge ultra-violet rays are generated which pass through the quartz wall of the tube 1 to the outside and act on the substance to be irradiated, which is supplied, for example, by the tube 15 and discharged by the tube 16. If the tube 14 consists of ordinary glass, the ultra-violet rays are prevented by this tube from emerging so that there is no risk of the ultra-violet rays acting unfavorably upon the surroundings.

The electrical energy consumed by the discharge tube and the intensity of the ultra-violet light emitted are great due to the fact that by giving the discharge tube a helical shape its length may be made very great, so that the device although possessing a large capacity may have relatively small dimensions.

Another advantage of the device consists in that during operation the seals between the various parts of the device remain better intact than if the tube 1 were straight for in this case the disparity in the coefficients of expansion of glass and quartz would give rise to the risk of the seals becoming untight. In the device according to the invention this cannot be the case as due to the helical shape of the tube 1 some difference in the variation of the length of the quartz tube 1 and the glass tube 14 is possible without the seal being too heavily loaded.

What I claim is:

1. A device for the irradiation of substances with ultra-violet rays, comprising a discharge chamber, an irradiation chamber concentric therewith, the walls of the said last mentioned chamber being connected to the walls of the discharge chamber adjacent the ends thereof, the discharge chamber having the form of a helix.

2. A device for the irradiation of substances with ultra-violet rays, comprising a discharge chamber having a central portion of relatively small cross-section in the form of a helix, means in the said discharge chamber for the generation of ultra-violet rays, an irradiation chamber mounted about and concentric with the said discharge chamber, the walls of the two chambers being joined adjacent the ends thereof, and means for the ingress and egress of the material to be treated into and out of the said irradiation chamber.

3. A device for the irradiation of substances with ultra-violet rays, comprising a discharge chamber having enlarged end portions, a filamentary cathode in one of the said end portions, a plurality of anodes separated by an insulating partition in the other enlarged end of the discharge tube, a portion of small diameter interconnecting the said enlarged ends and forming a tortuous path for the electrical discharge, an irradiation chamber of substantially cylindrical form mounted about and in substantially coaxial relation with the said discharge tube, the walls of the said irradiation chamber being joined to the walls of the said enlarged end portions of the discharge chamber, and means in the said irradiation chamber for the ingress and egress thereto of the material to be irradiated.

4. An ultra-violet irradiating device comprising a discharge chamber having enlarged end portions, electrodes sealed in said end portions, a portion of smaller diameter interconnecting the said enlarged ends and forming a tortuous path for the electric discharge between said electrodes, said portion of smaller diameter having a different coefficient of expansion than said end portions and being joined thereto by a graded joint, an irradiation chamber surrounding said portion of smaller diameter, the walls of said irradiation chamber having the same coefficient of expansion as and being joined to the walls of said enlarged end chambers, and means in said irradiation chamber for the ingress and egress of the material to be irradiated.

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