Aug. 21, 1956 J. B. TIGRETT ET AL 2,759,245

PROCESS FOR MAKING POWER UNITS FOR AMUSEMENT DEVICES AND THE LIKE

Filed Aug. 20, 1954

2 Sheets-Sheet 1

Fig. 1

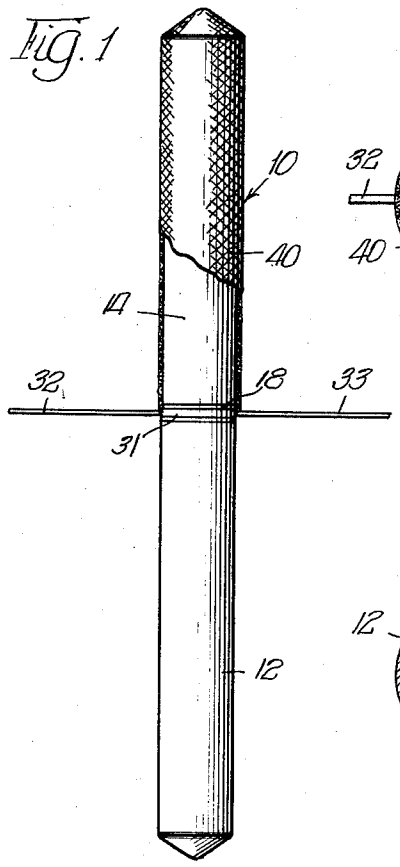


Fig. 3

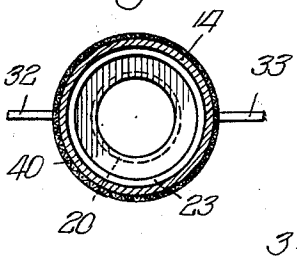


Fig. 2

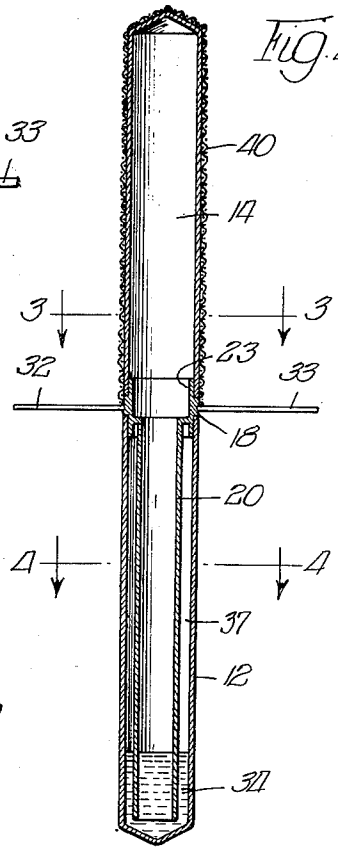


Fig. 4

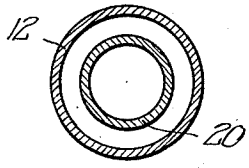


Fig. 6

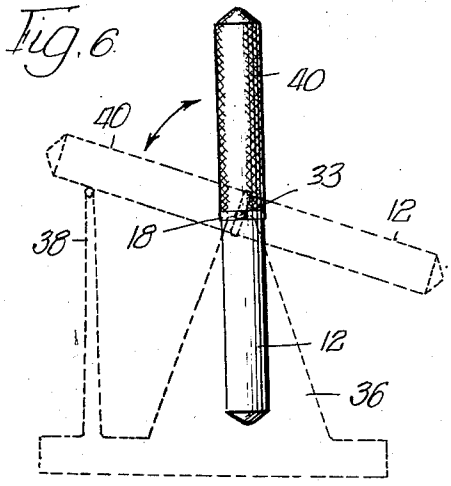
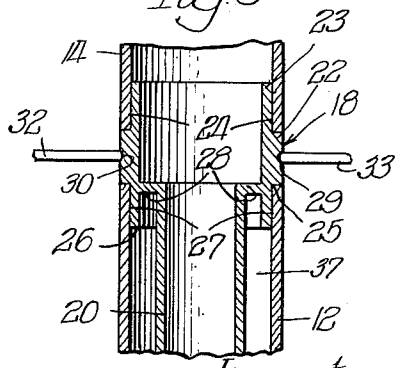


Fig. 5



Inventors.
John B Tigrett,
William B Greenlee,
BY Wilkinson, Huxley, Byron & Hume
Attys.

