

Nov. 12, 1968

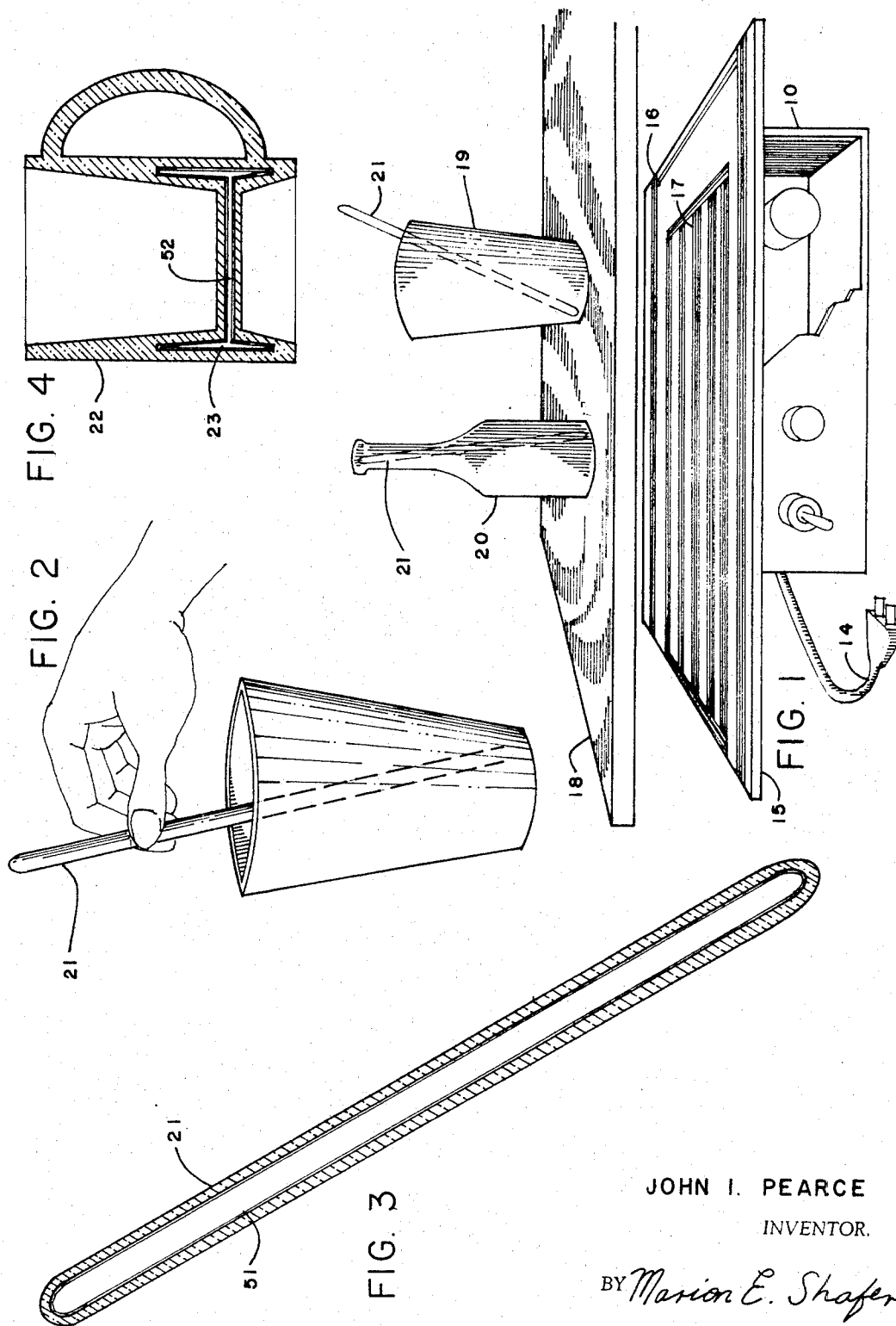
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3,411,003

