Nov. 17, 1953 C. F. MASSOPUST 2,659,215

METHOD OF MAKING POWER UNITS FOR AMUSEMENT DEVICES

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Fig. 1.

Fig. 3.

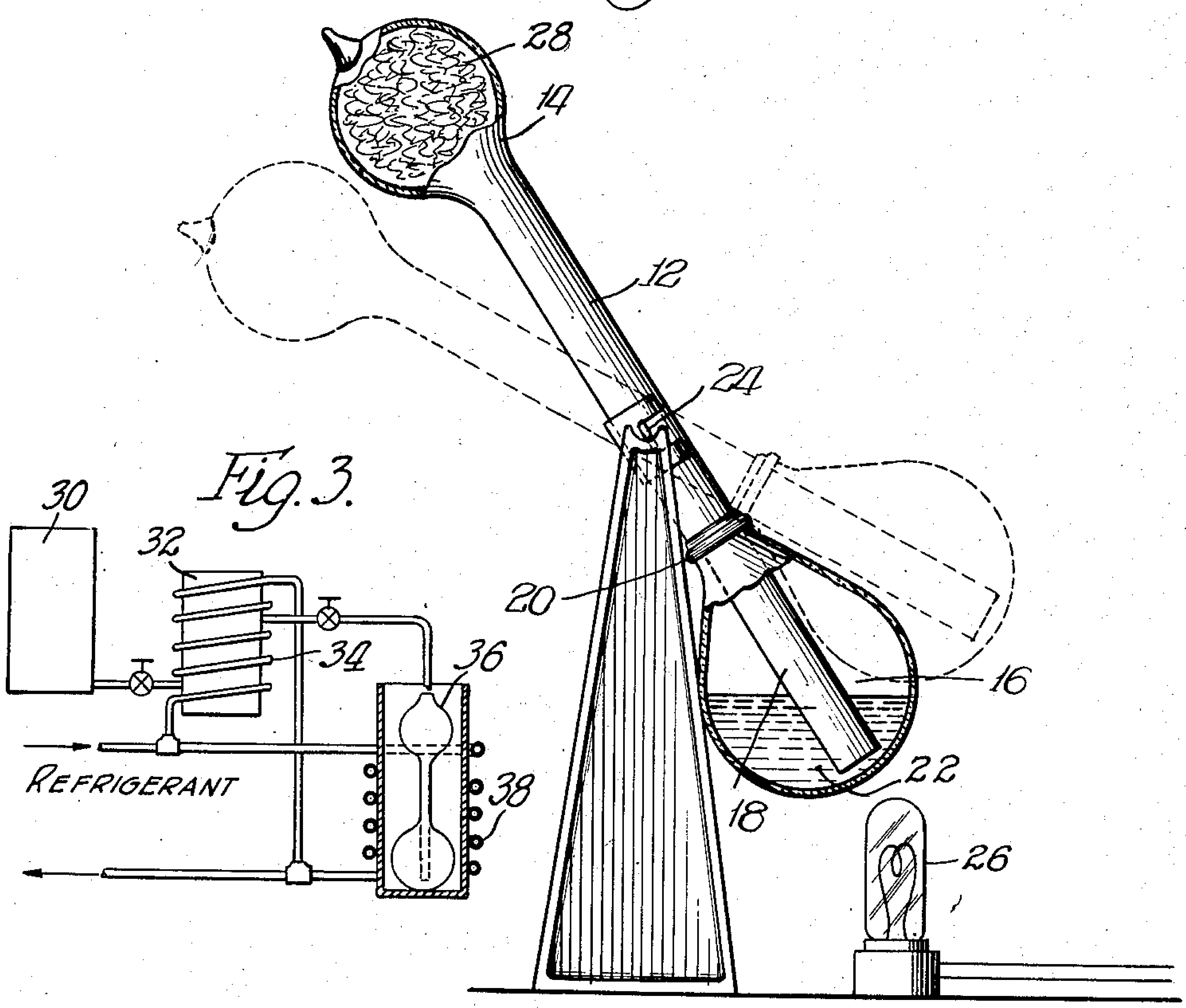
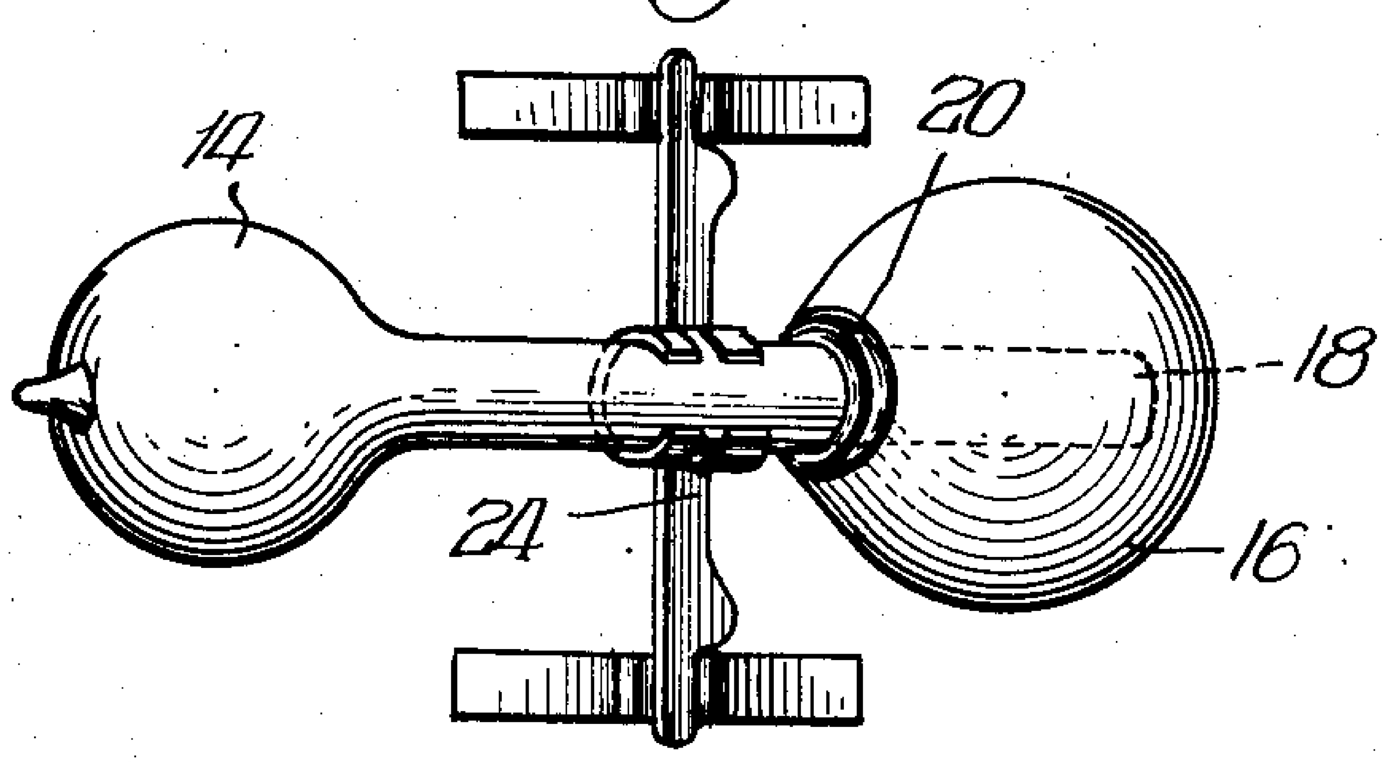


