April 16, 1946. C. E. SHORT ET AL 2,398,471

POWER UNITS FOR AMUSEMENT DEVICES AND THE LIKE

Filed May 15, 1945 2 Sheets-Sheet 1

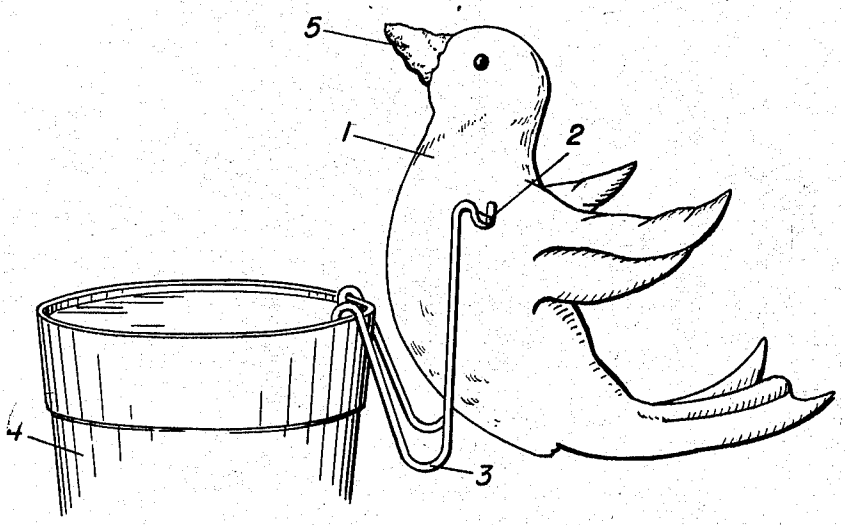


FIGURE 1

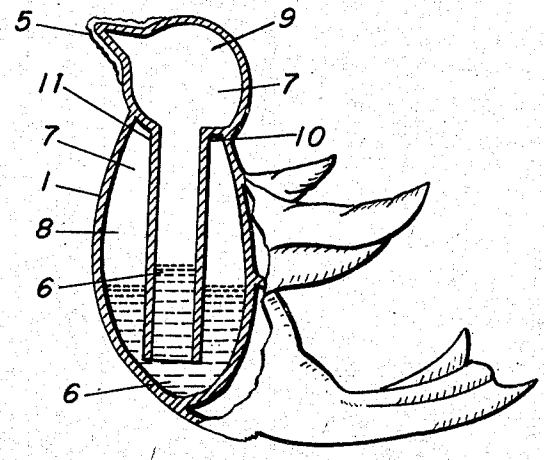


FIGURE 2

Edward M. Brown, Jr.
Charles E. Short

INVENTORS

BY Ernest M. Symmes

ATTORNEY

April 16, 1946. C. E. SHORT ET AL 2,398,471

POWER UNITS FOR AMUSEMENT DEVICES AND THE LIKE

Filed May 15, 1945 2 Sheets-Sheet 2

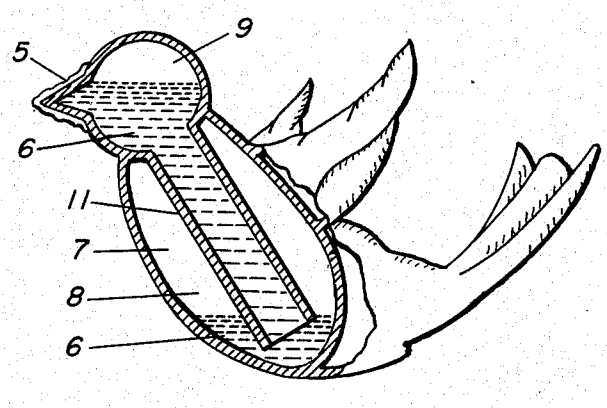


FIGURE 3

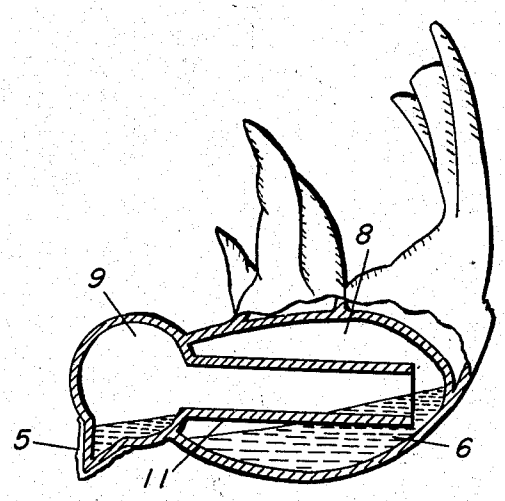


FIGURE 4

Edward M. Brown, Jr.
Charles E. Short
INVENTORS

BY Ernest M. Symmes
ATTORNEY

Patented Apr. 16, 1946 2,398,471

UNITED STATES PATENT OFFICE

2,398,471

POWER UNIT FOR AMUSEMENT DEVICES AND THE LIKE

Charles Elliott Short and Edward Madison Brown, Jr., Wilmington, Del.; said Brown assignor to said Short

Application May 15, 1945, Serial No. 593,836

2 Claims. (Cl. 46—124)

This invention relates to a power unit for amusement devices, toys, and the like and means to actuate the same.

Moving toys, and the like, are usually equipped with motive power in the form of electrical, spring-operated or gravity-operated motors. These require a spring, a battery, or hand re-setting. Spring or gravity-operated toys operate for only a short period of time before requiring re-setting. Battery-operated toys are expensive to operate.

The object of this invention is a device, operated solely by the heat of the surroundings, which is entirely self-contained and requires no adjustment, operates with greater force and reliability than those heretofore known, over long periods of time, and requires no resetting, rewinding, or battery.

Our invention may be utilized for operating all sorts of light power devices, where reliable movement, not requiring manual attention, is needed. An example of our invention is shown in Figures 1 to 4 of the accompanying drawings, although we do not limit ourselves to the particular form there shown.

Broadly, our invention comprises the provision of a supply of a volatile liquid, a vapor space above said liquid, into which vapor space heat flows from the surroundings, acting to expand said vapor, a tube reaching nearly, but not quite, to the bottom of the pool or liquid, up which tube the liquid in the pool is forced, to flow into an upper chamber which is cooled, for example by evaporation of water or other liquid. As the liquid fills the upper, cooled chamber, the balance of the device, resting upon hinges or pins, for example, is altered by the weight of the liquid in the upper chamber, and the device as a whole tilts on the hinges or pins, thus uncovering the bottom of said upright tube and allowing the liquid in the upper part of the device to flow back down the upright tube to the lower part of the device, whereupon the cycle is repeated.