ILLUMINATED NOVELTY BAR DISPLAY APPARATUS

Filed March 31, 1966

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

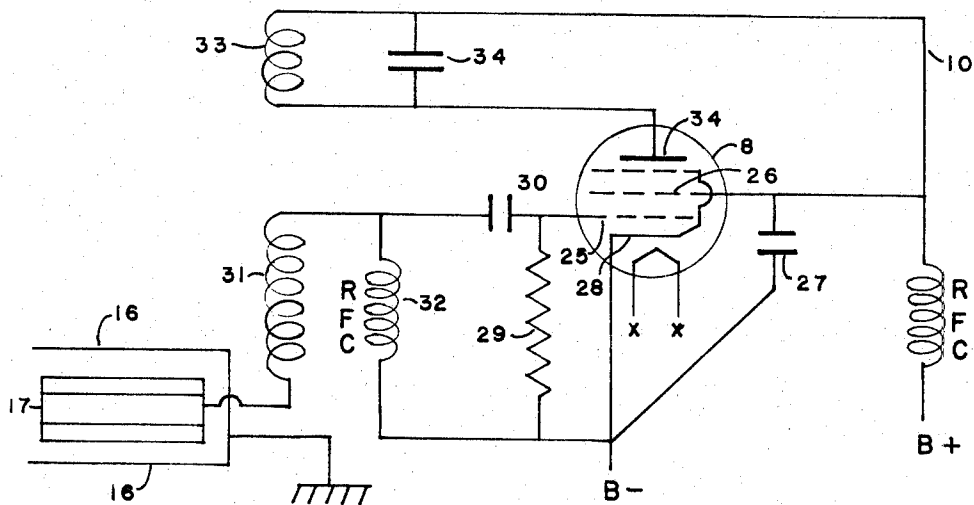


FIG. 5

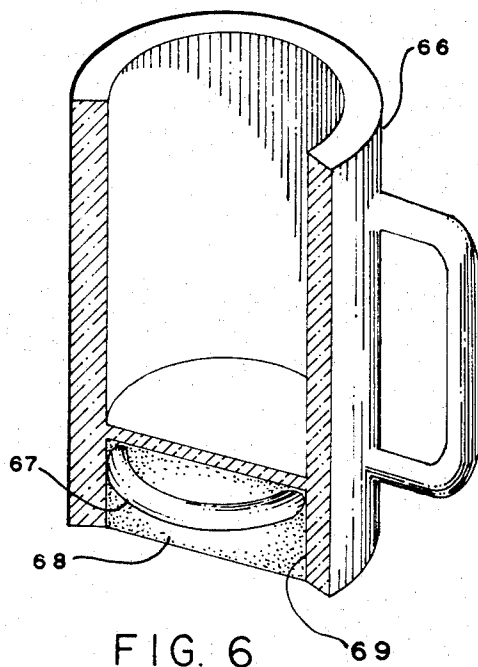


FIG. 6

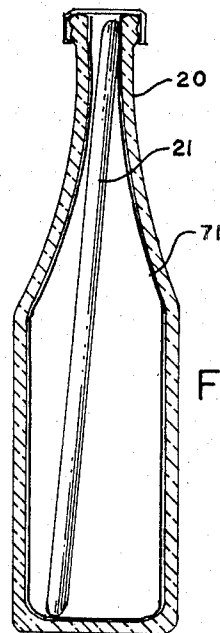


FIG. 7

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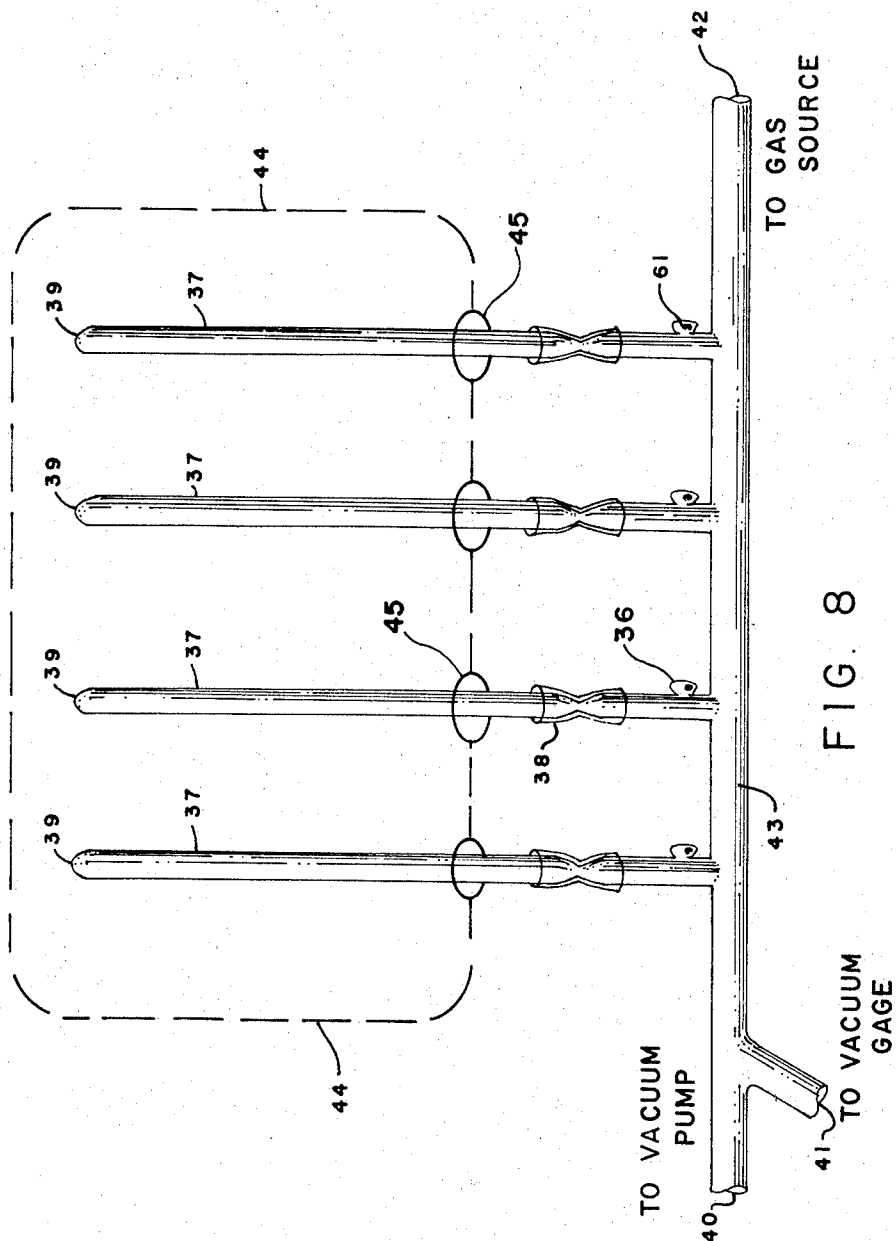
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ILLUMINATED NOVELTY BAR DISPLAY APPARATUS