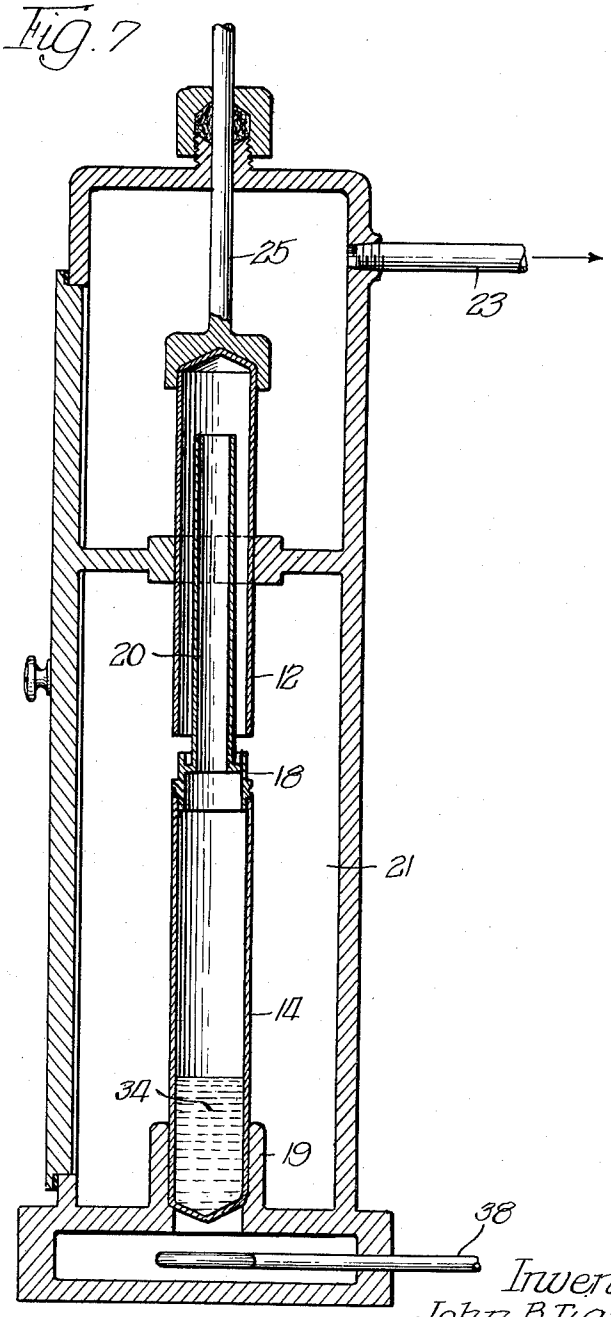
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2 Sheets-Sheet 2

Fig. 7



Inventors.
John B. Tigrett,
William B. Greenlee,
BY Williamson, Heesley, Byron & Hume
Attys.

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PROCESS FOR MAKING POWER UNITS FOR AMUSEMENT DEVICES AND THE LIKE

John B. Tigrett, Jackson, Tenn., and William B. Greenlee, Downey, Calif., assignors to Tigrett Industries, Inc., Jackson, Tenn., a corporation of Delaware

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3 Claims. (Cl. 29—156.4)

This invention relates to a process of manufacturing power units for amusement devices. More particularly, it relates to the method of manufacturing a thermal motor which may have the main elements thereof constructed of metal, adapted for use on a commercial scale.

Heretofore, thermal motors have been built in their main parts of glass or other similar materials which are highly frangible. Since it is difficult to manufacture a uniform product from such materials, the testing of each completed unit has normally been required. This is a procedure necessitating the exercise of considerable skill. Commercial production of this type of thermal motor has, therefore, been somewhat impractical in the past, despite the numerous applications which have been discovered for such motors.

The use of metal rather than glass for such motors is, therefore, desirable but the maintenance of a proper temperature differential between the several parts of the motor has been rendered difficult by the ease with which heat is conducted through most metals, as well as the fact that most metals have a lower coefficient of heat absorption than glass.

It is, therefore, an object of the present invention to provide a process of manufacturing a thermal motor possessing great efficiency in operation, whose principal parts may be formed of aluminum or other suitable metal substance, and which shall be tough and substantially shatter-proof.

Another object of the present invention is to provide a process of manufacturing a metal thermal motor which may be adapted for mass production techniques, and which nevertheless can be given characteristics sufficiently uniform so as to obviate the necessity for individual testing.

Another object is to provide a process for manufacturing a thermal motor of a type which, although made of metal, will readily maintain a temperature differential between the working chambers thereof.

Further objects and advantages of this invention will become evident as the description proceeds and from an examination of the accompanying drawing which illustrates one embodiment of the invention and in which similar numerals refer to similar parts throughout the several views.

In the drawings:

Figure 1 is a side elevation illustrating one embodiment of a product of the present invention.

Figure 2 is a view in vertical cross-section of the device shown in Figure 1.

Figure 3 is a view in horizontal cross-section of a portion of the device shown in Figure 2, the view being taken along line 3—3 of that figure.

Figure 4 is a similar view in horizontal cross-section, the view being taken along the line 4—4 of Figure 2.

