

[54] **ELECTRICALLY HEATED SMOKE OR STEAM GENERATOR**

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[57] **ABSTRACT**

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A device for generating smoke or steam, particularly for toys such as toy locomotives, includes a container for holding the chemical medium to be evaporated. A first imperforate tube of electrically insulating material constructed as a capillary is vertically mounted in the bottom of the container and extends longitudinally thereof. An electric heating resistance is mounted in the bore of the first tube. A second imperforate tube of electrically insulating material closed at its top surrounds the first tube in spaced relation thereto to form a space through which an electrical connection to the upper end of the resistance extends. A third tube open at its top surrounds the second tube in spaced relation thereto. Bores are provided at the lower end of the third tube for admitting the medium to be evaporated into the space between the second and third tubes whereby the heat of the resistance evaporates the medium to provide smoke or steam which is emitted from the open top of the third tube. The electrical connections to the resistance extend through the bottom of the container.

[30] **Foreign Application Priority Data**

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[51] **Int. Cl.**..... **H05b 3/00**; A63h 33/28; F22b 1/28

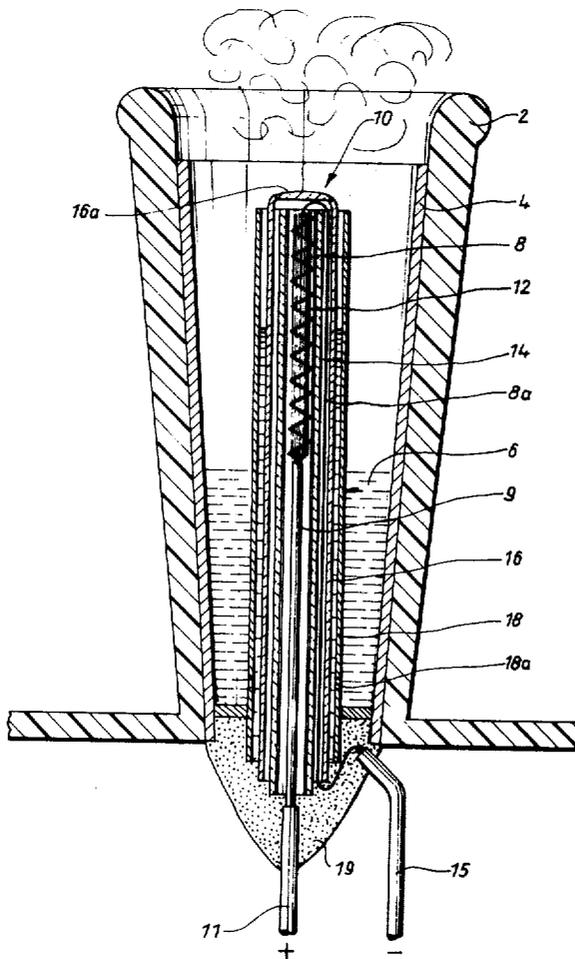
[58] **Field of Search**.... 219/306, 307, 319, 280-282, 219/271-276, 362, 335, 336; 21/110, 117-119, 121; 128/186, 173.2, 192, 193, 198; 261/141, 142; 126/113; 46/9