Filed March 31, 1966

3 Sheets-Sheet 3



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3,411,003 ILLUMINATED NOVELTY BAR DISPLAY APPARATUS

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Filed Mar. 31, 1966, Ser. No. 539,193
6 Claims. (Cl. 250—75)

This invention relates in general to luminescent displays, and more particularly to the type of luminescent display in which translucent or semitranslucent objects placed on a counter or table top are caused to emit fluorescent light by excitation from a concealed source of radio-frequency electromagnetic field. More particularly the invention relates to improved display apparatus in which novelty objects are made to glow as if by magic in a plane perpendicular to the surface on which the object rests and to an improved method of producing the vapor-filled objects that are made to glow on said counter or table top.

Heretofore, displays of fluorescent tubing excited by the presence of electromagnetic fields have taken the form of aggregations of letters spelling the name of a product or other symbolic referents thereto. It is an object of this invention to employ such fluorescent lighting effects to illuminate upstanding objects and dramatize the presence of the product itself.

A variety of "magic fluorescent signs" have been produced in the past in which letters, symbols or indicia are mounted on a background panel but such indicia characters are mounted in very close proximity to the background or mounting panel and lie in a plane parallel to the exciter radiating elements. A common defect of the previously existing methods of fluorescent display signs has been the presence of dark spots or lacunae in the otherwise uniformly distributed glow from the fluorescent glass tubing. Techniques for minimizing and concealing such dark spots exist in the art of fabricating fluorescent tubing for displays actuated by continuous current gaseous discharge, but do not give good results with fluorescent tubes activated by high frequency electromagnetic fields. A prime object of the present invention is accordingly to provide a method of preparation of gas filled objects for fluorescent illumination that minimizes or eliminates the formation of lacunae and discolorations in their illumination when activated by radio-frequency electromagnetic fields.

Another object of the present invention is to provide a device whereby the electromagnetic field capable of activating fluorescent materials is caused to be coterminous with and occupy the plane above and perpendicular to the top of a table or serving bar, so that properly built objects containing fluorescent materials placed upon said table or serving bar shall immediately emit luminescence.

Yet another object of the present invention is to ensure that the intensity of the electromagnetic field in and about the said table top or serving bar is as uniform as possible, so that the luminescence of objects containing fluorescent materials brought within the limits of such electromagnetic field may be as uniformly distributed over the entire length of said objects as possible.

A further object of the present invention is to provide means for the safe and harmless fluorescent illumination of common utensils, beverage containers, and novelty objects including a gas filled swizzle stick which glows as if by magic while the bartender or customer stirs his drink on the bar or table top above the concealed source of radio-frequency electromagnetic energy.

A still further object of this invention is to provide a source of low-frequency radio-frequency electromagnetic energy radiated from antennae and counterpoise array designed to produce a strong electromagnetic field just

above and perpendicular to the plane of the antenna array while confining almost all of the radiated electromagnetic energy within a foot or two of said antenna array.

All the aforementioned objects, together with other objects and advantages not previously set forth, will become more apparent hereinafter by perusal of the following description and the drawings to which it refers, in which:

FIG. 1 is a partially cutaway perspective view of the device of this invention showing the preferred orientation of the display to the source of activating energy.