Figure 5 is an enlarged fragmentary view of a portion of the device shown in Figure 2, showing the sealing member in greater detail.

Figure 6 is a side elevation illustrating by means of a dot-and-dash representation the operation of the device on a suitable support and stop means, shown in dotted lines; and

Fig. 7 is a somewhat diagrammatic representation of an apparatus suitable for making a motor as described.

Referring now to Fig. 1, a power unit is shown therein indicated generally by the numeral 10, which unit is in the form of a thermal motor embodying one form of product of the present invention. The motor 10 is preferably formed of three distinct elements, two of which are the hollow chamber members 12 and 14. These two members in the preferred form of the device may be made of a suitable metallic substance, such as aluminum. An annular sealing member 18 is provided which is adapted to form a connecting seal between the chamber members 12 and 14, as best shown in Fig. 5. This member 18 also has a tube 20 extending downwardly therefrom which is preferably formed integrally therewith, but which conceivably could be adapted to be threadedly received therein or secured in any like manner. This tube 20 is adapted to be received within the chamber member 12 when the device is completely assembled, as shown in Fig. 1.

The sealing member 18 has an annular shoulder 22 formed thereon in spaced relation to the end 23. The chamber member 14 is adapted to receive the end 23 of the sealing member 18 within its open end 24 so that the shoulder 22 is brought into abutment with the end 24.

A similar shoulder 25 is provided adjacent the opposite end 26 of the sealing member 18, this latter end being adapted to be received within the opening 27 of the chamber member 12 in substantially the same fashion. The elongated tube 20 is of slightly smaller diameter than the central portion of the sealing member 18 just described, and is joined to the latter by a flange 28, as shown in Fig. 5.

The portion 29 of the sealing member 18 which is disposed between the shoulders 22 and 25 may have a suitable groove 30 formed therein adapted to receive the common spring clip portion 31 of the pivot shafts 32 and 33 which are thus disposed on diametrically opposite sides of the motor 10. The dimensions of the various elements described can be designed so that the pivot shafts 32 and 33 are disposed at the appropriate balance point of the entire motor so that when the latter is supported on these pivot shafts, it will be disposed in the normal operating position.

Of course, as an alternative form of construction, bosses, recesses, or protrusions could be formed integrally in the outer surface of the sealing member 18 to serve the same purpose. The shafts 32 and 33, for example, could actually be part of the sealing member 18, if desired.

Normally, the vessel 12 will have sealed therein a volatile fluid 34, such as methylene chloride, which vaporizes at substantially room temperature. When said fluid is thus contained within the unit 10, and when the pivot shafts 32 and 33 are positioned on suitable supports 36 as shown in Fig. 6, the said unit will be nearly vertically aligned with respect to the supports 36 so that the vessel 12 will form the lower and the vessel 14 the upper portions of the unit 10. If the upper element 14 can be chilled, or, alternatively, if the lower element 12 can be heated, a pressure differential will be induced thereby between these two elements such that the atmosphere within the element 14 will be at a substantially lower pressure than the atmosphere in the annular space 37 between element 12 and the tubular extension 20, inasmuch as the fluid 34 constitutes a seal for the lower end of the tube 20 and prevents immediate equalization of the pressure between the two chambers. When this pressure differential becomes great enough, it will cause the

fluid 34 to be forced upward through the tube 18 and into the vessel 14 thereabove, so that the unit 10 will be made to tilt about the axis 32—33, as indicated in dot-and-dash form in Figure 6, until its upper end abuts the stop 38. The diagonal disposition of the unit 10 thus produced will serve to break the seal at the end of the tube 20 by means of the attendant reduction of fluid level in the chamber 12 and the changed disposition of the said fluid in the said vessel, which vent the tube 20 to the atmosphere of the chamber 12. The connection between the atmosphere in the chamber 12 and the atmosphere in the chamber 14 formed by the said venting of the tube 20 will serve to equalize the pressure within the respective chambers, resulting in the downward flow of the fluid in the chamber 14 to the chamber 12 and the return of the unit 10 to the initial vertical alignment.

As shown in Figure 6, the pivot shafts 32 and 33 are preferably to be disposed so that the body of the motor is normally tilted at a slight angle, in the direction of the stop 38. This insures that the motor will always pivot in that direction.

The preferred method of inducing a temperature differential and consequent pressure differential between the respective chambers is by means of a knitted sleeve 40 made of fibre-glass or other suitable material positioned over the vessel 14, and moistened so as to cool the said vessel by means of the normal evaporation of the moisture therefrom.

