

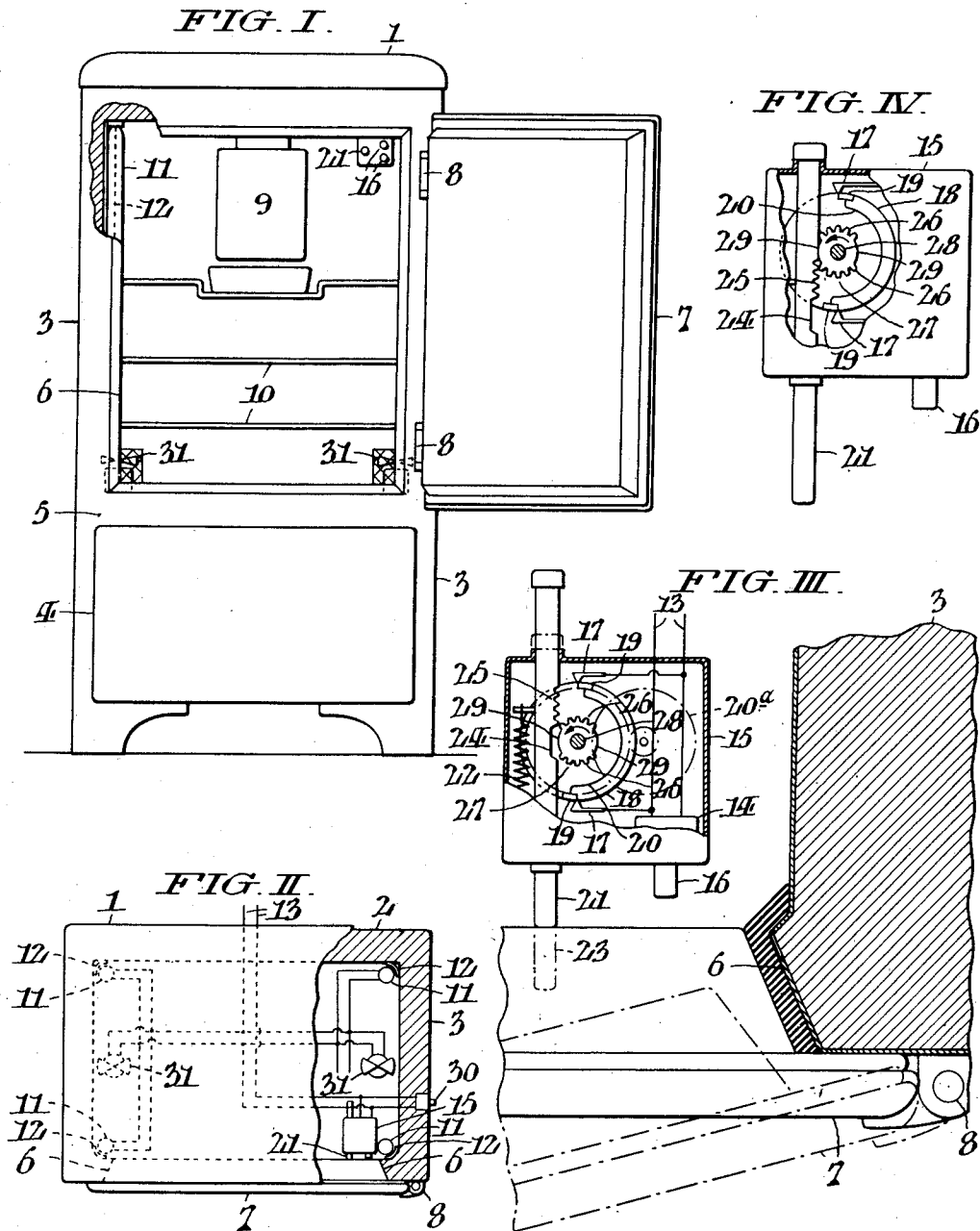
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STERILIZING CABINET

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STERILIZING CABINET

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The object of the invention is to provide improvements in the preservation of food and other perishables, especially for the use and enjoyment by the relatively small entity, such for instance as the individual or family as compared with the larger commercial organizations, and especially in domestic refrigerators, medical and surgical cabinets, and the like.