FIG. 2 is a perspective view of a novel "self-lighting swizzle stick," one of the principal forms of display.

FIG. 3 is a cutaway perspective view of one of the fluorescent swizzle sticks.

FIG. 4 is an orthographic cutaway view of a glass mug showing the structure which renders it capable of fluorescence.

FIG. 5 is a schematic drawing of the electronic circuit for generating the electromagnetic field.

FIG. 6 is a perspective cutaway view of a glass mug showing an alternative structure which renders it capable of fluorescence.

FIG. 7 is an orthographic cutaway view of a fluorescent-lighted beverage bottle.

FIG. 8 is a schematic diagram of the apparatus and method for producing swizzle sticks and objects susceptible of reliable excitation to fluorescence at very low radio frequencies.

In describing the preferred embodiment and method of manufacture of the device of this invention, specific terminology will be used for the sake of clarity. However, this terminology is not intended to be limited only to the terms used herein, and it is to be understood that each such term includes all technical equivalents which operate in a similar manner to accomplish a similar purpose.

Turning now to the specific preferred embodiment of the device of this invention, in FIG. 1 it will be seen to consist of three principal parts or set of parts, to wit:

A radio-frequency energizer 10 complete with an on-off switch 11 and safety power-line fuse 12, equipped with an electric power cord 14 suitable for connection to any standard A.C. electric socket.

A radio-frequency antenna comprised of an antenna array 17 and a counterpoise 16 suitably connected to the electronic circuitry of the energizer 10 in a manner hereinafter described and mounted upon a Masonite board 15 attached to the top of the energizer container.

A variety of gas-filled fluorescent lighted novelty display objects and devices such as swizzle sticks 21, illuminated beverage bottles 20, and illuminated beverage serving mugs 22 and 66.

Radio-frequency energizer 10 together with Masonite board 15 bearing the radio-frequency antenna array 17 and counterpoise 16 is fastened to the underside of a bar or tabletop 18 so that an electromagnetic field may be propagated in the plane of the tabletop and through the surface thereof. As a result, when gas-filled fluorescent objects such as the stirring device shown in FIG. 2 are brought into close proximity of the bar or tabletop, they will glow with a pleasant and subdued light. The color of the light may be made to vary by providing said objects with internal fluorescent coatings of different characteristic light-emission qualities and charging them with rare gases of different elemental properties in various admixtures and concentrations.

The occurrence of this apparently magical phenomenon in connection with objects and containers used in serving beverages will act to concentrate the attention of the patrons on the action of dispensing beverages, thereby

stimulating them to a renewed consciousness of thirst. In addition, the mystifying nature of the agreeable glow will constitute an inexpensive source of entertainment and provoke conversation conducive to conviviality, the which is not least among inducements to patronage of establishments where spirituous liquors are consumed.

FIG. 3 illustrates the fact that although the fluorescent swizzle sticks 21 are hollow their walls are of sufficient thickness to withstand ordinary shocks of being dropped, struck, or employed as stirring devices. It is consequently clear that the employment of said tubes as contemplated in the present invention is devoid of danger to the patrons or users.

Said swizzle stick 21 is fabricated from standard tubing and is provided with a coating of fluorescent material 51 on its interior surface. Said coating 51 can be any of the several commercial preparations in standard use in the neon sign industry except that the coating must be baked and the mixture of fluorescent gases introduced into said swizzle stick in accordance with the procedure or method hereinafter described.

FIG. 4 shows a glass beer mug 22 the interior of the base of which has been provided with a suitable cavity 23, coated with fluorescent material 52, evacuated, out-gassed, charged with rare gases and a drop of liquid mercury, and sealed by the method hereinafter described. Said beer mug as a consequence of such preparation exhibits within its base the phenomenon of fluorescence when placed in proximity of the radio-frequency field.

FIG. 6 shows an alternative structure whereby the base of a beer mug 66 may be caused to emit a fluorescent glow. A fluorescent tube 61 bent into a circular shape with a diameter such that it may snugly fit into the hollowed-out base of the mug 66 is fastened therein by means of epoxy cement 68 or other fastening. When the mug 66 is placed upon the bar 18 the tube 61 will be excited by the electromagnetic field and emit its characteristic glow.

Inasmuch as the presence of a visible circular fluorescent tube in the base of a beverage mug 66 would tend to vitiate the mystifying and novel character of a seemingly magically illuminated object, the fabricator of such a device may well find it desirable to coat the interior of the lower cavity of the mug 66 with an Aquadag or phosphor material, then insert a circular gas-filled tube 67 and secure both the coating and the circular tube 67 in place by filling the cavity with a potting material 67 such as an epoxy resin. The emitted light can be varied in color by changing the coating on the inside of circular tube 67 and changing the blend of rare gases introduced into said tube. In the experiments conducted thus far it has proven difficult to get short circular red tubes to fluoresce reliably. White tubes operate quite satisfactorily and from a purely functional standpoint green tubes work best of all at the excitation frequencies contemplated herein. However, it has been found that green light in a beer mug tends to stimulate a feeling of nausea in the beholder somewhat incompatible with enjoyment of the beer.