While the cooling effect of the wetted sleeve 40 will cause a temperature differential to be produced between the chambers 12 and 14, the transfer of heat by conduction between the said chambers will offset the advantage thus obtained unless an effective means of preventing such heat transfer shall be introduced therebetween. It has been found that the utilization of an inert organic material, such as nylon, to serve as the connective seal between these members 12 and 14 will provide an effective insulator such as will prevent dissipation of the desirable heat differential. It is, accordingly, a necessary aspect of the present process to provide a connective seal which shall be formed from a material of the type indicated.

The aluminum chambers 12 and 14 are, in the process herein disclosed, preferably formed by extruding a shell of the diameter required and cutting the shell thus extruded to the appropriate dimensions.

The connecting piece 18, formed, as indicated, of nylon or other suitable inert semi-resilient material, may be manufactured in the desired configuration by a molding process.

In the preferred method of manufacturing the unit 10, the member 18 is first pressed into the upper shell 14. The assembly thereby produced is positioned in a suitable rack or receiving means 19 (Fig. 7) and a suitable quantity of methylene chloride is introduced therein. The tubes thus racked and filled are then enclosed in a suitable chamber 21. The unit 12 is similarly positioned within the chamber above the unit 14, the unit 12 being disposed in contiguous relationship with the unit 14 so as to allow a slight vent or aperture to remain therebetween. A moderate vacuum is then introduced within the said chamber and therefore also in the motor 10 by means of suitable pumps (not shown), operatively connected to the conduit 23. This reduction in pressure effects a boiling of the methylene chloride within the unit 14 and a consequent flushing of air through the vent. At the proper time, an externally operated thrust means, diagrammatically referred to by reference numeral 25, introduced into the chamber 21 through suitable seals, is actuated to press the chamber member 12 fully onto the nylon sealing member 18 with a pressure sufficient to effect an airtight sealing of those members. A further sealing is preferably effected by later dipping, spraying or painting a suitable fluid sealing substance around the joints formed between the sealing member 18 and the two chamber members 12 and 14, so as to insure that the vacuum will not be dissipated.

Although a method for flushing air from the unit 10 by means of vacuum pumps has been described, alternative means for accomplishing this purpose, such as a suitable heating unit 38, to effect a boiling of the methylene chloride by application of heat thereto, may be used if desired.

As previously stated, it is intended that the members 12 and 14 shall be formed of a length such that the seal 18 inserted therebetween will form a balance point about which the unit 10 may rotate when positioned, by means of the pivot shafts 32 and 33 secured thereto, upon supports 36.

In the drawing and specification, there has been set forth a preferred embodiment of the invention, and although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation. Changes in form and in the proportion of parts, as well as the substitution of equivalents are contemplated, as circumstances may suggest or render expedient, without departing from the spirit or scope of this invention as further defined in the following claims.

It is claimed:

1. The process of assembling a thermal power unit having two elongated metallic chambers each provided with a single open end and a separate sealing member of organic material to prevent heat transfer between said metallic chambers having an elongated tube extending therefrom, which comprises introducing a volatile liquid into a first of said chambers disposed with the open end thereof substantially upright, securing said sealing member to the open end of said first chamber with said tube projecting upwardly therefrom, bringing the open end of the second chamber into closely spaced relation to the end of said sealing member with said tube received within said second chamber, causing said liquid in said first chamber to boil so that substantially all air is purged from both said chambers, and simultaneously bringing the open end of said second chamber into sealed relation with said sealing member so that said chambers are supported in sealed, interconnected relation thereby.

2. The process of assembling a thermal power unit having two elongated metallic chambers each provided with a single open end and a separate sealing member of organic material to prevent heat transfer between said metallic chambers having an elongated tube extending therefrom which comprises introducing a volatile liquid into a first of said chambers disposed with the open end thereof substantially upright, securing the open end of said chamber to said sealing member with said tube projecting upwardly from said chamber, inserting said tube into the second chamber so that the closed end of the latter is brought into close association with the upper end of said sealing member, reducing the atmospheric pressure at the open end of said second chamber and thereby causing said liquid in said first chamber to boil so that substantially all air is purged from both said chambers, and simultaneously bringing the open end of said second chamber into sealed relation with said sealing member so that said chambers are supported in sealed, interconnected relation thereby.

3. The process of assembling a thermal power unit having two elongated metallic chambers each provided with a single open end and a separate sealing member of organic material to prevent heat transfer between said metallic chambers, having an elongated tube extending therefrom, which comprises introducing a volatile liquid into a first of said chambers disposed with the open end thereof substantially upright, securing the open end of said first chamber to said sealing member so that the latter projects upwardly from said chamber, inserting said tube into the second chamber so that the closed end of the latter is brought into close asso-

ciation with the upper end of said sealing member, heating the liquid in said first chamber until it boils so that substantially all air is purged from both said chambers, and simultaneously bringing the open end of said second chamber into sealed relation with said sealing member so that said chambers are supported in sealed, interconnected relation thereby.

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