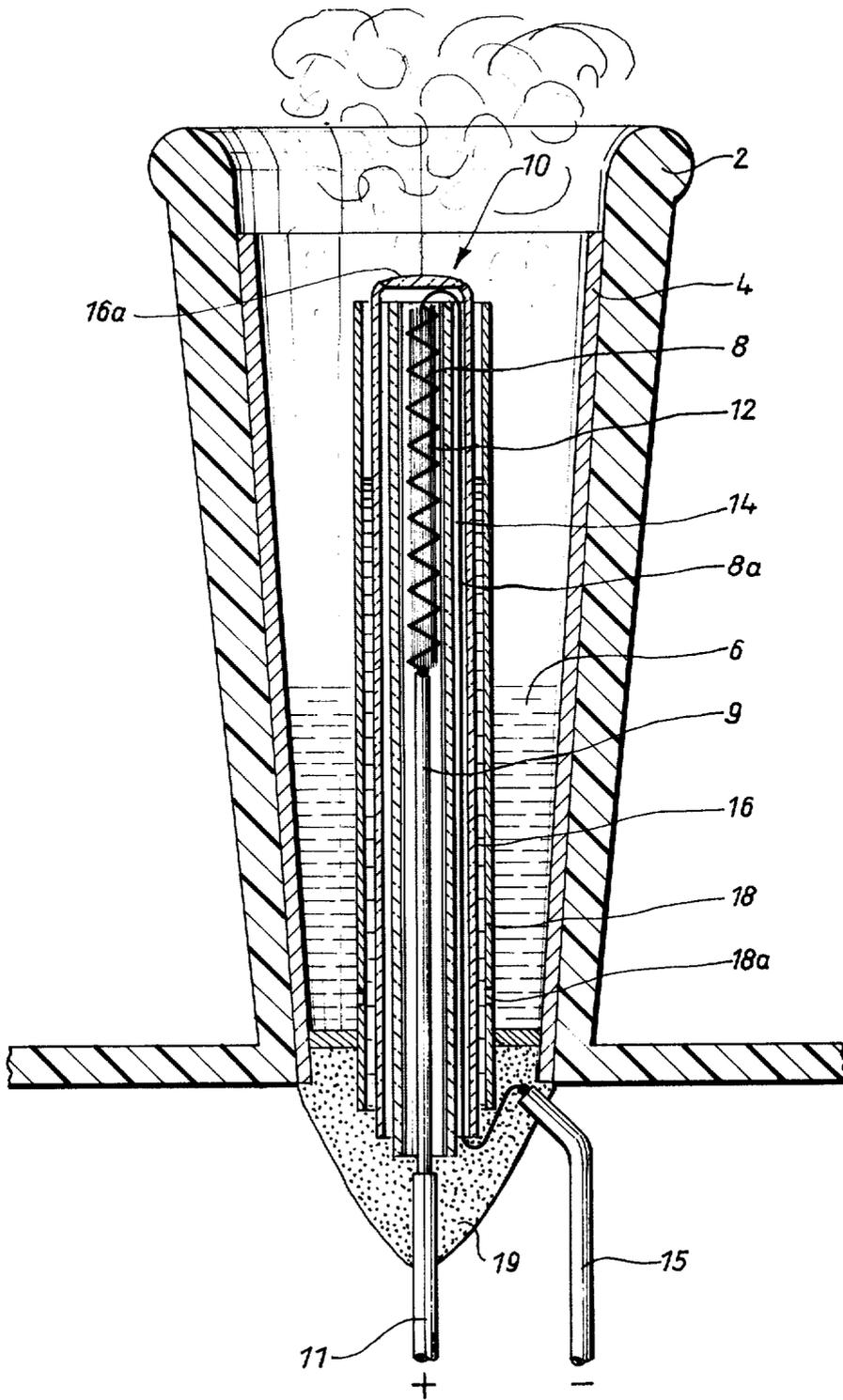
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**3 Claims, 1 Drawing Figure**





## ELECTRICALLY HEATED SMOKE OR STEAM GENERATOR

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

This invention relates to a device for producing smoke or steam, particularly for toys, by evaporation of a chemical evaporating medium by means of an electrical heating resistance which is guided coaxially with respect to and within a first tube which is constructed as a capillary, the end of the first tube being disposed on the bottom of the vessel containing the evaporating medium, while one end of the heating resistance is guided out of its other free end.

#### 2. Description of the Prior Art

Various constructions of steam generating devices for toys are known. Such steam generating devices based on the discontinuous evaporation of individual bubbles of liquid are for example used in chimneys of toy houses or locomotives. Since the clouds of steam emerge from the capillary in surges and accompanied by a puffing noise, a reasonable approximation to the example of a pulsating steam cloud formation as in heavy industry, e.g. in the case of factory chimneys, locomotives, houses or the like, is achieved.

Steam generating devices are known in which the electric heating resistance is wound around the rising pipe carrying the steam developer fluid. However, with such constructions, the amount of heat radiated to the walls of the container is quite considerable, so that poor efficiency and also difficulties in insulating against heat the parts of the toy enclosing the container walls are encountered.

German Pat. No. 1 187 165 discloses a steam producing device in which the capillary rising tube contains the electric heating resistance. In this case, the electric heating resistance which in its upper portion, located at the exit end, consists of a wire filament, which is carried by a wire of heavier cross-section, is completely guided inside the riser tube. This construction has the advantage that the heat radiating out from the heating wire is almost exclusively utilised for heating the liquid which is to be vaporised, since the heating wire extends within the liquid rising by capillary action up the riser tube so that the heat can, without notable losses, be concentrated inside the capillary.

However, in the practical operation of such steam producing devices, it has been found that as the steam producing agent is extracted by boiling, residues form in the region of the heating filament and these create transition resistances. In consequence, the steam generating device becomes incapable of operating after a few hours' use. In order to avoid such residues forming, such steam producing devices, when fitted into small locomotives, have in the past been operated only with reasonably constant voltages, voltage peaks being avoided. Therefore, the range of applications was limited.

### SUMMARY OF THE INVENTION

The invention is based on the problem of avoiding these disadvantages and of providing a steam generating device which operates residue-free even after prolonged use and can be perfectly operated under different voltages such as occur in the operation of model railways. In addition, such steam generating devices should also be suitable for use in small toy locomotives

such as are currently popular when HO track is in use.

According to the invention, this problem is resolved in that: coaxially with the first tube there is a second insulating tube, the end of the heating resistance being passed between the walls of the first and of the second tubes through the electrical connecting lead provided on the bottom of the container, while both tubes are enclosed by an outer third tube, the riser tube, carrying the evaporation medium. Both for reasons of production and also for reasons of heat insulation and temperature resistance, it has been found favourable for the second tube to consist of glass and to be fused at its free end.

### BRIEF DESCRIPTION OF THE DRAWING

Further advantages and features of the invention become manifest from the ensuing description in which reference is made to the attached drawing in which an example of embodiment of the object of the invention is illustrated in longitudinal section and on a substantially enlarged scale.