FIG. 7 illustrates the structure of a novel beverage display bottle 20. Since it would be difficult to secure a workable amount of fluorescent gas in a beer bottle or beverage bottle the more practical and least expensive means of producing an illuminated beverage display bottle is to introduce a short length of fluorescent-material filled tubing 21 into a translucent or semitransparent beverage bottle 20. As in the case of the circular tube in the base of the beer mug, the visible presence of tube 21 inside beverage bottle 20 would tend to vitiate the illusion of magic illumination, therefore the fabricator of such novelty beverage display bottles will find it desirable to coat the inside of bottle 20 with a semiopaque Aquadag or phosphor coating 71 in order to conceal the internal source of fluorescent light. The color of the emitted light can be varied by the techniques referred to above and the

creation of either white or green lights has proven quite pleasing.

It will be readily apprehended that a great variety of objects may be treated or constructed so as to render them readily fluorescent when placed in the proximity of the field generated by the radio-frequency energizer. It will also be apparent that the preceding description of structures, methods and devices does not exhaust the possible variations therein.

Referring to FIG. 5 the energizing circuit 10 will be seen to be comprised of a single oscillator vacuum tube 8 which may be a 6L6 type, having internally connected beam-forming electrodes (not shown), a control grid 25, and a screen grid 26. The screen grid 26 is connected through a capacitor 27 to the cathode 28 of the tube and the tube heaters $x-x$ are supplied from a small filament transformer (not shown).

Direct current plate power for the prototype of exciter circuit 10 described and illustrated herein was derived from a conventional voltage doubler circuit with the negative side of said power supply connected to the cathode 28, of vacuum tube 8 at the point marked "B—" in FIG. 5 and the positive potential from said power supply connected at the point marked "B+" in said FIG. 5 to provide plate potential.

The grid 25 of the tube is connected to ground by a resistor 29 and also connected through a small capacitor 30 to one end of a tank circuit comprising the secondary coil 31 of a radio-frequency transformer. This same end of the secondary coil is connected to ground by a radio-frequency choke coil 32 which serves to maintain a difference of potential at radio frequency between the radio-frequency transformer secondary and ground.

The radio-frequency transformer also comprises a primary coil 33 which is electromagnetically coupled with the secondary coil 31 by being wound about a common axis therewith. This primary coil 33 is electrically connected between the plate 34 and the screen grid 26 of the tube. Also connected between the plate and the screen grid of the tube, in parallel with the radio frequency primary coil 33 is a capacitor 34 of a value such that in combination with the primary coil it forms a resonant tank circuit having a fundamental frequency of approximately 65 kilocycles per second.

The circuit shown in FIG. 5 and described here is a variation of a standard oscillator circuit modified to force it to oscillate at 65 kilocycles in conjunction with the particular antenna array described herein. Beyond these modifications the oscillator-exciter is in accord with well-known oscillator configurations and any electronic engineer familiar with the art could devise a variety of equivalent oscillator-exciter that could be made to oscillate in the 65 kilocycle range and the choice of vacuum tube and oscillator circuit described herein is intended only as an illustration of one means of securing the desired low-frequency electromagnetic excitation energy.

The other end of radio-frequency transformer secondary coil 31 is connected to rectangular antenna array 17 which is laid out in a flat plane on Masonite board 15. Said rectangular antenna is also enclosed on three sides by counterpoise 16 which constitutes the geometrical boundary of the antenna radiating system and tends to materially limit radiation of the system beyond the perimeter of the Masonite board. Both antenna array 17 and counterpoise 16 are constructed from flat ribbons of conductive materials but could as readily be constructed of wire. These structures are intended to occupy a rectangular plane in a horizontal position described by Masonite antenna-mounting board 15. By designing the oscillator-exciter 10 to operate at a very low frequency with a wavelength several hundred times longer than the longest fluorescent novelty object to be illuminated in its field and arranging the antenna and counterpoise radiating elements in the configuration described the possibility of voltage nodes in the operating field with resultant dark

spots in the fluorescent objects to be illuminated are minimized and the radiated electromagnetic field developed between antenna array 17 and counterpoise 16 is directed upward instead of outward producing a substantially uniform illumination of objects filled with fluorescent materials and rare gases and placed in the electromagnetic field that is concentrated in the area immediately above and normal to the plane of the antenna-counterpoise array.