Another object is to provide such types of cabinets and refrigerators of the so-called domestic type, in which provision is made for taking advantage of the antiseptic or sterilizing effect of ultra-violet rays upon microorganisms, which cause meats, vegetables, fruits, bread, cake and foodstuffs in general to mold, ferment, putrify and even rot, as well as to breed disease bacteria of various sorts, in fact sterilizing to such an extent that the temperature (except possibly for freezing purposes) can be maintained at a higher level, thereby materially lessening current consumption without effecting the degree of food preservation, especially as the current consumed by present-day production of ultra-violet ray tubes and the necessary transformer is relatively insignificant.

It is a known fact that ultra-violet rays can accomplish the results mentioned, but heretofore their use for such purposes has been experimental, and so far as is known, their use has not been developed in such a relatively inexpensive yet efficient manner, as to make such use adaptable for small installations, as represented by the domestic refrigerators above referred to, and also such containers or cabinets as those used by doctors and surgeons for the storage of their instruments and accessories, to say nothing of the somewhat larger refrigerators used by butchers, druggists, hospitals and the like.

A further object is to provide in a device of this type, the combination of a closure, by which access is had to the interior of the chamber or compartment, with one or more ultra-violet ray mechanisms, and means to automatically operate such mechanisms for a predetermined period, following each opening and closing of the said closure; to also provide means for the periodic operation of such mechanism, irrespective of the opening and closing of said closure; to provide means for manually maintaining the operation of such mechanism for as long a period as may be desired, independently of either of said first two means; to provide means, where desired, for the continued operation of said ultra-violet ray mechanism in accordance with one or more physical conditions, such as maintaining its

operation until the temperature and/or the humidity of the compartment has reached a predetermined degree; and whenever desired to also provide means for the circulation and direction of the air within such compartment into the effective zone of said mechanism.

Still another object is to provide a device which, when embodied in a refrigerator, continues to maintain at least a substantially if not a completely sterilized atmospheric condition, when and in the event that the refrigerating mechanism fails to function for a sufficiently long period, as to permit the internal temperature to rise above such a degree as is necessary to insure both refrigeration and suspension of bacterial and/or other organic action, as for instance during periods of defrosting and in such cases as when the refrigerating mechanism fails to function, and until its proper functioning is fully restored.

With the objects thus briefly stated, the invention comprises further details of construction and operation, as hereinafter fully brought out in the following description, when read in conjunction with the accompanying drawing, in which Fig. 1 is a front elevational view of a representative type of cabinet with a portion of one side of the same broken away and representing any type of cabinet, or compartment, to which the invention is applicable; Fig. 2 is a top plan view of the same, partly in section; Fig. 3 is an enlarged fragmentary, horizontal section of adjacent portions of the door and door jamb of such refrigerator, together with an improved closure-actuated switch for operating the ultra-violet ray tubes within such a device; and Fig. 4 is a top plan view, partially in section, showing the switch per se in one extreme position of operation, which is opposite to that shown in Fig. 3.

Referring to the drawing, a domestic size refrigerator is shown as representative not only of domestic refrigerators, but also of cabinets of various sorts to which the invention can be applied, including such cabinets as those used by dentists, physicians, surgeons, druggists, chemists, and the like, for housing substances or articles which it is desired to maintain in as completely a sterilized atmosphere as possible. For purposes of illustration, therefore, the refrigerator illustrated is shown as comprising a top 1, rear and side walls 2 and 3, an enlarged bottom portion 4 within which is contained the refrigerating mechanism, and a frontal portion 5 which comprises inwardly directed flanged portions 6 comprising a door jamb, surrounding an opening

which is adapted to be closed by a suitable door closure 7, mounted upon hinges 8 and leading into a compartment, within which (in the case of a refrigerator) is positioned a so-called freezing unit 9, and a series of shelves or the like 10, upon which latter foods and other materials may be placed for preservation.

Within said compartment and preferably extending substantially vertically in each of the four corners thereof, is positioned any suitable form of ultra-violet ray tube 11, between which tube and the adjacent corner portion of said compartment there is preferably positioned a suitable reflector 12, which may be made of polished aluminum, or such other material as will most effectually reflect ultra-violet rays impinging thereupon from the tube adjacent to such reflector in each case. These several tubes are preferably connected in series in a common circuit terminating in the wires 13 (Fig. 3) which lead to a manually actuatable switch 14 within a suitable housing 15, and from which housing extend the usual "on" and "off" buttons 16. The wires 13 are also connected to brushes 17, which slidably engage the periphery of a disc 18, formed of insulating material and supporting preferably diametrically spaced commutator segments or the like 19, which are connected together by a bus bar 20, and are adapted to be simultaneously engaged by said brushes 17. The disc 18 is arranged so as to be normally rotated by any well-known type of synchronous electric motor 20a, or the like, so that when the door 7 is in normal closed position, the segments 19 will periodically engage the brushes 17, and thereby energize the ultra-violet ray tubes at predetermined intervals, depending upon the spaces between said segments, and for predetermined periods, depending upon the angular extent of said segments.