Fig. 2.



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METHOD OF MAKING POWER UNITS FOR AMUSEMENT DEVICES

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1 Claim. (Cl. 62—170)

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The present invention relates to thermodynamic motors and the method of making them.

Motors of this type have been made in a wide variety of shapes and sizes and are capable of many uses. They have been relatively expensive to make and require a certain amount of handwork and skill. This is largely due to the fact that the air in the unit must be evacuated before the liquid is sealed into it.

One type of thermodynamic motor to which the present invention is applicable consists of a hollow member having an upper and lower chamber with a tube connecting the two chambers and extending into the lower chamber. The member has a volatile liquid sealed in it and it is provided with a pivotal mounting so that one chamber may overbalance the other to produce an oscillating movement. Heretofore, the liquid used has generally been methylene chloride or other liquid capable of existing at the same time as a liquid and a gas at any given pressure and which will boil at room temperature at a pressure less than atmospheric. Methylene chloride boils at about 20° C. at 1 atmosphere and, in order to make the unit function properly at general room temperatures, it is necessary to evacuate the unit to about 26 inches prior to sealing the methylene chloride in it. This, in effect, reduces the boiling point of the liquid, as well as removes the air from the unit. This operation is expensive and requires skill.

It is, therefore, an object of the present invention to provide a thermodynamic motor which will operate at room temperatures and which contains a liquid that boils at a pressure in excess of 1 atmosphere.

It is another object to provide a thermodynamic motor which need not be evacuated prior to sealing the liquid in the unit.