Counterpoise 16 of said antenna-counterpoise radiating system is connected to the metallic chassis of oscillator-exciter unit 10 but there is no physical electrical connection between the negative side of exciter circuit 10 and the chassis. The chassis is therefore "floating" with respect to the circuit except for the effective capacity between the circuit and the chassis. An alternate path to earth ground may have been provided in the inventor's prototype by the large filter capacitor (not shown) placed between the negative side of a conventional voltage doubler power supply and one side of the A.C. power line 14. There is a possibility that a rectifier power supply with a transformer or equivalent isolated power supply might not have sufficient "capacity to ground" without said filter capacitor connection to the power line to enable the circuit to oscillate and "load up" at 65 kilocycles. If such should prove to be the case, any electronic engineer familiar with the art could connect a large capacitor between the chassis and the power line or earth ground and adjust the value of said capacitance to the extent necessary to cause the circuit to operate properly at the frequency.

In testing early prototypes of this invention the inventor learned that the use of high-frequency radio-frequency excitation for devices illuminated with neon and fluorescent devices produced burn spots in the fluorescent device wherever voltage maxima occurred and dark (blackout) spots where voltage nodes or minima occurred. The generation and radiation of sufficient power at higher radio frequencies in order to illuminate objects in a plane normal to the radiating system proved likely to produce radio interference in excess of the limits thereupon set by F.C.C. regulation. Furthermore, fluorescent illuminated objects excited at higher radio frequencies and formed with standard coatings of fluorescent materials and infusions of rare gases tended to discolor and burn out rapidly.

A solution to some of these problems was found to lie in the use of a very low excitation frequency associated with a wavelength extremely long in comparison to the length of the novelty device or object to be illuminated. 65 kilocycles was found to be the optimum frequency.

At such a low frequency, however, it proved difficult to obtain reliable ionization and fluorescence with standard mixtures of rare gases. Materially improved ionization and fluorescence were found to result at excitation frequencies as low as 40 kilocycles following the introduction of a small quantity of mercury into each fluorescent device and the fabrication of said devices in accordance with the following method, in which the inventor's improved method of manufacturing fluorescent gas-filled objects or devices to be activated by low radio frequencies will be illustrated by the procedure used in the manufacture of swizzle sticks 21 but with the understanding that devices of other shapes or configurations can be manufactured and treated in the same manner.

The novelty devices are cast or formed into the desired shape from translucent material with an interior cavity and a single external opening. The swizzle stick tubes are formed of standard fluorescent display tubing with interior fluorescent coating 51 for various colors already applied which may be purchased as a regular commercial product, prior to being cut into short segments 37 for preparation. In preparing the fluorescent devices for evacuation one end of each of the fluorescent devices or swizzle sticks 37

is sealed and rounded off at point 39 leaving but a single open end. The other end is shaped and inserted into tubulating connector tube 38 and a plurality of said swizzle sticks 37 and tubulating tubes 38 are attached to the successive outlets of clear glass manifold 43.

Just prior to such attachment a single drop of liquid mercury 61 is deposited in each mammilla 36 adjacent to the successive outlets of manifold 43. Care is to be exercised to keep the manifold upright in order that the liquid mercury should not prematurely roll out of the mammillae.

The inlet 42 to the clear glass manifold 43 is connected through a valve (not shown) to a source of rare gases. One of the outlets 40, from manifold 43 connects through a valve (not shown) to a vacuum pump. The other outlet 41 connects to a vacuum gauge.

After these connections have been made a small oven 44 provided with holes in its under side is set over the assembly of swizzle stick tubes 37 in such a manner that the swizzle sticks 37 project into said oven 44 but the manifold 43, tubulating tubes 38, and mercury retaining mammillae 36 remain outside the oven.

A standard vacuum pump (not shown) is started and said oven is simultaneously heated to a temperature of 330° C.

Heating the fluorescent tubes to this temperature drives off as gas those portions of the interior coating thereof which contribute to the existence of dark spots and lacunae in illumination under radio-frequency field excitation. The temperature of 330° C. is not sufficient, however, to appreciably diminish the deposits of fluorescent materials within the tubes.

When the oven has reached a temperature of 330° C., it is shut off while permitting the vacuum pump to continue to run until the temperature in the oven has gradually diminished to 200° C. When this condition obtains, the vacuum pump is shut off and the inlet valve of the manifold 43 is opened to admit a mixture of neon and argon gases. This mixture of gases is permitted to flow until the pressure in the manifold, as indicated by a vacuum gauge, is equivalent to 12 mm. of mercury. At that juncture the manifold is closed off and disconnected from all inlets and outlets, permitted to cool to room temperature and the assembly of swizzle sticks 37 is removed from the oven.