The housing 15 also supports for longitudinal movement, a rod 21 which has a tendency, under the tension of a spring 22 within said housing, to seek the outermost position indicated by the dot-and-dash lines 23, but from which position said rod is forced inwardly by and upon the closing of the door 7, against the tension of said spring. This rod is provided upon one side with a cut-away portion 24, while at the rear side of which cut-away portion said rod is provided with a series of rack teeth 25, which are adapted to mesh with the two diametrically positioned series of corresponding teeth 26 upon a mutilated gear 27, carried by and secured to the same shaft 28 as that upon which the disc 18 is mounted. Between the series of teeth 26, said gear is provided with plain portions 29, which permit free reciprocation of the rod 21 into the position shown in Fig. 4, when the disc 18 is in the position shown in Figs. 3 and 4.

In the operation of this device, and with the door 7 closed, it is possible to energize the tubes 11 by means of a suitable manually actuatable switch 30, which may be conveniently positioned upon the exterior of the cabinet. When said door is open, it is obvious that said tubes may be energized and de-energized at will by manually actuating the interior switch 16, as well as or in addition to the exterior switch 30, as for purposes of inspection to determine whether or not one or all of said tubes are functioning as intended.

When the door is in normal closed position, the synchronous motor 20 it will be seen from Fig. 3, is free to continuously and steadily rotate

the disc 18, so as to bring the segments 19 periodically into contact with the brushes 17, as hereinbefore described, and thereby energizing said tubes at predetermined intervals and for a predetermined period at each instance. By this operation, the bacteria, mold, fungi and/or other microorganisms, which may develop or leak into the compartment, will be killed by the ultra-violet rays emanating from said tubes, which in such cases are operated for approximately from thirty seconds to two minutes.

As air flows from the surrounding neighborhood into and throughout the interior of the compartment, during each period that the door of such compartment is open, it is desirable to effect an energizing of said tubes immediately upon and following each closing of said door, irrespective of the automatic operation of said tubes under regulation by said synchronous motor. Therefore, the construction shown in Figs. 3 and 4 is such that no matter in what position the disc 18 may be, when the door is open and the rod 21 is shifted outwardly, engagement of the rack teeth 25 with one or the other of the two series of mutilated gear teeth 26, the closing of said door and the return of said rod 21 to its innermost position will serve in each instance to re-set the disc 18 at a predetermined position, such that immediate resumption of the rotation of said disc by said motor will cause the segments 19 and brushes 17 to contact with each other, and thereby energize said tubes as long as each segment and its adjacent brush is in electrical contact, following which the periodic energizing of said tubes will be automatically maintained by said motor.

It is to be understood that the broad idea here presented comprises the use of ultra-violet ray sterilizing tubes (bulbs, or other forms thereof), within a refrigerator or other cabinet, irrespective of whether the operation of said tubes is made automatic, manual, or both, though it should be readily apparent that it is advantageous to provide means for automatically causing said tubes to function immediately following each opening and closing of the door, or other closure for the compartment in which the tubes are positioned, as for instance during a period of from one to five minutes duration, and that it is still more advisable to provide the additional automatic operation of said tubes at predetermined periods, as hereinbefore referred to, even while the compartment is maintained closed for an indefinite period. In addition, if desired, one or more relatively small electrically operated fans 31, shielded within wire cages or the like, may be positioned within said compartment and placed in the same circuit 13 with said tubes, in order that the air within said compartment will be circulated past and within the zones of influence of the respective tubes.

Furthermore, it is to be pointed out that while the sterilizing effect of ultra-violet ray tubes alone may not be equal to the combined effects of such tubes, plus the usual refrigeration temperatures maintained by well-known types of electrically operated refrigerators, having in mind the case of such perishables as foodstuffs and the like, nevertheless in such cases as when the refrigerating mechanism fails to function for such a period that the temperature of the compartment rises above the desired maximum, operation of said tubes alone will continue to restrain, if not actually inhibit, the propagation of the various undesirable microorganisms for a

considerable period, or until the refrigerating mechanism is restored to its proper operating condition.