In the accompanying drawings,

Figure 1 represents one embodiment of our invention, in the shape of a bird resting upon a wire support, the latter being fastened to the rim of a vessel containing water. Normally, the bird remains upright, at first, then gradually leans over toward the water in the vessel, finally dipping its beak into the water, then almost immediately resumes the upright position. This cycle is repeated every few seconds, constantly and reliably.

Figure 2 represents a vertical section of the device of Figure 1 in the upright position. Figure 3 represents a vertical section of the same device as it begins to tilt forward, and Figure 4 is a vertical section of the device as the liquid has returned to the lower chamber of the device and the device is about to re-assume the upright position shown in Figures 1 and 2.

In the device according to our invention we allow heat from the surroundings to pass into the body of the device and expand the vapor therein, to cause a slightly elevated pressure. This pressure acts upon the liquid beneath said vapor, forcing the liquid upward, through the central tube shown, into the upper chamber. The upper chamber is maintained at a slightly lower temperature than the lower chamber, so that the pressure in the upper chamber is slightly less, thus allowing the liquid to rise into the upper chamber. When the liquid reaches the upper chamber, the weight of the liquid in the upper chamber unbalances the device, suspended on pivots, and the device tilts forward to a substantially horizontal position, allowing the liquid and vapor in the two chambers to equalize and run together, most of the liquid then finding its way back to the lower chamber and tilting the device back to the upright position, whereupon the cycle is repeated.

As means for reducing the temperature of the upper chamber below the temperature of the lower chamber we utilize the heat removed by evaporation of water or other volatile liquid from an absorbent material attached to the upper chamber.

As material of construction of our device we may use, for example, a material not attacked or dissolved by volatile liquids, such as glass or sheet metal, but we prefer glass for strength and ease of tight sealing. Where other shapes or designs of toys and the like are desired, we may construct the operating means of glass and enclose the same, except for the cooling means, in stamped or shaped metal casings.