When cool to the touch, the manifold is tilted and rotated in a careful manner so as to induce the drops of liquid mercury 61 to run out of their respective mammillae 36 and fall into fluorescent tubes 37. Each of the said swizzle stick tubes 37 is then sealed as it is severed and withdrawn from tubulating tubes 38 by application of a hot concentrated flame. The completed swizzle sticks or other objects containing fluorescent materials and rare gases will, when processed or treated in accordance with this method give more reliable service over a much longer period of time than would objects prepared in accordance with standard neon manufacturing techniques.

Also, the addition of a very small amount of mercury in each device or object manufactured in accordance with the method described herein produces a fluorescent gas-illuminated with a lowered ionization level such that it can "start" with much less electromagnetic excitation than would be required to illuminate an equivalent neon gas device.

This mercury-induced lowering of the ionization point of the gas in said objects and devices contributes to the unique ability of the apparatus described herein to make fluorescent-gas filled objects luminesce even when standing oriented vertically in a plane at right angles to the plane of the energizing antenna array.

In operation, oscillator-exciter tube 8 and circuit 10 produce a sinusoidal current at an approximate frequency of 65 kilocycles which by flowing in the radio-frequency transformer primary 33 induces a similar current to flow in transformer secondary 31 at a higher voltage. This

voltage is applied to antenna array 17, a rectilinear formation of conductive ribbon oriented in a horizontal plane and situated directly beneath the top of a serving bar or table.

The exciter and rectangular antenna-counterpoise array radiate a low frequency electromagnetic field into the space immediately above the antenna array and adjacent tabletop. This field of electrostatic fluctuation transfers energy to the electron shell structures of certain atoms brought within its boundary. Said atoms emit fluorescent light by re-radiating a portion of the energy acquired from the electromagnetic field in the form of visible light waves. Macrocosmic structures coated with substances comprised of substantial quantities of such atoms will, given certain conditions of pressure and the presence of catalytic agents, emit enough light to appear to be clearly and visibly self-illuminated. In particular, certain common fluorescent substances when coated upon the inside of partially evacuated glass tubing containing small amounts of mercury vapor and rare gases such as neon and argon as described herein will glow with a soft bright light in the presence of the radio-frequency field produced by the exciter part of this device. The color of this light may be varied by varying the chemical composition of the fluorescent coating 51 and the form of the self-illuminated objects contemplated in the present invention may be any of a plurality of drinking and serving utensils found in bars and other establishments where spirituous liquors are sold, as for example, but not restricted to, beverage mugs, highball glasses, stirring rods, beverage display bottles, cocktail shakers, soda water dispensers and the like.

These and other similarly prepared objects would be caused to glow with a pleasant, novel and attractive fluorescent light by being placed upon a serving bar or table top provided with the energizer and radiating devices described herein. Such a glow would be an enticement to consume the beverages dispensed, having effect upon the human mind by the power of social suggestion.

The frequency of 65 kilocycles ensures two distinct advantages to the present invention. First, it is low enough so that the wavelength associated therewith is very long. This ensures that the voltage nodes in the electromagnetic field propagated in the vicinity of the antenna will be few and shallow, inasmuch as the physical size of said antenna is small by comparison with the wavelength of the energy it radiates. The physical length of the fluorescent objects employed in display is even smaller by comparison with the length of the wave exciting them, consequently the intensity of light emission therefrom will tend to be uniform over their entire length. A further advantage of the low frequency generated by this invention is that only a very small amount of the radio energy associated therewith can escape or be radiated to cause interference to radio and television receivers in the vicinity. Even the fifth harmonic of the wave, 325 kilocycles, is well below any frequencies customarily employed for radio communication.

The recited and apparent advantages of the present invention are numerous but among its more important features is its ability to illuminate free-standing fluorescent objects or devices oriented in a plane vertical to the plane of the radiation array and in particular to illuminate and advertise a potable product by attracting human attention directly to the illuminated object or product rather than to indicia or symbolic media of communication. It is susceptible of application to a great many different forms of objects. It is safe and harmless in operation, and requires no training to use. By variations in the color of light produced, it is capable of exercising subtle psychological effects upon consumers, and of enhancing the attractiveness of certain products.

By comparison with other devices of similar nature it provides for a more uniform glow of light from its display, and eliminates ugly and objectionable dark spots in the self-illuminated objects and articles. It produces

much less radio-frequency interference signal than similar devices heretofore.