With regard to the amount of current consumed when ultra-violet ray units are employed, it is pointed out that two present-day tubes (or equivalent bulbs, or the like) and their associated transformer require approximately 25 watts, while in operation. As the tubes are in operation for possibly as much as one hour during each twenty-four, it requires about 40 days to consume one kilowatt, which is considerably less than the current required to operate the ordinary refrigerator unit alone, sufficiently to offset the effective results obtained by operating both ultra-violet ray and refrigerating units together.

Summarizing the effectiveness of the use of violet rays in the preservation of food stuffs, it is well known that most baked goods, and probably all fruits, vegetables, meats and the like, are maintained in their best condition in an atmosphere of relatively high humidity, even as high as 85% to even 100%, but that spoilage of such substances in atmospheres of such high humidity is very pronounced and rapid, especially at temperatures of 55 degrees Fahrenheit and over, whereas ultra-violet rays when properly controlled are effective under such conditions as an inhibitant of most if not all bacteria, fungi and mold, as well as effecting a tenderizing of meats and certain other food stuffs without permitting dehydration or other deterioration of the same over an extended period. Within a suitable food compartment provided preferably with a series of ultra-violet ray tubes, meat that has previously required several weeks for tenderizing can be improved to the same extent in only a few days, especially when the temperature within such compartment is well above that of ordinary refrigeration, and in which case the control of the bacteria, mold, etc., is dependent entirely upon the sterilization effected by the ultra-violet rays, since refrigeration to any material degree is not present. The effectiveness of the present invention, therefore, lies to a large degree in the regular repetition and definite duration of the ultra-violet ray emanation, both in accordance with the operation of the door or doors to such compartment and/or also regularly but independently of such operation, and also, if desired, manually independent of each of said first two mentioned modes of operation. It is furthermore to be understood that the invention broadly comprises the basic principles herein set forth, without being limited to the exact switch and door-actuated means shown in the accompanying drawing and hereinbefore described, as there are many other such devices that can obviously be adapted for use towards attainment of the desired result.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent of the United States is:

1. The combination of a compartment having an opening, a closure for said opening, a refrigerating means within said compartment, an ultra-violet ray auxiliary preserving unit within said compartment, an electrical means to periodically energize said unit while said closure is in closed position, and means operative upon the opening of said closure to positively discontinue

the operation of said energizing means, and upon the closing of said closure to positively reset said energizing means for immediate subsequent operation.

2. The combination of a compartment having an opening, a closure for said opening, an ultra-violet ray unit also within said compartment to sterilize the contents therein, an electric timing mechanism to provide intermittent energizing of said unit, comprising a commutator, a motor to drive said commutator, and reciprocatory means actuated by said closure in opening to arrest said commutator, and movement of said closure also operating to positively reset said commutator for immediate energizing of said unit upon said closure reaching closed position.

3. The combination of a cabinet having a chamber and an opening leading thereinto, a series of compartments in said chamber, an ultra-violet ray tube extending transversely of and common to said compartments, a closure for said opening, a motor-driven timing device to cause said tube to be intermittently energized only while said closure is closed, and means actuated by and upon the opening of said closure to arrest operation of said device and prevent energizing of said tube, and upon again closing said closure positively re-setting said timing device to immediately energize said tube at the beginning of a cycle of operation of said timing device.

4. The combination of a compartment having an opening, a closure for said opening, refrigerating means within said compartment, an ultra-violet ray auxiliary preserving unit within said compartment, electrical motor actuated commutation means with reduction gearing to automatically energize said unit intermittently for substantial periods and thereby continue a food-preserving condition of the atmosphere within said compartment, in the event of failure of said refrigerating means to function, and mechanism automatically actuated by the movement of said closure, to arrest the operation of said commutation means upon opening said closure, said mechanism being positively reset by the movement of said closure, whereby re-closing of said closure permits resumption of the operation of said commutation means so as to continuously function at predetermined intervals beginning with substantially immediate energizing of said unit.

5. The combination of a compartment having an opening, a closure for said opening, a refrigerating unit within said compartment, an ultra-violet ray unit also within said compartment to sterilize the contents therein, an electric switch mechanism for said unit comprising a commutator, a motor to continuously drive said commutator to cause said unit to function intermittently to sterilize the contents of said compartment during each period of operation, and means actuated by said closure upon being opened to discontinue further movement of said commutator, and upon said closure being closed said last-mentioned means operating to positively reset and enable said motor to start the rotation of said commutator and the periodic energizing of said unit.

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