We find it advantageous or necessary, depending upon the liquid we employ in our device, to exhaust most of the air from our device, so that the vapor therein will not be diluted by fixed gases.

As liquid in our device we preferably use a volatile liquid, such as methyl alcohol, ethyl alcohol, ethyl ether, acetone, chloroform, methylene chloride, or the like. After placing the desired quantity of volatile liquid in the device, we exhaust the air remaining in the device through a tube still attached to the device, then seal off

the device by fusing said tube while still connected to the exhausting means.

Referring now particularly to Figure 1 of the accompanying drawings, 1 represents the body of the moving toy or like device, 2 represents a pin or hinge fastened to said body, 3 a support or cradle for said device, upon which the device rests by pin 2, and which support, in turn, rests upon the rim or edge of a container 4, almost full of water or other volatile liquid, 5 an absorbent material, for example cotton wool, normally wet with water or other volatile liquid and from which the water or other volatile liquid evaporates.

In the vertical section, Figure 2, 6 represents the volatile liquid contained in the device, 7 the volatile liquid vapor above said liquid, 8 the lower chamber of the device, 9 the upper chamber of the device, sealed off from said lower chamber at the neck 10, except through upright tube 11, which reaches nearly to the bottom of lower chamber 8.

In the vertical section, Figure 3, heat from the surroundings has entered lower chamber 8, expanded vapor 7 therein and caused said vapor to exert pressure on liquid 6, to force liquid 6 up the upright tube 11 into upper chamber 9, into which the liquid will flow because of a lower vapor pressure in upper chamber 9, due to the cooling by evaporation of volatile liquid from absorbent material 5. The device is now overbalanced by the weight of liquid in upper chamber 9 and near absence of liquid in lower chamber 8, and tilts over to the substantially horizontal position represented in Figure 4, whereupon the lower end of upright tube 11 is uncovered by the liquid, vapor pressures between upper chamber 9 and lower chamber 8 equalize, and liquid 6 flows back from upper to lower chamber, the weight of the liquid thus returned to lower chamber 8 again altering the balance of the device and causing the device to assume the upright position represented in Figures 1 and 2.

As the device assumes the substantially horizontal position shown in Figure 4, absorbent material 5 on upper chamber 9 dips into the water or other volatile liquid contained in vessel 4, and the supply of cooling liquid on upper chamber 9 is replenished.

Our device, according to our invention, is in no way dependent upon delicate balance, nor in any way dependent upon weight of condensed liquid to cause operation, as are certain prior art devices, such as that disclosed in U. S. Patent 2,240,906. On the contrary, in the device according to my invention there is physical movement of original, uncondensed liquid, caused by a slight difference of vapor pressure between upper and lower chambers. A relatively considerable quantity of liquid is thus transferred, resulting in absolutely reliable operation, due to the considerable weight of such liquid, instead of the very small quantity of condensed liquid in prior art devices.

It will be noted that, in the device according to our invention, no delicate adjustments, or sliding, balancing weights are required, and no knife edges for the support. In fact, no means of balancing, after manufacture, are necessary.

Although we have shown, by way of example of our invention, a device in the shape of a bird on the edge of drinking fountain, we do not limit ourselves to this particular embodiment, but may utilize our invention in the form of any rocking or tilting device desired, large or small, or to furnish power to operate other devices, such as movable signs, bells, lights, or even hydrostats or psychrometers, since we have found that the device according to our invention has a period of operation dependent upon the relative humidity of the atmosphere at a given temperature.

We claim:

1. A self-contained power unit comprising an evacuated chamber divided into lower and upper compartments, said upper compartment having at one side thereof a horizontally-projecting portion freely communicating with said upper compartment, a tube extending from said upper compartment to near the bottom of said lower compartment, pivot pins attached to the side of said lower compartment, the power unit resting upon a support by said pivot pins in such manner as to tilt, said lower compartment being partly filled with a low-boiling liquid to such extent that when said power unit assumes an approximately horizontal position the bottom of said tube is uncovered by said liquid and the said liquid enters said projecting portion of said upper compartment, and means to cool said upper compartment.

2. A self-contained power unit in accordance with claim 1, in which the low-boiling liquid is methylene chloride.

CHARLES ELLIOTT SHORT.
EDWARD MADISON BROWN, JR.