### DESCRIPTION OF THE PREFERRED EMBODIMENT

In the case of the example of embodiment illustrated, the steam generating device according to the invention is inserted into a chimney 2 of a toy, for example a toy locomotive, which is not shown in greater detail. In a container 4 is a liquid 6 which is evaporated by a heating device generally designated 10 and disposed centrally in the container, readily visible clouds of steam forming. For this purpose, a heating resistance is provided which consists of a heating filament 8 which is mounted on a carrier wire 9 of thicker cross-section by soldering or by adhesion using an electrically conductive adhesive. This carrier wire 9 is connected to an electric connecting lead 11 leading to the bottom of the container. The heating filament is wound preferably on fibrous carrier material 12, e.g., glass silk.

As the drawing shows, the heating resistance 8, 9 is enclosed by a first insulating tube 14. This serves as a guide tube for the resistance and is at the same time provided for electrical insulation. It consists for example of temperature-resistant toughened glass. The free end 8a of the heating filament 8 is extended out of the upper free opening of the first tube 14 and extends along the outer peripheral shell of the tube 14 to the second power supply lead 15 provided in the bottom of the container.

Guided coaxially around the first tube is a second tube 16, which, in the example of embodiment illustrated, consists like the first tube 14 of a toughened glass which is resistant up to approximately 900°C. It serves to screen and insulate the end 8a of the heating filament which is passed through between the tube walls 14 and 16. It has the effect of avoiding access by the evaporating agent 6 to the heating wire end 8, so that the aforesaid disadvantages of combustion residues and transition resistances forming cannot occur. The tube 16 which likewise has capillary dimensions of approximately 0.9 mm inside diameter, is drawn under marked heating at melting temperatures and is fused at one end, at 16a. Its fused end is slipped over the bent-over part of the heating filament 8a so that the heating resistance is completely screened on the outside.

Finally, a third, outer tube 18 is disposed around the first and second insulating tubes 14 and 16, coaxially

enclosing the two inner tubes. This tube must be regarded as a riser tube in which, through bores 18a, and by capillary action, evaporating fluid rises and, in the heating filament region 8, vaporises as a result of the considerable heat which develops there. Readily visible clouds of smoke emerge thereby from the free end of the container through the opening at the top of the chimney.

It has been found that the steam generating device described, can be used with great success in toys of even very small dimensions. Since no residues of any kind can form, due to insulation of the heating filament end by the glass tube 16, the heating resistance is capable of withstanding a greater load and of therefore working over a greater range of voltages without disadvantage. Therefore, it is possible to work at higher temperatures than previously. Special screening of the vapourising container with respect to the wall 2 of the toy, the said wall consisting in most cases of plastics material, is unnecessary since insulation is provided by the tube 16. The dimensions of the tubes 14, 16, 18 are within the capillary range.

For example, the inside diameter of the tube 14 is 0.6 mm, the inside diameter of the tube 16 is 0.9 mm, and the inside diameter of the tube 18 is 1.3 mm for a wall thickness of approximately 0.07 mm.

Provided beneath the bottom of the vapourising container 4 is a cementing 19 which simultaneously carries the heating resistance and the three tubes. It consists of a temperature resistant quick-hardening adhesive medium.

According to an advantageous example of embodiment, the outer tube 18 may be formed from a coil spring which substantially coaxially surrounds the two inner tubes 16 and 14. This has the advantage that the manufacturing tolerances may be greater.

I claim:

1. A smoke producing device for toys including a container for holding a chemical evaporating medium and having a closed bottom end; a first imperforate tube of electrically insulating material constructed as a

capillary, mounted in the said bottom of the container and extending longitudinally from said bottom end towards the opposite end of the container; an electrical heating resistance coaxially mounted within the bore of said first tube and having electrical connections thereto extending from each end of the first tube; a second imperforate tube of electrically insulating material substantially co-extensive in length with said first tube and spaced from and coaxially mounted by its lower end relative to the first tube in the bottom end of the container; a connection to the upper end of the heating resistance extending between the walls of the first and second tubes and through the bottom end of the container; a connection to the lower end of the heating resistance extending through the bottom of the container; a pair of electrically conductive wires mounted externally of the bottom end of the container connecting said electrical connections to a voltage source; a third tube surrounding the first and second tubes being spaced from and coaxially mounted with the second tube, the spacing between the second and third tube being independent of the spacing between the first and second tubes and being open at the top; and means provided in the third tube and located towards the closed bottom end of the container for admitting evaporating medium in the container into the space between the second and third tubes, wherein when the pair of conductive wires is connected to a source of voltage the temperature of the heating resistance increases to evaporate the evaporating medium in the space between the second and third tubes to provide smoke or steam which is emitted from the open upper end of the third tube.

2. Device according to claim 1, in which the second tube consists of glass and is fused closed at its upper end.

3. Device according to claim 2, in which the tubes are held in a cemented portion provided at the closed bottom end of the container and which portion also holds the pair of electrically conductive wires.

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