It is a further object to provide a motor that may be made with a minimum amount of skill and expense.

It is another object to provide a motor of this type which will operate at relatively low ambient temperatures.

With these and various other objects in view, the invention may consist of certain novel features of construction and operation as will be more fully described and particularly pointed out in the specification, drawing and claim appended hereto.

In the drawing, which illustrates an embodiment of the invention and wherein like reference characters are used to designate like parts—

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Figure 1 is a side elevation of the device showing it in an upper position in full line with part of the wall of the lower chamber broken away and showing it in a lower position in broken lines; and

Figure 2 is a top plan view of the device shown in Figure 1.

Figure 3 is a diagrammatic representation of one form of apparatus which may be utilized to carry out the method which is the subject matter of this application.

The device shown in the drawing is one of the simplest types and is shown for the purpose of facilitating the explanation of the theory of operation of the thermodynamic motors of the general type under consideration.

A hollow member designated as **12** consists of an upper chamber **14** and a lower chamber **16**. A connection between the chambers consists of a tube **18** which extends into the lower chamber and is spaced from the wall thereof. At the point where tube **18** enters the lower chamber **12** indicated at **20** there is an airtight connection. As shown in the full line position in Figure 1, all of the liquid **22** is in the lower chamber. With the unit in this position and where there are no outside influences, the vapor pressure in both chambers is the same. If, however, the temperature of the lower chamber is raised as by a heating element such as the light bulb **26** which may be disposed adjacent said chamber or the temperature of the upper chamber is lowered as by evaporation of liquid from the moisture retentive material **28** which may be disposed on the outer surface thereof (or if the temperature of both the lower chamber is raised and the upper chamber is lowered), the vapor pressure in the lower chamber will be greater than in the upper chamber and, consequently, the liquid in the lower chamber will move to the upper chamber.

After a certain amount of liquid has moved from the lower chamber to the upper chamber, it will overbalance the lower chamber and the unit will pivot on the mounting **24**. The amount of fluid in the upper chamber required to overbalance the lower chamber will depend upon the position of the pivot point, and it may be altered accordingly.

With the unit in the position shown in broken lines in Figure 1, the end of connecting tube **18** is no longer below the surface of the liquid in the lower chamber. This is caused by the lowering of the liquid level in the lower chamber when some of it moves to the upper chamber and by the change in position of the surface of the liquid with respect to the end of the tube caused by the upper chamber overbalancing the lower. The lower end of tube 18 no longer being blocked by the fluid, the higher vapor pressure in the lower chamber will cause vapor to move to the upper chamber until the pressure is equalized. In this condition, the liquid in the upper chamber will flow by gravity through tube 18 back to the lower chamber and the lower chamber will then overbalance the upper chamber completing the cycle.

The action of the unit is dependent only upon a pressure difference in the two chambers. The temperature change, however, induces the pressure differential.

It is contemplated for the present invention that the unit contain a liquid which will cause it to operate at room temperature as above described without the unit first being evacuated or the pressure reduced to below atmospheric. An example of such a liquid is dichloromonofluoromethane which boils at about 10° C. at 1 atmosphere. It is, therefore, unnecessary to evacuate the unit when this material is used since it will boil at less than room temperature without having a condition of reduced pressure.

In filling a unit with dichloromonofluoromethane, as shown in Figure 3 the material may be passed from a pressure tank 30 in which it is supplied to a chilled expansion chamber 32 where it is maintained in a liquid state at atmospheric pressure at a temperature of about 0–5° C., by the refrigerating coil 34. The chilled liquid is then measured and passed into a chilled motor unit 36, which is originally maintained at substantially the same temperature as the chilled liquid by the refrigerating coil 38. The cooling may be accomplished by using melting ice, brine or refrigerating coils as shown here, or by any other suitable means. After the measured amount of the material is in the unit, the temperature of the material is allowed to rise slightly. Boiling then occurs and the vapors from the material purge out most of the air. The unit may then be sealed. Other materials

having the required characteristics could be used, including those having an even lower boiling point.

The invention is not to be limited by the exact embodiment and method described and shown, which is merely by way of illustration and not limitation, as various other forms, materials and variations in the method will be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claim.

I claim:

A method of filling a thermodynamic motor consisting of passing a liquefied gas having a boiling point below room temperature from a pressure tank into an expansion chamber chilled below room temperature, passing a measured amount into a hollow member chilled below room temperature from said chilled expansion chamber, permitting the temperature of the liquid in said hollow member to rise until it boils, boiling the liquid until the vapor therefrom purges most of the air from the member, and sealing said member.

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