It is to be understood that the form of the invention shown and described herewith is only a preferred embodiment. Various changes may be made in the size, shape, arrangement of parts, form of items in the display, power-generating capabilities and the like. For example, the oscillator tube might be multiple rather than single, or of a type producing greater output of current. Rather than a tube, the oscillator might be a semiconductor device or devices. The method of preparation of the fluorescent objects might vary in procedure or with respect to the chemicals, techniques, and devices employed therein. The shape of the antenna might be circular rather than rectangular or be oriented in a vertical plane behind a shelf of bottles. A different arrangement of circuit elements and a substitution of equivalent parts and elements might be made. All such changes and variations in the preferred embodiment herein described might be made without departing from the spirit or scope of the invention. For this reason, the above description should be considered as illustrative and not as limiting the scope of the following claims.

Having thus described my invention, I claim:

1. Illuminated novelty display apparatus adapted to illuminate upstanding fluorescent gas-filled objects comprising:

- (A) a radio-frequency energizer having
 - (1) at least one electronic control device such as a vacuum tube in
 - (2) an oscillator circuit configuration adapted to oscillate at very low radio frequencies;
- (B) a rectangular antenna-counterpoise array adapted to rest in a horizontal plane and radiate electromagnetic energy in a plane at right angles to the plane of the array;
- (C) Means for mounting said antenna-counterpoise array under a horizontal surface such as a tabletop;
- (D) Novelty and display objects
 - (1) fabricated from semitranslucent material
 - (2) said objects provided with an internal cavity
 - (3) said cavity coated with a fluorescent material, and
 - (4) containing a mixture of neon and argon gas and a minute quantity of mercury, such that said objects and display devices are capable of fluorescent illumination when placed in a low frequency electromagnetic field.

2. The illuminated display apparatus described in claim 1 except that the novelty device is a swizzle stick which is provided with a longitudinal cavity, including a coating of fluorescent material adhered to the walls of said cavity and a mixture of fluorescent gases and a minute quantity of mercury confined in said cavity.

3. The illuminated display apparatus described in claim 1 except that the novelty device is a beverage mug provided with a cavity in the base of said mug; the interior surface of said cavity being provided with a coating of fluorescent material and a mixture of fluorescent gases and a minute quantity of mercury confined in said cavity.

4. The illuminated display apparatus described in claim 1 except that the novelty device is a beverage mug provided with a recess in the base of said mug; the interior surface of said recess being coated with a semiopaque phosphor material; a circular fluorescent gas filled tube secured in said recess with an epoxy material and a mixture of fluorescent gases and a minute quantity of mercury confined in said cavity.

5. The illuminated display apparatus described in claim 1 except that the novelty device is a beverage bottle having a coating of semiopaque phosphor material on the interior surface of said bottle; and a short fluorescent tube concealed within the bottle; said tube having a coat-

ing of fluorescent material on the interior surface of said tube and a mixture of fluorescent gases and a minute quantity of mercury sealed into said tube.

6. An improved method of preparing fluorescent illuminated free standing novelty and display devices adapted for extended use in low radio-frequency electromagnetic fields, said improved method comprising the steps of:

- (A) cutting and shaping the fluorescent novelty device to the desired shape from translucent material while preserving an internal cavity; 10
- (B) preparing the device for evacuation by sealing all but one opening; 10
- (C) coating the walls of the interior cavity of the device with a coating of fluorescent material in those cases where the devices is fabricated from material other than standard precoated neon tubing; 15
- (D) inserting the open end of the novelty device into a tubulating connector tube; 15
- (E) depositing a drop of mercury in mammillae recesses near each of the opening of the successive outlets of a manifold having a plurality of upright outlet tubes; 20
- (F) connecting a fluorescent device and tubulating tube to each of the outlets on said manifold; 25
- (G) lowering a small special oven over the manifold so that the plurality of fluorescent devices project through a plurality of openings in the bottom of the oven sufficiently to cover the devices but excluding the tubulating tubes and the mercury-retaining mammillae; 30
- (H) connecting one end of the manifold assembly to a source of rare gases through an inlet valve;
- (I) connecting the other end of said manifold assem-

- bly through a valve to a vacuum pump and a vacuum gauge;
- (J) starting the vacuum pump and heating the oven to a temperature of 330° C.;
- (K) shutting off said oven after a temperature of 330° C. has been attained while allowing the vacuum pump to continue to run;
- (L) cutting off the vacuum pump when the temperature in the oven falls to 200° C.;
- (M) opening the inlet valve to the manifold to permit a mixture of neon and argon gases to flow into the devices until a pressure of 12 mm. of mercury in the devices and the manifold is indicated on the vacuum gauge;
- (N) closing off all manifold inlet and outlet valves;
- (O) disconnecting the manifold from all inlets and outlets and allowing the manifold and attached devices to cool to room temperature;
- (P) tilting and rotating the manifold and attached devices to cause the liquid mercury to run out of their respective mammillae and fall into each of the attached fluorescent devices; and
- (Q) severing and flame-sealing each fluorescent device as it is cut loose from its tubulating tube.

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